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ELECTION DAY LONG LINES: RESOURCE ALLOCATION

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Brennan Center for Justice *at New York University School of Law*

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ACKNOWLEDGEMENTS

The Brennan Center gratefully acknowledges the Democracy Alliance Partners, FJC - A Foundation of Philanthropic Funds, Ford Foundation, Anne Gumowitz, Irving Harris Foundation, The Charles Evan Hughes Memorial Foundation, The Joyce Foundation, The JPB Foundation, Leon Levy Foundation, John D. and Catherine T. MacArthur Foundation, Mertz Gilmore Foundation, Nancy Meyer and Marc Weiss, Open Society Foundations, Rockefeller Family Fund, Bernard and Anne Spitzer, The Streisand Foundation, and Vital Projects Fund for their generous support of our voting work.

The authors are incredibly grateful to the political scientists who contributed insight and analysis to this report. These include Mark Lindeman, adjunct assistant professor of political science at Columbia University, Charles Stewart III, of the Massachusetts Institute of Technology, and Bridgett King, instructor at Valdosta State University, for her contributions to the analysis in the early stages of the report. We also want to thank the many state and county election officials who generously provided data for this report.

The authors would like to offer special thanks to the many Brennan Center staff members who contributed to this analysis, including Nelson Castaño for research, drafting, and editing assistance, Emily Apple and Sonam Sheth for collecting data, and Rebecca Morse for editing. The authors owe much to Jim Lyons, Desiree Ramos Reiner, Jeanine Plant-Chirlin, John Kowal, and Michael Waldman for their invaluable editorial assistance, and Lena Glaser and Erik Opsal for their help with design and layout. We are very grateful to Oliver Roeder and Elena Llaudet for their assistance and advice with the statistics and methodology. A special thank you is also owed to Wendy Weiser for her leadership, vision, and strategic insight throughout the drafting process.

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EXECUTIVE SUMMARY

The images of voters standing in long lines at the polls in the November 2012 election generated much attention from the media, the public, and from the president. Accounts of individuals waiting for hours to cast a ballot inspired both admiration for those determined to make their vote count, and dismay at a ramshackle election administration system.

In early 2013, President Barack Obama convened a bipartisan commission to address the problem of long lines and determine best practices for local election officials.[1] According to the commission's findings, 10 million people waited longer than half an hour to vote in 2012.[2] The commission concluded that no voter should wait more than 30 minutes, and issued recommendations for election officials to improve the casting of ballots.[3] Almost two years after the 2012 election, however, policymakers have done little to prevent long lines from recurring. This study offers fresh data to guide reform efforts.

What causes long lines at the polls? Unexpected surges in turnout could be an easy, and in some ways, an accurate answer, but the story is more complex. This study finds that the resources distributed to polling places are a key contributor to long lines. Which precincts have the most voting machines? Do they have enough poll workers? Do they comply with minimum state requirements for how those resources must be allocated? Importantly, this study suggests that the answers to those questions could affect how long voters have to wait in line, and which voters have to wait longer. Many of the lines that manifested on Election Day in 2012 could have been mitigated with planning that looked at factors known before the day of the election, like the number of registered voters and the level of resources allocated to each polling place for Election Day.

Little research has assessed how resource allocation contributes to delays. This analysis attempts to fill that gap by analyzing precinct-level data from states where voters faced some of the longest lines in the country: Florida, Maryland, and South Carolina. Specifically, this study assesses whether and how machine and poll worker distribution contributed to long lines in those states during the 2012 presidential election. Given the media coverage and political commentary in the wake of the 2012 election suggesting a racial component to the problem of long lines, we also sought to understand what role, if any, race played in predicting where long lines might develop. Accordingly, we examined the interplay between resource allocation, race, and long lines across each state. We also examined those same factors in each county so that strong trends in particular counties would not create the appearance of a statewide trend.

Each state studied presents its own nuances and qualifications. There were no perfectly uniform findings. That said, there are unmistakable patterns that emerge:

- **Voters in precincts with more minorities experienced longer waits.** This mirrors findings from two prior studies, suggesting a genuine problem that needs to be addressed. For example, in South Carolina, the 10 precincts with the longest waits had, on average, more than twice the percentage of black registered voters (64 percent) than the statewide average (27 percent).

- **Voters in precincts with higher percentages of minority voters tended to have fewer machines.** This is the first multi-state study to assess voting machine allocation by race, and the findings are consistent with two county-level studies. In Maryland, by way of illustration, the 10 precincts with the lowest number of machines per voter had, on average, more than double the percentage of Latino voting age citizens (19 percent) as the statewide average (7 percent).

- **Precincts with the longest lines had fewer machines, poll workers, or both.** This is the first multi-state study to assess machine and poll worker allocation. Our findings are consistent with the one other study of machine allocation, which focused on one particular county. In Florida, for example, the 10 precincts with the longest lines had nearly half as many poll workers per voter as the statewide average.

- **There is widespread non-compliance with existing state requirements setting resource allocation.** Both Maryland and South Carolina set certain requirements for what polling places are supposed to provide voters, but we found that only 25 percent of the precincts studied in South Carolina and 11 percent of the precincts in Maryland complied with these requirements.

Put simply, this empirical study of three states reinforces what others have noted: Precincts with greater numbers of minorities were more likely to have long lines in November 2012. It presents new empirical data that underscores that conclusion and further finds that precincts serving minorities tended to have worse resource allocation.

There are two important caveats to this last finding. First, resource allocation outcomes are often the product of various other decisions made for many reasons. This study does not find that any jurisdiction or person intentionally discriminated against any group of voters. The findings do, however, call for review and reform of polling place resource allocation to ensure that all voters enjoy fair access to the ballot box. Second, inadequate resource allocation does not explain away all of the long lines: For example, precincts with greater numbers of blacks in Maryland and South Carolina still had longer lines even when they had an equivalent amount of machines as other precincts.

The table below (Figure 1) generally summarizes the principal outcomes of this study, summarizing the relationships we found to be statistically significant in each state. For each finding, we note whether these findings applied statewide or within counties:

	Maryland	South Carolina	Florida
Who Waited Longer in Lines	Blacks (Within Counties) Latinos (Statewide & Within Counties)	Blacks (Statewide & Within Counties) Latinos (Within Counties)	Blacks (Within Counties) Latinos (Statewide & Within Counties)
Minorities Had Fewer	Machines (Statewide)	Machines (Statewide) Poll Workers (Latinos - Statewide)	Machines (Within County) Poll Workers (Latinos - Statewide & Within Counties)
Factors that Drove Long Lines	Race of Voter (Black Within Counties) Number of Machines (Statewide & Within Counties)	Race of Voter (Black Statewide & Within Counties) Number of Machines (Statewide & Within Counties) Number of Poll Workers (Statewide & Within Counties)	Race of Voter (Within Counties) Number of Machines (Statewide) Number of Poll Workers (Statewide & Within Counties)

Figure 1. *Statewide Findings and County-Specific Findings.* Race and resource allocation relationship to line length. For a more detailed version of this table, see the appendices.

Race Relationship to Long Lines

Across the three states, we found that voters in precincts with more minorities tended to experience longer waits. While this was true for blacks and Latinos across the three states when examining trends within counties, it was also true statewide for Latinos in Maryland and Florida, and for blacks in South Carolina.

Race Relationship to Resource Allocation

Across the three states, we generally found that there were fewer machines to serve minority precincts. Specifically, there tended to be fewer machines in precincts with a higher percentage of: voting age Latino and black citizens across Maryland (according to the data that was available, as explained more in the methodology section); Latino and black registered voters across South Carolina; and, within relevant counties, black and Latino registered voters in Florida. In all three states, this relationship was substantially stronger in relation to precincts with a higher percentage of Latinos.

The findings were mixed as to the allocation of poll workers in the two states that had poll worker data. In Florida, Latino registered voters in certain counties had fewer poll workers than white registered voters, but black voters in South Carolina had more poll workers per registered voter than white registered voters.

Resource Allocation Relationship to Long Lines

In all three states, the study found that longer lines could be explained, at least in part, by fewer machines and/or poll workers. In each of the three states, the fewer machines allocated per registered voter statewide, the longer the delay. In Florida, machines seemed to contribute to voting wait times when considered statewide, but not when considered alongside the variation within counties. Many of the same precincts that had lower poll worker allocation also had lower machine allocation. This overlap makes it difficult to untangle the simultaneous influence of these two factors on Election Day delays.

In South Carolina and Florida, the two states we studied that had data on poll worker distribution, we found, as a general matter, that lines were longer when fewer poll workers were allocated. In South Carolina, polling places with wait times longer than 30 minutes had an average of nearly 70 registered voters more per poll worker than polling stations without long wait times. In Florida, poll workers played an even greater role in line length. In some of the state's largest counties, there was wide disparity in poll worker allocation between the polling places that had long wait times and those that did not. In Hillsborough County, for example, precincts with a less than 30-minute delay had about 74 Election Day eligible voters per poll worker compared with about 122 Election Day eligible voters per poll worker in precincts that had delays of greater than 30 minutes.

In short, our research suggests that election resource allocation can contribute to long lines at the polls, and that minority precincts have tended to get the short end of the resource allocation stick. To ensure fair access to the ballot box for all voters, policy makers should focus on setting standards and procedures to ensure that voters have sufficient voting machines and poll workers.

I. INTRODUCTION

Long lines are perhaps the most visible manifestation of Election Day problems. In recent years, they have become a prominent feature in our elections.[4]

While long lines at the polls may reflect failures of election administration, they may also reflect unanticipated enthusiasm in electoral contests that results in voters flooding polling locations. Although there may be more than one cause, research suggests that long lines can have the effects of depressing turnout and dampening voter satisfaction.[5] Additionally, some studies suggest that voters living in minority communities experience longer lines in their states than white voters.

Since President Obama's acknowledgement in his 2012 victory speech of the long lines problem, there has been much discussion among elected officials, election administrators, academics, and voting rights advocates about the causes of long lines and potential fixes. Many of the solutions offered have centered around increasing the number of early voting days and locations, improving the voter registration system, decreasing the length of ballots, decreasing the size of precincts, and addressing other pre-election day conditions.[6] Less attention has been paid to Election Day resource allocation.

The Presidential Commission on Election Administration is a notable exception. The Commission considered issues of polling place design, such as the flow of voters through various points from check-in to casting a ballot.[7] It also recommended that local election administrators determine in advance how long it takes a poll worker to check in individual voters and how long it takes a voter to complete a ballot, in order to use that information to determine how poll workers and machines should be distributed on Election Day.[8] It made several resource calculators available as tools so that administrators could better determine allocation needs.[9]

Our study of resource allocation builds on previous seminal research analyzing long lines. Much of the existing work so far has focused on queuing theory, which applies a model for how lines form to the conduct of elections and management of polling places.[10] Political scientist Charles Stewart used national survey data with self-reported wait times to find that four states — Florida, Maryland, South Carolina, and Virginia — had the longest average waits in 2012.[11] He found that black voters waited longer on average than white or Latino voters. However, this was not due to the race of voters as much as to the fact that they lived in racially diverse areas. Stewart found that both black and white voters who live in racially diverse zip codes, specifically those with more than 50 percent of a minority population, experienced longer wait times than those who lived in racially homogenous zip codes with less than a 5 percent non-white population.[12] In a Florida study based on precinct closing times, political scientists Daniel Smith and Michael Herron found that Latino registered voters experienced longer lines than white registered voters during Election Day in 2012.[13] Ben Highton and Walter Mebane studied voting machine scarcity in Franklin County, Ohio, in the 2004 presidential election, examining the relationship between scarcity and turnout.[14] Both found that machine availability had a dampening effect on turnout.

In the following analysis, we examined how the number of voting machines and poll workers assigned to each precinct influence delays, as well as whether there were racial disparities in how those resources were allocated on Election Day.

II. METHODOLOGY AND LIMITATIONS

This analysis focused on two types of polling place resources — voting machines and poll workers — because these resources are critical to facilitating the voting process. We analyzed how the allocation of these two resources drives the amount of time voters have to wait to vote in select states, discussed in further detail below. We also examined how the racial composition of precincts, and where they were located, played a part in resource allocation and Election Day wait times.

Selection of States

We selected three states for this analysis: Maryland, South Carolina, and Florida. These were three of the four states that Stewart identified as having the longest lines, which we found to be consistent with media reporting on Election Day lines. These three states were also among those with multiple complaints of long lines fielded by Election Protection, a nonpartisan hotline that tracks Election Day problems.[15] They also had data on poll closing times, machine allocation, and poll worker distribution readily accessible.

Other states, such as Ohio and Virginia, also had reports of long voter wait times and complaints to voter hotlines. We did not include them here due to limitations on our ability to obtain data. Unlike Virginia, Maryland, South Carolina, and Florida did not place limits on whether non-residents could make public records requests. In addition, these three states collect data on when the last ballot was cast — a critical factor in our analysis of long lines. We were able to obtain data in the three states studied both from other researchers[16] and through public records requests.[17]

Selection of Counties

We selected the largest counties in the three states that would allow us to account for a minimum of 75 percent of all registered voters in each state. We do not include any precincts outside of those counties.

Calculation of Wait Times

A. How We Measure Wait Times

Wait times were measured by calculating the difference between when the polling location was officially scheduled to close and when it actually reported closing. Each state had a slightly different method of collecting data on polling place closures. In Maryland, the delay time was calculated based on when the last voter checked into the electronic poll book. In South Carolina, the delay in closing is represented by the timestamp of when the last voter cast an electronic ballot on the iVotronic Direct-Recording Electronic (DRE) voting machine. Because Florida uses optical scanners, the closing time delay is represented by the time when results were transmitted to the county office. We make the assumption that these timing delays represented a logjam at the polling place caused by long lines.

B. Limitations

This method of calculating line waits had the advantage of avoiding the problems associated with self-reporting by voters,[18] but it is limited in two major ways. First, it only captures delays that happened at the end of the day. Delays earlier in the day would entirely escape our analysis if they had waned by the evening. Likewise, polling locations that may have been delay-free until the end of the day would be captured. These limitations are especially relevant in Maryland, where other research shows many counties experienced the highest volume of voters in the morning hours.[19] For example, Anne Arundel, Prince George's, and Baltimore counties were the three counties where the most voters self-reported that they waited more than 30 minutes to vote.[20] However, both Anne Arundel and Baltimore County experienced higher turnout in the evening hours, while Prince George's had higher turnout in the morning hours.[21]

Because Maryland's self-reported closing time is based on when the last voter checked into the electronic poll book, we do not actually capture when the last voter was fully processed at each polling location. Also, with respect to Florida at least, there is no guarantee that results were transmitted immediately after the last ballot was cast. In some cases, there could have been a delay between when voting at a polling location concluded and when results were sent in, which would overstate the line length. Note, however, that this is the measurement for poll closures that other researchers studying long lines in Florida have used, and we adjust our interpretation of delays in Florida accordingly. While each method has its drawbacks, these measurements were the best data available about poll closure times in each state.

Calculation of Resources

A. How We Calculated Resource Factors

For voting machine allocation, we collected data on how many DRE voting machines were assigned to each precinct in Maryland and South Carolina, and how many optical scan units were assigned to each precinct in Florida. We also received information about how many poll workers were assigned to each of the precincts in South Carolina and Florida.

To test whether resources had an effect on wait times, precinct-level measures were created based on the number of registered voters in a precinct and the number of voters who turned out on Election Day. In Maryland and South Carolina, we analyzed the number of registered voters per machine and per poll worker because this is how these states set their allocation standards. Note that these standards vary from state to state. For instance, some states, such as Maine, have different standards for the allocation of Election Day resources, which are based on registered and active voters rather than on the basis of registered voters alone.[22] Florida has no such standards and a significant portion of voters cast their votes before Election Day, either by voting early in person or by absentee ballot. Therefore, we created a measure that subtracts voters who had cast ballots by mail or at early voting centers from the total number of registered voters in a precinct. We call the voters who fell into this category "Election Day eligible voters."

B. Limitations

Maryland did not have data on how many poll workers were assigned to each precinct, so we only have poll worker data for South Carolina and Florida. States and counties sent data about the raw number of poll workers assigned to each precinct, but the data did not specify if those workers were at the polling location for the entirety of Election Day or only part of the day. Because those jurisdictions sent the whole number of poll workers for each precinct, we made the assumption that each poll worker was assigned to the polling location for the entire day.

In addition, since poll worker data from Florida and South Carolina was collected individually from counties, there may be small differences in reporting procedures. While these factors may represent the shortcomings of the data, it is the best available to researchers.

Calculation of Race

A. How We Calculated Racial Factors

Our analysis also incorporates a method of analyzing the relationship between race-ethnicity and wait time. The percentage of whites, blacks, and Latinos for each precinct is broken out, as well as a category for other non-whites.[23]

B. Limitations

Election officials in Florida and South Carolina supplied registration data from which the demographic data was drawn. Maryland, however, did not have this data available. As a proxy, we used 2010 Census data about Maryland's citizen voting age population ("CVAP"). This data reflects the population that is aged 18 and older as of the most recent decennial Census, rather than the more relevant measure of who is registered to vote. Although racial diversity of the voting age population may not accurately reflect the racial diversity of registered voters who turn out for elections, it is the best available measure of racial diversity that can be consistently used within states and across counties and precincts.

The Census calculates Voter Tabulation Districts (VTDs) that approximate voting precincts, but do not perfectly mirror existing precincts. Because of changes in the number and size of precincts in certain jurisdictions from 2010 to 2012, we are not able to provide estimates for polling locations that were created or changed after the 2010 Census. However, with the absence of detailed registration data in Maryland, it is the best approximation available.

Statistical Analysis

For each state, we used a statistical tool called a regression model.[24] This model measures how several factors simultaneously affect an outcome being measured. We used regression models (shown in the appendices) to measure the effect of four factors on delay: (1) the number of registered voters per machine, (2) the number of registered voters per poll worker (in the states where that information was available), (3) the racial composition of precincts, and (4) the county in which a precinct is located.

In addition, we used regression models to measure two factors on the allocation of resources (machines, and, if available, poll workers): (1) racial composition of the precincts and (2) the county in which the precinct is located.

Finally, we performed our regressions in two ways, examining trends that occur across each state, as well as how these statewide trends are affected by the differences in racial composition and resource availability within counties. The difference between these two types of analysis is simple: statewide findings indicate a statewide problem, whereas findings that are county-specific relate to problems that originate from within counties.

As mentioned before, in all Florida models, we used Election Day eligible voters instead of registered voters to measure resource allocation. While our regression models evaluate the factors that contribute to Election Day waits, and resource allocation, we only report statistically significant results. While a regression model is a commonly used statistical tool, like all statistical methods, it has its limitations. There may be other factors that influence delays that we were unable to account for in our model, which could also be "drivers" of delay. Our research suggests that long lines have a statistically significant relationship with multiple factors, including resource allocation measures, race, and county. This means that delays are likely attributable to the specific causes that we evaluate, rather than something random.

III. MARYLAND FINDINGS

On Election Day 2012, Maryland had 3.7 million registered voters served by 1,590 polling locations.[25] Of the 1,359 polling locations[26] in the eight counties included in our analysis, 1,085 (80 percent) closed on time; 214 (16 percent) had delays between 1 and 30 minutes; and 60 (4 percent) had delays of more than 30 minutes. Of the 60 polling locations with delays of more than 30 minutes, 24 had wait times that exceeded one hour.

Our analysis shows that:

- When we considered differences within Maryland counties, precincts with higher percentages of black or Latino voting age citizens tended to have longer lines;
- Statewide, precincts with higher percentages of minority voting age citizens had fewer voting machines;
- Polling places with long wait times were found in precincts with fewer machines per registered voter when examining the issue statewide and at the county level; and
- Statewide, precincts with a higher percentage of Latino voting age citizens waited in longer lines.

The analysis that follows is based on data obtained from the eight Maryland counties with more than 125,000 registered voters: Anne Arundel, Baltimore, Frederick, Harford, Howard, Montgomery, Prince George's, and the City of Baltimore, which account for approximately 80 percent of the state's voters ("the studied counties").[27]

As noted above, our analysis of long lines in Maryland faced a central limitation: Our measure of delay only captured polling places with delays around poll closing. The analysis could not account for delays that occurred earlier. Other research suggests that many long lines in Maryland cleared up before poll closing time.[28] Analyzing resource allocation using check-in data is an area for future research that may yield further findings. That said, based on the available data, we found statistical evidence shedding light on why delays occurred in Maryland and which communities were disproportionately affected by them.

Magnitude of the Delays

While some voters in the studied counties experienced no delays, other voters had an almost three-hour wait time. Less than 5 percent of precincts in the studied counties closed more than 30 minutes late, but 40 percent of them had wait times that exceeded one hour. Voters in two of the studied counties — Anne Arundel and Baltimore counties — were disproportionately affected by late poll closings. For this reason, we focus on them here. In Anne Arundel's 155 precincts, 24 (15 percent) had wait times of 30 minutes or more, while 49 (32 percent) closed between the scheduled time and 30 minutes late. In Baltimore County, 21 of the 226 precincts (9 percent) had delays of 30 minutes or more, while another 43 (19 percent) were delayed in closing up to 30 minutes. According to Census figures, Anne Arundel County's black and Latino voting age citizen population is 15 percent and 5 percent, respectively. Baltimore County's black and Latino voting age citizen population is 24 percent and 4 percent, respectively.[29]

Resource Allocation: Descriptive and Regression Findings

Under Maryland law, precincts are required to have one machine for every 200 registered voters.[30] Only 152 of the 1,359 studied precincts — about 11 percent — met the state standard. More than 90 percent of all precincts in Anne Arundel and Baltimore counties, the counties with the longest average wait time, had fewer machines per voter than required by law.

Unsurprisingly, both statewide and in these two counties, precincts with a delay of 30 or more minutes had the fewest number of machines per registered voter. Across all the studied counties, precincts with no delay, on average, had 217 registered voters per machine, but precincts with a delay of more than 30 minutes, on average, had 230 registered voters per machine.

Statewide, our research found that, on average, precincts with higher percentages of black or Latino voting age citizens had fewer machines per voter when compared to precincts with a higher percentage of white voting age citizens. This disparity was pronounced in precincts with a higher percentage of Latino registered voters and slight in precincts with a higher percentage of black registered voters.

Maryland – Average Registered Voter Per Machine and Duration of Delay

	Studied Maryland Counties	Anne Arundel County, Md.	Baltimore County, Md.
State Law	**200**	**200**	**200**
No delay	217	217	222
1-30 Minutes	225	225	231
30+ Minutes	230	230	233

Table 1. *Precinct delays and machine allocation in Maryland, Anne Arundel County, and Baltimore County.* The table shows the average number of registered voters per machine in each precinct based on the length of delay times.

What Happened in Prince George's County?

Prince George's County has the greatest percentage of minority residents among Maryland's counties. While poll closing times do not suggest many delays, findings from a study conducted by the Maryland Board of Elections and the Schaefer Center for Public Policy noted that Election Day voters in Prince George's County reported some of the longest waits in the state.[31] However, the busiest time for many polling places in the county was on the morning of Election Day,[32] and hence the delays are not evident in the state's data because it measures the time differential between scheduled and actual closing times. Our analysis concluded that Prince George's County had the state's highest number of precincts in violation of the state's machine allocation standard.[33] On average, each precinct had 230 registered voters per machine, which is greater than the state's standard of 200 registered voters per machine. Taken together, these findings suggest that Prince George's long lines cleared before polls closed.

Drivers of Delays: Regression Findings

We found that higher percentages of minority voting age citizens in a precinct, and higher numbers of registered voters per machine, were associated with longer delays.

As noted above, when we considered the dynamics within Maryland counties, precincts with higher percentages of black or Latino voting age citizens tended to have longer lines. Our research found, however, that in Baltimore County, only precincts with a higher percentage of black voting age citizens tended to have longer delays than precincts with a higher percentage of white voting age citizens. There was no statistically significant relationship between race and delay in Anne Arundel County.

With respect to machines, we found statewide that precincts with a fewer number of machines per registered voter were more likely to see long lines on Election Day. Additionally, an examination of trends within counties also found that line length increased as machines had to serve more registered voters. The county-specific findings from both Baltimore and Anne Arundel Counties suggest that the under-allocation of voting machines contributed to long lines in those particular counties.[34]

Our findings suggest that wait times for precincts with a higher percentage of Latino voting age citizens were almost entirely explained by poor resource allocation. In contrast, resource allocation explains a small portion, but not all of the wait times in precincts with a higher percentage of voting age black citizens.

IV. SOUTH CAROLINA FINDINGS

On Election Day 2012, South Carolina had 2.9 million registered voters served by 2,089 polling locations.[35] Of the 1,318 polling locations included in our analysis, 795 (60 percent) closed on time; 365 (28 percent) had delays between 1 and 30 minutes; and 158 (12 percent) had delays of more than 30 minutes. Approximately 100 of those precincts had wait times exceeding one hour.

Our analysis shows that:

- When we looked within South Carolina counties, precincts with higher percentages of black or Latino registered voters tended to have longer lines;
- Statewide, precincts with higher percentages of minority registered voters had fewer voting machines, but only precincts with a higher percentage of Latino registered voters had fewer poll workers;
- Polling places with long wait times were found in precincts with fewer machines and poll workers per registered voter when examining the issue statewide and within counties; and
- Statewide we found that precincts with higher percentages of black registered voters tended to have longer lines.

The analysis that follows is based on data obtained from 16 large South Carolina counties, all of which have at least 50,000 registered voters (the "studied counties").[36] This sample accounts for approximately 75 percent of the state's registered voters.[37]

Magnitude of the Delays

While some voters in the studied counties experienced no delays, other voters had a wait time of almost *five hours*. Less than 12 percent of precincts in the studied counties closed more than 30 minutes late, but 60 percent of these had wait times that exceeded one hour. Voters in two of the studied counties — Richland and Berkeley — disproportionally experienced late poll closings. For this reason, we focus on them here. Richland County was responsible for about half of the state's wait times that were longer than 30 minutes. It had an average wait time of 80 minutes.[38] Berkeley County was responsible for 24 percent of the state's wait times that were longer than 30 minutes. It had an average wait time of 44 minutes, the state's second highest.[39] About 48 percent of Richland County's registered voters are black, and the county contains approximately 14 percent of the state's entire black registered voter population. About 27 percent of Berkeley County's registered voters are black and the county contains about 3 percent of the state's entire black registered voter population.[40] In each county, about 1.5 percent of registered voters are Latino.

Resource Allocation: Descriptive and Regression Findings

Under South Carolina law, precincts are required to have one machine for every 250 registered voters.[41] Only 336 of the over 1,300 studied precincts — about 25 percent — met the state standard. More than 85 percent of all precincts in Richland and Berkeley counties had fewer machines per voter than required by law. Across the studied counties, the precincts with the longest wait times had the lowest numbers of voting machines per voter. Across all the studied counties, precincts with no delay had an

average of 279 registered voters per machine, while precincts with a delay of 30 minutes or more had an average of 379 registered voters per machine. This means that each machine would have had to serve 100 more registered voters — 36 percent more — than in precincts with no delay.

Statewide, our research found that precincts with higher percentages of Latino or black registered voters had fewer machines per registered voter when compared to precincts with a higher percentage of white registered voters. This disparity was pronounced in precincts with a higher percentage of Latino registered voters and slight in precincts with a higher percentage of black registered voters.

The evidence of machine shortages was even more apparent in Richland County, where the delays were the longest. Eighty-seven percent of the precincts assigned more registered voters to machines than allowed under state law. Precincts with no delay had an average of 312 registered voters per machine, compared to 432 registered voters per machine in precincts with delays of 30 minutes or more. In other words, machines in Richland County precincts with delays served 39 percent more registered voters than those without delays.

State law also requires that there be three poll workers for every 500 registered voters,[42] which amounts to about 167 registered voters per poll worker. Approximately 33 percent of precincts in the studied counties met this standard. Precincts with no delay across the state had an average of 189 registered voters per poll worker, while precincts with a delay of 30 minutes or more had an average of 264 registered voters per worker, or 40 percent more.

Statewide, precincts with higher percentages of Latino registered voters received fewer poll workers than precincts with higher percentages of white registered voters. Statewide and within counties, precincts with a higher percentage of black registered voters in South Carolina had more poll workers than in precincts with a higher percentage of white registered voters.

Richland County's non-compliance with regard to poll worker allocation standards was more pronounced, with 94 percent of precincts assigning more registered voters per poll worker than permitted by state law. In Richland County, precincts with no delay had 232 registered voters per poll worker. Meanwhile precincts with delays of more than 30 minutes had 321 registered voters per poll worker, nearly double that required by state law.

Percent of Precincts Not Meeting Resource Allocation Standards

Resources	South Carolina – 16 Counties	Richland County, S.C.
Machine Allocation: Precincts Not Meeting Statutory Standard	75%	87%
Poll Worker Allocation: Precincts Not Meeting Statutory Standard	67%	94%

Table 2. *Precincts and resource allocation standards.* This table shows the percentages for how many precincts did not meet (1) machine allocation standards of one machine per 250 registered voters and (2) poll worker allocation standards of one worker per 167 registered voters. These statistics are reported in the studied counties and in Richland County specifically.

Average Machine Allocation Values and Duration of Delay

	South Carolina 16 Counties Average Reg. Voters Per Machine	Richland County, S.C. Average Reg. Voters Per Machine
State Law	**250**	**250**
No Delay	279	312
0-30 Min. Delay	302	355
30+ Min. Delay	379	432

Table 3. *Average machine allocation in South Carolina and Richland County.* This table shows the average number of machines allocated to each precinct in the studied counties, and in Richland County, based on delays.

Average Poll Worker Allocation Values and Duration of Delay

	South Carolina 16 Counties Average Reg. Voters Per Poll Worker	Richland County, S.C. Average Reg. Voters Per Poll Worker
State Law	**167**	**167**
No Delay	189	232
0-30 Min. Delay	216	250
30+ Min. Delay	264	321

Table 4. *Average poll worker allocation in South Carolina and Richland County.* This table shows the average number of poll worker allocated to each precinct in the studied counties, and in Richland County, based on delays.

Drivers of Delays: Regression Findings

We found that the percentage of minority registered voters in a precinct, the number of registered voters per machine, and the number of registered voters per poll worker were associated with longer delays.

As noted above, when we considered variation within South Carolina counties, precincts with higher percentages of black or Latino registered voters tended to have longer lines. Additionally, statewide, longer delays were associated with a higher percentage of black registered voters in a precinct. This analysis found that in Richland and Berkeley counties, precincts with a higher percentage of black registered voters tended to have longer lines.

With respect to machines and poll workers, we found statewide that precincts with a higher number of registered voters per machine or poll worker were more likely to see long lines on Election Day. Additionally, when we examined the counties we also found that line length increased as machines or

poll workers had to serve more registered voters. The county-specific findings from Richland County suggest that the under-allocation of voting machines and poll workers contributed to the long lines in the county. There were no statistically significant findings in this regard in Berkeley County.[43]

Our findings from within counties suggest that wait times for precincts with a higher percentage of Latino voting age citizens were almost entirely explained by poor resource allocation. In contrast, resource allocation explains none of the wait times within counties for precincts with a higher percentage of black voting age citizens. However, statewide findings suggest that some of the delays in precincts with a higher percentage of black voting age citizens were explained by poor resource allocation.

V. FLORIDA FINDINGS

On Election Day 2012, Florida had 11.9 million registered voters who voted at 4,650 polling sites.[44] Of the 3,666 polling locations[45] in the 17 counties included in our analysis, 1,429 (39 percent) had delays of 30 minutes or less, and 2,237 (61 percent) had delays of more than 30 minutes. Of those locations, 1,041 polling places — about 22 percent of all the polling places in the state — had delays exceeding one hour. A portion of precincts did not have data on delays.[46]

Our analysis shows that:

- When we looked within Florida counties, precincts with higher percentages of black or Latino registered voters tended to have longer lines;
- Within counties, precincts with higher percentages of minority registered voters had fewer voting machines;
- Precincts with higher percentages of Latino registered voters had fewer poll workers when examining the issue statewide and within counties;
- Statewide, polling places with longer wait times were found in precincts with fewer machines and poll workers per Election Day eligible voter; and
- Within counties, polling places with longer lines had fewer poll workers per Election Day eligible voter.

The analysis that follows is based on data obtained from 17 large Florida counties, all of which have at least 200,000 registered voters ("the studied counties").[47] This sample accounts for approximately 75 percent of the state's registered voters.[48]

The Latino Population in Florida

The Latino population in Florida is larger than in South Carolina and Maryland. Approximately 14 percent of Florida's registered voters are Latino. In Miami-Dade County, roughly 54 percent of registered voters are Latino. Orange, Broward, Hillsborough, and Palm Beach counties are also home to a sizeable percentage of Latino registered voters.[49]

Magnitude of the Delays

Delays on Election Day were widespread throughout Florida. While specific counties were disproportionately impacted by delays in South Carolina and Maryland, our research shows that in Florida there was a systemic, statewide problem. The average delay across the 17 counties was 53 minutes. In addition, our findings show wide variation in the average delay across counties. In Miami-Dade County, the average delay was 67 minutes, whereas in Broward County the average delay was 25 minutes. The average delays from the 17 Florida counties are summarized in Figure 2.

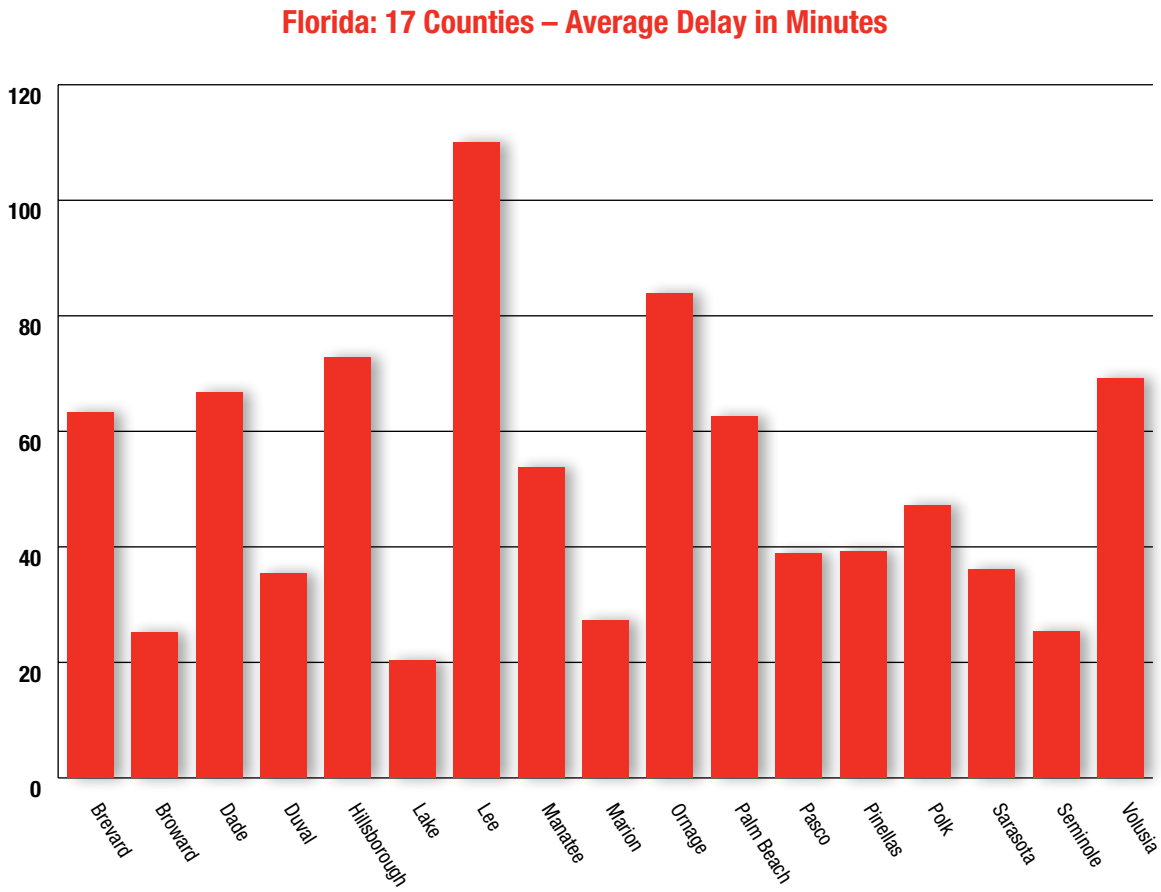

Figure 2. *Average wait times in 17 Florida counties.* This graph shows the average delay in each of the studied counties in Florida. While the delay data from Florida is limited, it clearly shows the differences in the average wait time between the counties.

Resource Allocation: Descriptive and Regression Findings

Florida does not have minimum standards for poll worker and voting machine allocations. This may explain the variation among counties in the distribution of machines and poll workers. As described in the methodology section, we created a new type of precinct-level measure called "Election Day eligible voter" to evaluate how resources were distributed on Election Day since almost half of voters in Florida vote before Election Day — by absentee ballot or at early voting locations.[50] Table 5 highlights the variation in how machines and poll workers were allocated across the 17 counties and in five heavily Latino counties.[51]

	Florida – 17 Counties	Broward	Hillsborough	Miami-Dade	Orange	Palm Beach
Election Day Eligible Voters Per Optical Scanner	1,109	935	1,162	555	1,486	1,028
Election Day Eligible Voters Per Poll Worker	148	143	121	132	232	121

Table 5. *Average potential voters per machine and poll worker.* Average Election Day eligible voters per optical scan unit and per poll worker are shown for Florida and the five most heavily Latino counties among the studied counties.

In Maryland and South Carolina, precincts with longer delays had more registered voters per machine and poll worker. In Florida, the same pattern was found, based on the number of Election Day eligible voters per machine and per poll worker. Generally speaking, the precincts with the longest wait times had the worst average resource allocation. Across the precincts in the 17 counties with wait times greater than 30 minutes, there was a 31 percent increase in the number of Election Day eligible voters per machine and a 20 percent increase in the number of Election Day eligible voters per poll worker, when compared to precincts with delays of 30 minutes or less.

When considering the differences within counties, there were fewer machines and poll workers per Election Day eligible voter in Florida counties with higher percentages of black or Latino registered voters. The disparity in resource allocation was considerably stronger in precincts with a higher percentage of Latino registered voters. Specifically, in Miami-Dade, Orange, Hillsborough, and Broward counties, precincts with large numbers of Latino registered voters received fewer Election Day resources.[52] Interestingly, statewide, precincts that had more minority registered voters had more machines per Election Day eligible voter. This finding suggests that counties with larger populations of minority registered voters had, on average, more machines per voter, but within these counties the machines were not equitably distributed.

Florida 17 Counties and Five Heavily Latino Counties (Among Studied Counties): Average Resource Allocation and Durations of Delay

	Average Eligible Election Day Voters Per Optical Scanner		Average Eligible Election Day Voters Per Poll Worker	
	0-30 Min. Delay	30+ Min. Delay	0-30 Min. Delay	30+ Min. Delay
Florida – 17 Counties	943	1,232	132	159
Broward	844	1,287	132	185
Miami-Dade	496	575	95	144
Hillsborough	597	1,181	74	122
Orange	1,081	1,636	170	254
Palm Beach	938	1,049	109	123

Table 6. *Average potential voters per machine and poll worker.* Average Election Day eligible voters per optical scan unit and per poll worker are shown for Florida and the five most heavily Latino counties.

Drivers of Delays: Regression Findings

We found that the percentage of minority registered voters in the precincts, the number of Election Day eligible voters per machine, and the number of Election Day eligible voters per poll worker were associated with longer delays.

As noted above, when considering trends within Florida counties, precincts with higher percentages of black or Latino registered voters tended to have longer lines. This finding for Latino registered voters is especially pronounced in the Florida counties that are home to the most Latino registered voters, including Broward, Hillsborough, Miami-Dade, and Orange County.[53] Additionally, statewide, longer delays were associated with a higher percentage of Latino registered voters in a precinct.

With respect to machines and poll workers, we found statewide that precincts with a higher number of Election Day eligible voters per machine or poll worker were more likely to see long lines on Election Day. Additionally, an examination of the differences within counties also found that line length increased as poll workers had to serve more Election Day eligible voters.

When taken into consideration separately, both poll workers and machines were significant drivers of delay. While our regression model did not find machines to be a driver of delay when considered within counties, this is *not* necessarily a sign that machines are unimportant to understanding long wait times in Florida.[54] Our measures of poll worker and machine allocation are "highly correlated" – meaning that there was overlap between precincts that had both low levels of machine and poll worker allocation.[55] This sort of overlap can contribute toward counterintuitive, or confusing, statistical output.

CONCLUSION

In the three studied states, race had a statistically significant relationship with line length and resource allocation on Election Day. Because all voters should be able to cast a ballot without excess delay, we recommend:

States take major steps to ensure that all polling places have sufficient voting machines and poll workers.

- Policymakers and election officials should identify effective standards for the allocation of resources. There are different ways to set standards. Some states are like Maryland and South Carolina in that they allocate resources by setting maximum limits on the number of registered voters that can be served by a machine or poll worker. Other allocation standards set a maximum acceptable wait time and expect resources to be set to comply with that wait time. For example, the presidential commission determined that no voter should generally wait longer than 30 minutes. This analysis did not evaluate the strength or weaknesses of either approach, but it did demonstrate that there was a greater variation in distribution of machines and poll workers in Florida counties (and even among polling locations in the same county), which has no standards, than in Maryland and South Carolina, which has some resource allocation standards.

- Legislators must provide election officials the means, including financial resources, to responsibly equip polling locations. Election administrators are responsible for ensuring that counties have enough voting machines and that those machines are working properly. They are also responsible for recruiting and training enough poll workers. To achieve this, they must have sufficient resources. Election administration must be appropriately funded.

States pay special attention to precincts with high numbers of minority voters, which tend to get fewer such resources.

- Election officials must ensure that resource allocation is done in an equitable and non-discriminatory manner. Great care must be taken to monitor how polling place resources are distributed, and to identify and eliminate any disparities in allocation based on race.

- Election officials should standardize the reporting practices for the allocation of Election Day resources. Good data is essential for appropriate management and allocation of polling place resources. Unfortunately, relevant data is not consistently retained or made readily accessible. For example, the Maryland State Board of Elections was able to provide data on the number of voting machines per precinct, but was unable to provide the number of poll workers per precinct. South Carolina was able to provide machine allocation numbers for each precinct, while poll worker data could only be obtained county-by-county. In Florida, requested data had to be collected on a county-by-county basis. Improvements in election administration should include a requirement that data be made available and collected in a standardized fashion through the collaboration of state and local election offices. This should also apply to other data that would help election

officials make resource allocation decisions, such as the time it takes a voter to check in at a polling location and how long it takes a voter to cast a ballot.

- Election officials should have a plan for making last-minute adjustments to accurately target and serve potential voter turnout on Election Day. Election officials should be able to predict, with some degree of accuracy, potential turnout before Election Day and plan resource allocation accordingly. In Florida, we were able to calculate how many Election Day eligible voters there were based on the number of people who voted early and absentee. Unexpected outcomes and glitches will occur, however, even with the best-laid plans, and election officials need the flexibility to make last-minute adjustments.

Legislators and election officials enforce existing standards for resource allocation.

- Many of the precincts with longer wait times in this analysis were not in compliance with their state's standards for resource allocation. Our findings indicate, generally, that precincts with more resources per voter had shorter lines.

- States should periodically review their standards to ensure they are appropriate. States should enforce existing standards to ensure that all precincts are in compliance.

APPENDIX A: SUMMARY OF FINDINGS FROM STATEWIDE AND COUNTY MODELS

	Maryland	South Carolina	Florida
Who Waited Longer in Lines	Latino	Blacks	Latino
Minorities Had Fewer	Machines (Blacks & Latinos)	Machines (Blacks & Latinos) Poll Workers (Latinos)	Poll Workers (Latinos)
Factors that Drove Long Lines	Number of Machines	Race of Voter (Black) Number of Machines Number of Poll Workers	Number of Machines Number of Poll Workers

Figure 3. *Statewide Regression Findings.* Race and resource allocation relationship to line length.

Variation Within Counties	Maryland	South Carolina	Florida
Who Waited Longer in Lines	Blacks Latinos	Blacks Latinos	Blacks Latinos
Minorities Had Fewer			Machines (Black & Latino) Poll Workers (Black & Latino)
Factors that Drove Long Lines	Race of Voter (Black) Number of Machines	Race of Voter (Black) Number of Machines Number of Poll Workers	Race of Voter (Latinos & Blacks) Number of Poll Workers

Figure 4. *Regression Findings from Models Measuring Variation Within Counties.* Race and resource allocation relationship to line length.

APPENDIX B: DELAY RELATED FINDINGS FROM MARYLAND

Maryland	DEPENDENT VARIABLE: DELAY (MINUTES) (MEAN=4.0,SD=15.12)					
	Model 1		**Model 2**		**Model 3**	
Voters/Machine	**0.8767**	**(0.1192)**			**0.8979**	**(0.1231)**
% Black			-0.0502	(0.0536)	-0.1034	(0.0532)
% Latino			**1.043**	**(0.4004)**	0.6948	(0.3978)
% Other			**-0.8693**	**(0.3009)**	**-0.7037**	(0.2987)
Fixed Effects	No		No		No	
Voters/Machine	**0.6586**	**(0.1236)**			**0.6103**	**(0.1241)**
% Black			**0.277**	**(0.0712)**	**0.2559**	**(0.0707)**
% Latino			**0.103**	**(0.4024)**	0.1809	(0.4055)
% Other			**0.4973**	**(0.3421)**	0.3222	(0.3467)
Fixed Effects	Yes		Yes		Yes	

Regression Coefficients for Anne Arundel and Baltimore Counties: Model 3 with Fixed Effects		
Anne Arundel	**47.24**	**(6.44)**
Baltimore County	**27.09**	**(5.9)**

Multivariable regression model for Maryland. The model accounts for the number of registered voters per machine, as well as the percentage of black, Latino, and other minority voting age citizens in a precinct. It also controls for county-specific effects that cannot be explained by resource allocation or race alone. Baltimore City was dropped from the model to provide a baseline against which to compare the other counties. Similarly, the percentage of white voting age citizens was dropped from the model in order to compare other racial groups. The models on the upper row do not include county-level variation, whereas the models on the lower row include county-level variation.

Bolded values are statistically significant.

APPENDIX C: DELAY RELATED FINDINGS FROM SOUTH CAROLINA

South Carolina DEPENDENT VARIABLE: DELAY (MINUTES) (MEAN=12.71,SD=36.93)

	Model 1		Model 2		Model 3	
Voters/Machine	**0.2441**	**(0.0203)**			**0.2087**	**(0.0198)**
Voters/Poll Workers	**0.2026**	**(0.0224)**			**0.2015**	**(0.0221)**
% Black			**0.6503**	**(0.0807)**	**0.5587**	**(0.0705)**
% Latino			-0.1904	(2.3420)	-3.357	(2.0340)
% Other			**14.7225**	**(2.0330)**	**7.4383**	**(7.5410)**
Fixed Effects	No		No		No	
Voters/Machine	**0.1584**	**(0.0187)**			**0.1542**	**(0.0189)**
Voters/Poll Workers	**0.1427**	**(0.0210)**			**0.1452**	**(0.0218)**
% Black			**0.2444**	**(0.0754)**	**0.2765**	**(0.0697)**
% Latino			**5.0178**	**(2.0963)**	3.816	(1.9540)
% Other			**3.884**	**(1.7950)**	-0.135	(1.7680)
Fixed Effects	Yes		Yes		Yes	

Regression Coefficients for Richland and Berkeley Counties: Model 3 with Fixed Effects		
Richland	**93.98**	**(7.26)**
Berkeley	**79.94**	**(8.43)**

Multivariable regression model for South Carolina. The model accounts for the number of registered voters per machine and per poll worker, as well as the percentage of black, Latino, and other minority registered voters in a precinct. It also controls for county-specific effects that cannot be explained by resource allocation or race alone. Greenville County was dropped from the model to provide a baseline against which to compare the other counties. Similarly, the percentage of white registered voters was dropped from the model in order to compare other racial groups. The models on the upper row do not include county-level variation, whereas the models on the lower row include county-level variation.

APPENDIX D: DELAY RELATED FINDINGS FROM FLORIDA

DEPENDENT: DELAY (MINUTES) (MEAN=52.54,SD=47.91)

Florida

	Model 1		Model 2		Model 3	
Voters/Machine	**0.0056**	**(0.0016)**			**0.016**	(0.0017)
Voters/Poll Workers	**0.2004**	**(0.0156)**			**0.1212**	(0.0161)
% Black			-0.0591	(0.0368)	**-0.0046**	(0.0348)
% Latino			**0.5522**	**(0.0385)**	0.6441	(0.0390)
% Other			**0.5462**	**(0.2660)**	**-0.3607**	(2.2560)
Fixed Effects	No		No		No	
Voters/Machine	**-0.0024**	**(0.0019)**			-0.0013	(0.0019)
Voters/Poll Workers	**0.3279**	**(0.0177)**			**0.2834**	(0.0178)
% Black			**0.1368**	**(0.0358)**	**0.0949**	(0.0332)
% Latino			**0.8772**	**(0.0554)**	**0.5926**	(0.0530)
% Other			**1.324**	**(0.2773)**	0.4946	(0.2590)
Fixed Effects	Yes		Yes		Yes	

Multivariable regression model for Florida. The model accounts for the number of Election Day eligible voters per optical scan unit and poll worker in each precinct; the percentage of black, Latino, and other minority registered voters in each precincts; and county-specific effects. Broward County was dropped from the model to provide a baseline against which to compare the other counties. Similarly, the percentage of white registered voters was dropped from the model in order to compare other racial groups. The models on the upper row do not include county-level variation, whereas the models on the lower row include county-level variation.

APPENDIX E: RESOURCE ALLOCATION AND RACE FINDINGS FROM MARYLAND, SOUTH CAROLINA, AND FLORIDA

	DEPENDENT VARIABLE: VOTERS PER MACHINE					
	MD		SC		FL	
	(MEAN=218.56,SD=21.46)		(MEAN=297.47,SD=90.84)		(MEAN=1108.84,SD=621.96)	
% Black	**0.06**	**(0.018)**	**0.05**	**(0.10)**	**-3.15**	**(0.45)**
% Latino	**0.41**	**(0.119)**	**7.63**	**(2.78)**	**-7.47**	**(0.49)**
% Other	-0.15	(0.088)	14.32	(2.50)	**17.72**	**(3.05)**
Fixed Effects	No		No		No	
% Black	0.04	(0.023)	0.10	(0.10)	**1.335**	**(0.42)**
% Latino	-0.11	(0.125)	2.62	(2.69)	**6.07**	**(0.66)**
% Other	**0.29**	**(0.103)**	**7.99**	**(2.35)**	**17.26**	**(2.94)**
Fixed Effects	Yes		Yes	Yes	Yes	

	DEPENDENT VARIABLE: VOTERS PER POLL WORKER			
	SC		FL	
	(MEAN=205.48,SD=82.17)		(MEAN=147.87,SD=65.73)	
% Black	**-0.29**	**(0.09)**	-0.06	(0.05)
% Latino	**7.23**	**(2.49)**	**0.18**	**(0.06)**
% Other	**17.83**	**(2.24)**	**3.71**	**(0.35)**
Fixed Effects	No		No	
% Black	**-0.31**	**(0.09)**	**0.15**	**(0.06)**
% Latino	2.30	(2.38)	**1.08**	**(0.07)**
% Other	**15.67**	**(2.07)**	**2.66**	**(0.35)**
Fixed Effects	Yes	Yes	Yes	

Resource Allocation and Race - Multivariable regression models for Maryland, South Carolina, and Florida. These models measure the strength of the relationship between resource allocation on Election Day and the racial composition of precincts in each state. The percentage of whites, as defined in the section for each state, was dropped from the model in order to compare the other racial groups, as defined in the section for each state. The models on the upper row do not include county-level variation, whereas the models on the lower row include county-level variation.

APPENDIX F: MEAN AND STANDARD DEVIATION FOR VARIABLES INCLUDED IN MARYLAND, SOUTH CAROLINA, AND FLORIDA ANALYSES

Maryland		
	Mean	SD
Delay	4.0	15.12
% Black	33.44%	32.96
% Latino	6.94%	9.01
% Other	14.71%	12.61
Registered Voters Per Machine	218.56	21.46

South Carolina		
	Mean	SD
Delay	12.72	36.93
% Black	27.20%	26.13
% Latino	1.14%	0.9832
% Other	1.46%	1.1
Registered Voters Per Machine	297.47	90.84
Registered Voters Per Poll Worker	205.48	82.17

Florida		
	Mean	SD
Delay	52.54	47.91
% Black	15.48%	21.95
% Latino	16.30%	20.16
% Other	6.41%	3.27
E.D.E.V. Per Machine	1108.84	621.96
E.D.E.V. Per Poll Worker	147.87	65.73

ENDNOTES

1 Exec. Order No. 13,639, 78 Fed. Reg. 19,979 (Apr. 3, 2013).

2 The Presidential Comm'n on Election Admin., The American Voting Experience: Report and Recommendations of the Presidential Commission on Election Administration 13 (2014), *available at* https://www.supportthevoter.gov/files/2014/01/Amer-Voting-Exper-final-draft-01-09-14-508.pdf [hereinafter Presidential Comm'n on Election Admin.].

3 *Id.* at 14.

4 *Voters wait in line to decide Election 2004*, Usa Today, Nov. 3, 2004, *available at* http://usatoday30.usatoday.com/news/politicselections/nation/2004-11-02-election-wrap_x.htm; Ian Urbina, *Voters find long lines, but no catastrophes*, N.Y. Times, Nov. 5, 2008, *available at* http://www.nytimes.com/2008/11/05/world/americas/05iht-05vote.17539032.html; Editorial Board, *Long voting lines suggest a need for reform*, Wash. Post, Nov. 7, 2012, *available at* http://www.washingtonpost.com/opinions/long-lines-for-voting-suggests-a-need-for-reform/2012/11/07/190a57ba-2927-11e2-b4e0-346287b7e56c_story.html.

5 Theodore Allen found that long lines at the polls during the 2012 Presidential election caused an estimated 201,000 voters not to vote. Scott Powers& David Damron, *Analysis: 201,000 in Florida didn't vote because of long lines*, Orlando Sentinel, Jan. 29, 2013, *available at* http://articles.orlandosentinel.com/2013-01-29/business/os-voter-lines-statewide-20130118_1_long-lines-sentinel-analysis-state-ken-detzner. Allen's previous research suggested that during the 2004 electoral contest between George W. Bush and John Kerry, long lines in Franklin County, Ohio, discouraged an estimated 20,000 voters from voting. *See* David Damron & Scott Powers, *Researcher: Long lines at polls caused 49,000 not to vote*, Orlando Sentinel, Dec. 29, 2012, *available at* http://articles.orlandosentinel.com/2012-12-29/news/os-discouraged-voters-20121229_1_long-lines-higher-turnout-election-day. In addition to suppressing turnout, long lines can have an effect on voter evaluations of their experience. Voters, particularly those in urban areas, report less positive evaluations of their voting experience when they experience longer lines on Election Day. *See* David C. Kimball, Why Are Voting Lines Longer for Urban Voters? (Mar. 29, 2013) (unpublished manuscript) *available at* http://ssrn.com/abstract=2255009.

6 Mark Binker & Matthew Burns, *Florida official: Cutting early voting times a mistake*, WRAL.com (April 3, 2013), http://www.wral.com/florida-official-cutting-early-voting-times-was-a-mistake/12300795/; Theodore T. Allen, *Delving into the reasons for long lines can bring solutions*, Orlando Sentinel, Jan. 8, 2013, *available at* http://articles.orlandosentinel.com/2013-01-08/news/os-ed-long-lines-voting-florida-010813-20130107_1_long-lines-ballot-length-turnout; Mike Schneider, *In Florida, not every precinct is created equally*, Fla. Trib., Nov. 16, 2012, *available at* http://tbo.com/ap/politics/in-florida-not-every-precinct-is-created-equally-566822; Penelope Townsley, After Action Report - November 6, 2012 General Election, (Dec. 19, 2012); Lawrence Norden, Brennan Ctr. for Justice, How to Fix Long Lines (2013), *available at* http://www.brennancenter.org/sites/default/files/publications/How_to_Fix_Long_Lines.pdf; Wendy Weiser et al., Brennan Ctr. for Justice, How to Fix the Voting System (2013), *available at* http://www.brennancenter.org/sites/default/files/publications/How_To_Fix_Voting_System.pdf.

7 Presidential Comm'n on Election Admin., *supra* note 2, at 38.

8 Presidential Comm'n on Election Admin., *supra* note 2, at 40.

9 Stephen Graves, *Line Optimization and Poll Worker Management*, Mass. Inst. of Tech., http://web.mit.edu/vtp/calc1.html (last visited June 27, 2014); Aaron Strauss, *Poll Worker and Machine Optimization*, Mass. Inst. of Tech., http://web.mit.edu/vtp/calc2.html (last visited June 27, 2014); Mark Pelczarski, *Line Optimization*, Mass. Inst. of Tech., http://web.mit.edu/vtp/calc3.html (last visited June 27, 2014). All resource calculators can be accessed through the Commission's website. *See* The Presidential Comm'n on Election Administration, https://www.supportthevoter.gov/ (last visited June 27, 2014).

10 Justin Levitt, *"Fixing That:" Lines at the Polling Place*, Legal Studies Paper No. 2013-14, 28 J.L. & Pol. 465 (2013).

11 Stewart also found that Washington, D.C. had some of the country's longest wait times. Charles Stewart, Waiting to Vote in 2012, at 15, 19 (Apr. 1, 2013) (unpublished manuscript) *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2243630.

12 *Id.* at 19, 20.

13 Michael Herron & Daniel Smith, Precinct Closing and Wait Times in Florida during the 2012 General Election 7 (Aug. 28, 2013) (unpublished paper) *available at* http://www.dartmouth.edu/~herron/HerronSmithAPSA2013.pdf.

14 Benjamin Highton found that voting machine scarcity in the 2004 presidential election was a factor in lower turnout. Benjamin Highton, *Long Lines, Voting Machine Availability, and Turnout: The Case of Franklin County, Ohio in the 2004 Presidential Election*, 39 PS: Political Science and Politics 65-68 (2006). Walter Mebane, Jr. found the impact of voting machine scarcity on turnout was even greater when examining active voters as opposed to all registered voters due to unreliable registration data in Franklin County. Furthermore, the number of voting machines is more strongly related to turnout in heavily African-American precincts than it is in precincts with low percentages of African-American voters. Walter R. Mebane Jr., *Voting Machine Allocation in FranklinCounty, Ohio, 2004: Response to U.S. Department of Justice Letter of June 29, 2005* (2006).

15 The Election Protection hotline database was searched for all calls which reported long lines, wait times or delays. We compiled a list of counties and states in which the calls were generated and contacted election officials in the jurisdictions that reported the longest lines or delays on Election Day. In jurisdictions where the data was available but would involve the extensive man hours on the part of staff to manually pull the data from each of the voting machines, we did not pursue the fulfillment of the public records request out of respect for county election boards and their staff.

16 In addition to our public records requests, we received data on closing times from Scott Powers and David Damron of the *Orlando Sentinel*. Following the 2012 General Election, Damron and Powers gathered precinct closing times, which were measured as the number of minutes after the scheduled 7:00 p.m. close of the polls that results were transmitted to the Supervisor of Elections. Our analysis also relies on the number of absentee, early, and Election Day ballots cast, which we obtained from Powers and Damron. In South Carolina, we received extensive information regarding last ballot scan times on iVotronic machines across South Carolina counties from Duncan Buell.

17 The data for the analysis was acquired through a series of public records requests to state and county election offices. Specifically, we requested records for each precinct in a state or county pertaining to: the electronic record of the time the last ballot or voter was processed; the number of registered voters; the number of ballots cast on Election Day; the number of ballots cast during the early voting period (where applicable); the number of ballots cast absentee; the number of voting machines; and the number of poll workers.

18 Norbert Schwarz & Daphna Oyserman, *Asking Questions About Behavior: Cognition, Communication, and Questionnaire Construction*, 22 Am. J. of Evaluation 127 (June 2001) (discussing the ways people can be influenced when reporting on their own behavior).

19 Schaefer Ctr. for Public Policy, Voting and the Administration of Elections in Maryland (2014) *available at* http://scpp.ubalt.edu/WordPress/wp-content/uploads/2014/02/Voting_and_the_Administration_of_Elections_in_MD_-_Final_Report_01.21.14_rev6.pdf.

20 *Id.* at 72, Table 26.

21 *Id.* at 42.

22 Me. Rev. Stat. 21. 9, § 629(1): municipal officers must provide at least one voting booth for each 200 of the qualified voters (excluding inactive voters) in each voting place. In non-general elections, that number can be decreased when circumstances indicate that fewer booths will be adequate. § 811(4): in municipal voting districts using voting machines, municipalities must provide at least one voting machine for each 450 of the voters qualified to vote at each voting place.

23 In counties that provided detailed demographic information about registered voters, we consolidated racial information to form the "other" category, aside from black, white and Latino.

24 For our analysis, we used a linear Tobit regression model. The Tobit model was used to account for the number of zeros present in the delay time data for each state. James Tobin, *Estimation of Relationships for Limited Dependent Variables*, 26 Econometrica 24, 36 (1958).

25 Md. State Bd. of Elections, Number of Precincts and Polling Places by County, *available at* http://www.elections.state.md.us/elections/2012/precinctsbycounty.pdf (last visited July 2, 2014). Md. State Bd. of Elections, Eligible Active Voters on Precinct Register, (2012) *available at* http://www.elections.state.md.us/press_room/documents/PG12/PrecinctRegisterCounts/statewide.pdf.

26 In some counties in Maryland, one polling location served more than one precinct. Anne Arundel, Frederick, and Harford counties all had multiple combined precincts.

27 *See* Md. State Bd. of Elections, Eligible Active Voters on Precinct Register, *supra* note 25.

28 Schaefer Ctr. for Public Policy, *supra* note 19.

29 These percentages are based on 2010 CVAP estimates of VTDs.

30 Md. Code Regs. § 33.10.02.07. After the 2012 election, Maryland amended its regulation to eliminate any fixed numerical ratio between registered voters and machine allocation, so the ratio considered in this report is not applicable for future elections. The number of precincts in violation of Maryland's minimum standard for machine allocation may be smaller than estimated in this report given a regulation that permitted the "State administrator" to reduce allocation requirements on Election Day by the estimated percentage of voters who would "turn out during early voting." Under the estimates made by the Maryland State Board of Elections in 2012, only 1.5 percent of precincts in our analysis would have violated the minimum standard. We compared the Board's estimates with the actual use of early voting in the eight counties in our analysis, and found that the Board overestimated the use of early voting, on average, by 5 percent. When considering the actual use of early voting, we found that 37 percent of Maryland precincts exceeded the then-existing requirement. The counties with the worst delays, Anne Arundel and Baltimore County, had a higher percentage of precincts in violation of the standard: 50 percent and 75 percent, respectively. Furthermore, if Maryland officials reduced the registered population by the sum of the actual percentage of early voters and the actual percentage of absentee voters, 15 percent of precincts would still have violated the minimum standard.

31 Schaefer Center, *supra* note 19, at 59-60.

32 *Id.*at 41-42.

33 According to our analysis, 98 percent of precincts in Prince George's County do not meet Maryland's standards for machine allocation. Only 5 of the 221 precincts included in our analysis met the state standard.

34 Findings from Anne Arundel and Baltimore Counties are based on county-specific regression analyses.

35 Information provided via telephone from the S.C. State Election Comm'n (Mar. 21, 2014).

36 Our analysis includes data from Aiken, Anderson, Beaufort, Berkeley, Charleston, Dorchester, Florence, Greenville, Horry, Lexington, Orangeburg, Pickens, Richland, Spartanburg, Sumter, and York counties.

37 Voter registration data from S.C. Election Comm'n, Voter Registration Totals County/Precinct/Race (September 30, 2012) (unpublished report) (on file with the Brennan Center for Justice).

38 While approximately half of the registered voters in Richland County are black, which is substantially higher than the state average of 28 percent, our analysis did not find a statistically significant relationship between race and resource allocation.

39 *See* S.C. Election Comm'n, *supra* note 37 for voter registration data. *See* Census Bureau, 2012 American Community Survey 5-year estimates, Table DP05 for census figures.

40 *See* S.C. Election Comm'n, *supra* note 37.

41 South Carolina code states that one voting machine per 250 registered voters of a precinct shall be provided or portion thereof whichever is practicable. S.C. Code Ann. § 7-13-1680.

42 South Carolina's standard for the number of poll managers per polling location is dependent on the type of election. For general elections in November of even-numbered years, each polling location is to be assigned 3 poll managers per 500 registered voters or fraction thereof. S.C. Code Ann. § 7-13-72.

43 Findings from Richland and Berkeley Counties are based on county-specific regression analyses.

44 *See* Fla. Div. of Elections, 2012 General Election Facts, *available at* http://election.dos.state.fl.us/gen-election-facts.shtml#2012gef (last visited July 1, 2014).

45 A number of Florida counties combined precincts into single polling locations. Both Miami-Dade and Palm Beach County had a large number of combined precincts.

46 These precincts were disproportionately located in Broward County and Palm Beach County. This represents a limitation to the data that was obtainable from the relevant county elections agencies. As a result the regression model for Florida includes 92.3 percent of all cases.

47 Our analysis includes data from Brevard, Broward, Miami-Dade, Duval, Hillsborough, Lake, Lee, Manatee, Marion, Orange, Palm Beach, Pasco, Pinellas, Polk, Sarasota, Seminole, and Volusia counties. There are doubts as to the quality of the delay data for Volusia County that is included in our analysis. This has been noted by prior researchers, including Smith and Herron, who also used delay data provided by the Orlando Sentinel. *See* Michael Herron and Daniel Smith, Congestion at the Polls: A Study of Florida precincts in the 2012 General Election (Aug. 20, 2013) (report commissioned by Advancement Project) *available at* http://b.3cdn.net/advancement/88f591c5cdad8054fd_evm6vt2b8.pdf.

48 *See* Fla. Div. of Elections, General Election County Registration by Race, (2012) *available at* http://election.dos.state.fl.us/voter-registration/statistics/pdf/2012/GEN2012_CountyRace.pdf.

49 Latinos are 21 percent of registered voters in Orange County; 17 percent of registered voters in Broward County; 9 percent of registered voters in Palm Beach; and 14 percent of registered voters in Hillsborough County. *See id.*

50 According to public data from Florida's Division of Elections, voters cast 3,736,946 ballots in person on Election Day, 2,409,097 ballots at early voting centers, 2,380,115 absentee ballots, and 42,745 provisional ballots. Approximately 56 percent of ballots were cast before Election Day. *See* Fla. Dep't of State Div. of Elections, Ballots-by-Type Activity for 2012 General Election, (2013) *available at* http://election.dos.state.fl.us/reports/pdf/2012BallotsCast.pdf.

51 This analysis includes allocation data from precincts that were missing delay information, but for which race and resource allocation data was available.

52 This finding is based on county-specific regression analyses from Miami-Dade, Orange, Hillsborough and Broward Counties.

53 Findings from Miami-Dade, Orange, Hillsborough and Broward Counties are based on county-specific regression analyses. This also reflects findings from Herron & Smith, *supra* note 13.

54 See footnote 45.

55 The correlation coefficient for the relationship between poll worker allocation and machine allocation is .6837 (p - .000).

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