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Election Administration: The Effect of Race on Election Technology Implementation and
Advancement in the United States

By
Danielle Blaustein

Submitted in partial fulfillment
of the requirements for Honors in
the Department of Political Science

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Table of Contents

Acknowledgments.....2

List of Tables and Figures.....4

Abstract.....5

Chapter 1: Introduction.....7

Chapter 2: Ethnographic Account of SCOB E Experience.....38

Chapter 3: Quantitative Analysis.....54

Chapter 4: Conclusion.....69

Bibliography.....78

Appendix A.....81

List of Figures and Tables

Chapter 1: Introduction

Figure 1.1- Illustration of Lever Voting Machine.....	12
Figure 1.2- Image of Direct Recording Electronic (DRE) Voting Machine.....	16
Figure 1.3- Example of Butterfly Ballot from 2000 Presidential Election.....	19
Figure 1.4- Image of BMD used by disabled populations.....	24
Figure 1.5- Diagram of controller used by voting machines for the disabled.....	25

Chapter 3: Quantitative Analysis

Table 3.1- Demographic Composition of The United States in 2010 and 2018.....	62
Table 3.2- Percent Composition of States Chosen by Race for 2010.....	63
Table 3.3- Percent Composition of States Chosen by Race for 2018.....	64
Table 3.4- Voting Technology Implementation from 2010 to 2018 in terms of Demographic Composition.....	65
Figure 3.1- Visual Representation of Table 3.4.....	66

Abstract

BLAUSTEIN, DANIELLE ELECTION ADMINISTRATION: THE EFFECT OF RACE
ON ELECTION TECHNOLOGY IMPLEMENTATION AND
ADVANCEMENT IN THE UNITED STATES

ADVISOR: Mark Dallas

A necessary condition for democracy is the ability for citizens to be heard. The way by which this is done is through electing officials that represent a diverse set of beliefs and values. The mechanism by doing this is through elections. At a quick glance, elections appear to play a minor role in democracy. But in fact, the foundations of elections are essential to our understanding of American democracy. It is assumed that the implementation of an electoral system is sufficient for American democracy. Diving deeper into the complexities of election systems provides evidence for benchmarks that prevent elections from representing democratic values. It holds true that elected officials rely on democratic elections to legitimize their role in government. Perceptions of democracy are in fact affected by the fragilities of the electoral process. When it all goes right, democracy appears to be protected to the perspective of citizens. The odds of an election going off without a hitch is one in a million. The aspects of elections that are most worrisome to experts as well as the public are accuracy and reliability. Past elections have shown that accuracy and reliability are issues of election technology and the failure of these aspects puts the United States' democratic processes at risk. I argue that as of today, election officials and scholars are at a tossup. They cannot foresee any way to advance technology without risking or compromising on the accuracy and reliability of elections. This poses significant challenges because for elections to be accessible to all, technological advances are needed to accommodate those with disabilities, the elderly, and the fact that voters are busy and expect an easy, seamless process when they reach the polls. There are many factors that affect the implementation and advancement of voting technology. Previous research has provided

evidence that the racial composition of counties affect the ability of election administrations to advance to new technologies. This thesis aims to further explore the issues of election technology and their role in defining democracy by analyzing different aspects of election administration and by focusing the role race plays in the advancement of voting technology.

Chapter One: Introduction

A citizen's right to vote is essential to the democratic function of the United States government. The ability of citizens to indicate their preferences on election day, and perceiving that their vote means something, allows for elected officials to represent a diverse set of beliefs and values. This perception held by American citizens is unsound. The infrastructure of elections allows for a schizophrenic understanding of the electoral process held by citizens. I would know. Before becoming an intern at the Suffolk County Board of Elections, I held many of the same views that other voters held about elections. We, as Americans, see elections as a seamless, perfect process. You register to vote and on election day, you go to your designated polling place, cast your ballot and leave. You leave with the sentiment that your vote counts and your voice was heard. Perceptions of democracy are in fact affected by the fragilities of the electoral process. If there were problems that arose on election day, the media would report it causing public concern. What is lost in translation is that election day is a snapshot of the entire electoral process and that the most fragile aspect of this process is not what is seen on election day- the implementation of voting technologies. Voters use voting machines that are prepared for them. They do not know what occurs behind the scenes that allows for these machines to operate the way they do on election day.

In this chapter, I will bring attention to the history of election technology and its relevance to today's challenges faced by election administrations, explore the current standards and statutes related to election technology, as well as examine how federalism plays an important role in the implementation of voting technology at all levels of government. I seek to establish that elections are in fact political. The issues that are taken on by federal, state and local governments are impacted by the political influences and forces that affect decision making and

technological advancement. The field of election technology is an overlooked area of study. This is noteworthy to bring attention to because this area of study is essential to the development and continuance of democracy. If it isn't a high-ranking concern to officials and scholars, then there is a risk that democracy will be undermined. This is a risk that Americans shouldn't be willing to take. Recent elections have brought the topic of election technology to the forefront of election administration issues, precisely noting the challenges with accuracy and reliability. These issues have become widely known to the public and are a topic of robust conversation. The fact that many see election technology as a great concern is enough for governments, scholars, and organizations to want to dedicate time and resources.

1.1 History of Election Technology

Election technology has been implemented in the election process since the beginning of elections in the United States. The exact method of election technology used in elections has advanced, but not without hesitation and concern from election officials, elected officials, and scholars. These concerns mainly surround accuracy, reliability, and security. With each advancement there is an associated risk of threatening the stability of the function of elections and it does not always contribute to better voting systems. Along with this concern, there are other factors that play a role in the advancement of voting technology in the general sense and in terms of what technology each jurisdiction chooses to use.

Elections have made a considerable amount of advancement since the first known elections. In the early 1700s, there was no modern technology available to assist in the inputting and tabulation of voters' preferences. The method election officials used involved sitting at a central location with a judge and other election officials and have citizens outwardly voice their

preferences to the clerk and the judge.¹ This method of collecting votes goes against the many conventions that are known today. For example, there were no ballots, ballot boxes, or a right to cast your vote secretly.² This means that there was no way to audit or have any record to show the number of votes for each candidate. There is a possibility that these aspects of election procedure were not an important issue back then. Historically, the advancement of election procedure is somewhat related to historical periods. What is meant by this is that the historical context can help explain the circumstances associated with how the voting process was instituted. This section relies heavily on the work of Douglas Jones, who is credited with outlining the historical account of voting technology.

The first ballots or method of expressing voter choice in a tangible manner was outside of the United States. In Ancient Greece, voters were given a token and would place it in a clay box expressing their preference.³ The token and ballot box method is the first documented voting technology. This should be prefaced with a clear definition of what constitutes a voting technology. A voting technology is characterized as any method (technical or not) that contributes to the translation of voter intent to something that can be counted. The first ballots are a clear example of this definition. Although clay tokens are not what is thought of a conventional technology, it shows that technology can be created and utilized in different ways. When analyzing voting technology, it is important to keep this context in mind.

Paper ballots were a prominent voting technology in United States during the late 1600s.⁴ This type of technology is a staple in the voting process and this technology is not going to be

¹ Jones, Douglas W., "A Brief Illustrated History of Voting", Voting and Elections Web Pages, The University of Iowa Department of Computer Science, 3/12/21.

² *Ibid.*

³ *Ibid.*

⁴ *Ibid.*

phased out in the near future. Paper ballots provide a paper trail, allowing records of voter intent to be created. The Constitution addresses the use of ballots in the 12th amendment. Jones states,

By the time the 12th Amendment to the United States Constitution was passed, it was clear that the term ballot was routinely taken to refer to a slip of paper on which were written the names of candidates for office. The very fact that the 12th amendment requires the use of separate ballots to elect a President and Vice-President implies that the use of one ballot to elect candidates to more than one office was understood at the time.⁵

The notion that the 12th amendment, which was passed in 1789, conceptualizes the fact that a paper ballot would be used to indicate vote preference. Paper ballots paved the way for newer, more advanced technology to be created. Many voting technologies operate off of paper ballots. For example, current voting machines collect paper ballots that contain the voter's preference. At first, voters would bring a blank sheet of paper to where they voted.⁶ The blank sheet of paper upgraded to a preprinted ballot with each candidate named.⁷ These ballots were provided by political parties and the candidates themselves.⁸ It is noteworthy to bring attention to this particular advancement because it foreshadows the many advancements that occur later in history and how such advancement within one technology can revolutionize the voting process.

In 1838, there was an urgent request for a secret ballot in London, England. A secret ballot prevents voter intent from being revealed to those counting the votes or to those who see the ballots after the vote is tabulated. The secret ballot in London was a ball that would be placed in a hole that represented the voter's preference.⁹ By dropping a ball that was the exact same as every other ball, the votes were indistinguishable from each other. The secret ballot is a core manifestation of democracy. In a democracy, there should be no pressure to vote in a particular

⁵ *Ibid.*

⁶ *Ibid.*

⁷ *Ibid.*

⁸ *Ibid.*

⁹ *Ibid.*

way. By ensuring that voter intent is not exposed during the process, citizens are protected from any one or any institution from preventing that choice to be made.

The interest of using a private ballot was held by Australians as well. In turn, Australia is credited with creating the Australian Paper Ballot in the 1800s. This type of ballot was implemented in the United States in 1888.¹⁰ The Australian Paper Ballot is a standard ballot that is printed and distributed by the government to voters.¹¹ The United States did not implement the Australian ballot type all at once, it was done at the state's discretion. Some states like New York and Massachusetts were the first to implement these ballots.¹² Issues with security and fraud arose in previous elections which lead to this shift.¹³ This antiquated technology appears to be a less integral part of the voting process, but led to further technological advancement.

In a similar manner, lever voting machines are categorized as another major advancement in voting technology. The MIT Election Lab provides a well-written explanation of how this technology functions:

Lever machines are operated by the voter indicating his or her choice by depressing a lever next to the preferred candidate. When the voter enters the voting machine, he or she pulls a large lever that pulls a curtain around the voter, ensuring privacy. There is an interlocking mechanism in the machine that prevents the voter from over-voting—that is, voting for more than the allowed number of candidates. Once the voter is finished, the voter pulls the large lever again, which causes the counters associated with his or her choices to be incremented by one and the machine prepared for the next voter. At the end of Election Day, votes are counted by opening the machine and reading the numbers on the counters associated with all the candidates. By law, mechanical lever machines may no longer be used in federal elections, although they're sometimes still used in state and local elections.¹⁴

¹⁰ *Ibid.*

¹¹ *Ibid.*

¹² *Ibid.*

¹³ *Ibid.*

¹⁴ Voting Technology MIT Election Lab , <https://electionlab.mit.edu/research/voting-technology>, 3/12/21

Lever voting machines were first used in 1892, but took much longer to implement this technology across the United States.¹⁵ During this time period, lever voting machines were a considered an advanced technology. Jones states,

Lever voting machines were so pervasive by the mid 20th century that most of us born in midcentury grew up assuming that all voting machines would always be lever machines. Today, although they have been out of production since 1982, these machines are still in extremely widespread use. They completely eliminate most of the approaches to manipulating the vote count that were endemic a century ago, and they can easily be configured to handle a complex general election ballot.¹⁶

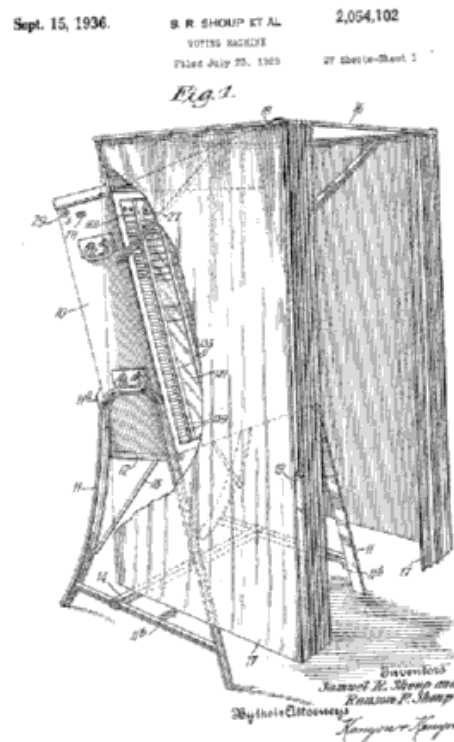


Figure 1.1 Illustration of a lever voting machine submitted for patent
Source: Jones, Douglas W., *A Brief Illustrated History of Voting*,

This perspective illuminates a number of different concerns relating to the advancement of election technology. The notion that lever machines were in widespread use in 2001 is alarming. The Brennan Center of Justice states that election technology should be replaced after ten years

¹⁵ Jones, Douglas W., "A Brief Illustrated History of Voting", Voting and Elections Web Pages, The University of Iowa Department of Computer Science, 3/12/21.

¹⁶ *Ibid.*

in use and that the technology won't be reliable after 20 years.¹⁷ Lever machines were at risk of being unreliable, but many jurisdictions still depend on them. This perspective also alludes to the voter comfort level with this specific type of voting technology. In terms of its usage, lever machines were easy to understand and use, which made it less likely that voters' preferences were demonstrated incorrectly.

Punch Card Voting Machines are a voting technology that was adapted from another use. Punch card voting systems were first created to catalogue and run statistics for the Baltimore Board of Health and for other tabulations across many different fields.¹⁸ The punch card system works as indicated by the following description:

In the most common version of the punch-card machine, a blank pre-scored card is inserted into a holder. The holder contains a ballot and a set of targets associating each choice with a punch position on the card. If a voter wants to vote for a candidate, he or she uses a stylus to dislodge a chad (the pre-scored bit of paper) and create a hole in the card associated with the candidate's number. When the voter is done, he or she takes the ballot card and deposits it in a ballot box. At the end of Election Day, the ballots are counted using a card reader, usually in the central election office.¹⁹

IBM is credited with creating the punch card system used for voting, but abandoned the system in 1969 due to well-known technology issues.²⁰ The technology of this voting system was complex and used by many election jurisdictions. There were two punch card voting systems that were of wide use: IBM's Votomatic system and Election Data Corporation's Data-Punch system.²¹ From a historical perspective, this is the first instance that two private companies were in competition with each other, providing jurisdictions with the opportunity to choose between two different options. As a result, there was more variability in the voting process. A positive

¹⁷ Norden and Famighetti, "America's Voting machines at Risk",4

¹⁸ *Ibid.*

¹⁹ Voting Technology, MIT Election Lab, , <https://electionlab.mit.edu/research/voting-technology>, 3/12/21

²⁰ *Ibid.*

²¹ *Ibid.*

consequences is that there was more access to this type of machine for all jurisdictions to purchase and use.

Optical Mark-Sense scanners are similar to punch card voting systems in the sense that this technology had other uses before being adapted to help administer elections. Optical scanners were created by IBM to be used to grade the Scholastic Aptitude Test (SAT).²² Furthermore, Mark-Sense Optical Scanners were created for a similar standardized test, the ACT.²³ Optical scanners were first used in California in 1962.²⁴ This technology worked as explained below:

Optical Scan Paper Ballot Systems include both marksense and digital image scanners in which voters mark paper ballots that are subsequently tabulated by scanning devices. On most optical scan ballots voters indicate their selections by filling in an oval, completing an arrow or filling in a box. Ballots may be either scanned on hand-fed optical scan tabulators in the polling place or vote center (Precinct Count) or collected in a ballot box to be scanned at a central location (Central Count.) High capacity batch-fed optical scan tabulators are used in some jurisdictions to handle larger volumes of central count ballots. Optical scan voting systems can scan and tabulate ballots marked by hand or those marked by a ballot marking device.²⁵

This technology is an advanced method used to count votes when compared to other types of voting technologies. It is important to note that this technology is flexible. With the thousands of counties in the United States, it is important that any voting technology is adaptable to fit the needs of each county that uses them. These machines are still used in many jurisdictions today.

Direct Recording Electronic (DRE's) voting machines are a part of the latest advancement of voting technology. This type of voting technology was first created to assist in recording votes on the floor of the legislature.²⁶ Notably, there are two main companies that

²² *Ibid.*

²³ *Ibid.*

²⁴ *Ibid.*

²⁵ Voting Equipment, "Verified Voting", Verified Voting, 3/12/21, <https://verifiedvoting.org/votingequipment/>

²⁶ Jones, Douglas W., "A Brief Illustrated History of Voting", Voting and Elections Web Pages, The University of Iowa Department of Computer Science, 3/12/21.

manufactured DRE's: Electrovote and Microvote. The older model, Microvote, had too fewer buttons required by many jurisdictions to run their elections.²⁷ On the other hand, Electrovote is considered to incorporate more technology, using a "smartcard interface" as well as a touchscreen.²⁸ Since the devices have a user-friendly interface, they are manageable to use regardless of one's comfort level with technology. Jones explains that the Evervote DRE as,

... a wedge shaped affair, basically an IBM PC compatible with a touch screen, packaged for voting, with a secure case that prevents keyboard or mouse from being plugged in while it is in the polling place. The machine plugs into a network hub that also includes a UPS (uninterruptable power supply, including battery pack), and sits in a voting booth that is little more than a table with a corrugated plastic privacy screen -- this is a bare minimum voting booth, but the flat panel display screen on the voting machine has very poor off axis viewing, so the privacy is a bit better than the minimal booth suggests.²⁹

Figure 1.2 illustrates the components of a DRE. The privacy shield signifies to the voter that their vote a private one and that their privacy is still a priority. Additionally, the touchscreen interface speeds up the voting process on election day. This technology tries to prevent a number of different issues that could occur during the voting process such as an unstable power supply which was seen as a problem for other voting technologies. DRE's are no doubt one of the most advanced types of voting technology produced in recent years.

²⁷ *Ibid.*

²⁸ *Ibid.*

²⁹ *Ibid.*



Figure 1.2 Representation of a Direct Recording Electronic (DRE) machine
Source: Google

A historical account exemplifying the advancement of voting technology is absolutely necessary to bring attention to. Having this understanding of the historical context aligns with how election boards choose to implement voting technology and how they decide to update older technology. On a similar note, the sequential nature of the advancement of voting technology provides various insights to how one voting machine and its faults contribute to the shift to new voting technologies. Since the beginning of elections, there has been substantial change in how they are administered and how votes are tabulated. The timeline brings attention to many concerns as to how voting machines produced in the 1980s is still being used in many jurisdictions today and how systems with proven problems are still being used. This leads to the next discussion of the 2000 election where outdated, flawed technology wreaked havoc on the state of Florida.

1.2 The 2000 Election and the Help America Vote Act

The 2000 Presidential Election brought attention to a number of flaws in the United States' electoral process. The race between the Republican candidate, George W. Bush and Democratic candidate Al Gore relied heavily on the results in Florida. This race was considered the closest presidential election in the history of the United States and was clearly unprecedented that the judicial system did not know how to provide the right remedy to derive a solution to the situation. A significant issue that led to the uncertainty of 2000 General Election was the newly designed ballot used in Palm Beach County, Florida. In Palm Beach County, the puzzling design of the ballot used in the election and the implementation of outdated voting technology led to the intent of voters to not be fully represented as they wished.³⁰ Many who intended to vote for Al Gore, had their vote misrepresented and in turn not counted. The chaos that ensued led to a Bush presidency. This sections will rely heavily on the work of a team of scholars from various institutions that played a significant role in analyzing constituents' intent and what went wrong in Palm Beach County, Florida.³¹

Unlike the case in almost every other election carried out in the United States, the 2000 election was a wakeup call to the country about the delicacy of the electoral process. One alarming summary of the findings from Brady et al. is that the voting system failed the country. They state, "We saw, up close, a very significant problem—the failure of our voting system to convert people's vote intentions into counted votes- chopped into law-suit sized pieces that obliterated the larger picture and led to legalistic solutions that often seemed to miss the point."³² The key point here is that a legal remedy would not suffice. Citizens and administrators alike

³⁰ Mann, Thomas E., "Reflections on the 2000 U.S. Presidential Election., The Brookings Institute, 1/1/01, <https://www.brookings.edu/articles/reflections-on-the-2000-u-s-presidential-election/>.

³¹ Brady et al., "Law and Data: The Butterfly Ballot Episode"58

³² Brady et al., "Law and Data: The Butterfly Ballot Episode",59

looked to the courts for a solution. Before the legal ramifications and precedents associated with 2000 election law are explored, the problem of the butterfly ballot and in turn the major problems that arose on November 7th 2000 must be examined.

In preparation for the 2000 Presidential Election, Palm Beach County, Florida decided to implement a new ballot format. This ballot, when aligned with the holes for the punch card system, did not line up correctly to the candidate, leading to mass confusion among voters.³³ Figure 1.4 provides an example of the ballot used in Palm Beach County. As seen, the punch hole that signifies a selection for president is not actually coinciding with the candidate the hole represents. This exact reasoning resonates with how other voters perceived the ballot and suggests that there was more than a select few who suffered from this confusion. As a result, in Palm Beach County, the race between George W. Bush and Al Gore boiled down to 537 ballots and ultimately cost Gore the election.³⁴ Calculations by Brady et al., show that about 2,000 supporters for Gore accidentally casted their vote for Buchanan.³⁵ From the 20% of Floridians who supported Buchanan, 7% of that support came from Palm Beach County.³⁶ On a similar note, the number of overvotes calculated during this election was upwards of 19,000.³⁷ For clarity, an overvote occurs when a voter indicates two choices for a contest that only allows for one choice to be made.

³³ Mestel, Spenser, "How bad ballot design can sway the result of an election", The Guardian, 11/19/2019, <https://www.theguardian.com/us-news/2019/nov/19/bad-ballot-design-2020-democracy-america>

³⁴ *Ibid.*

³⁵ *Ibid.*

³⁶ *Ibid.*

³⁷ *Ibid.*

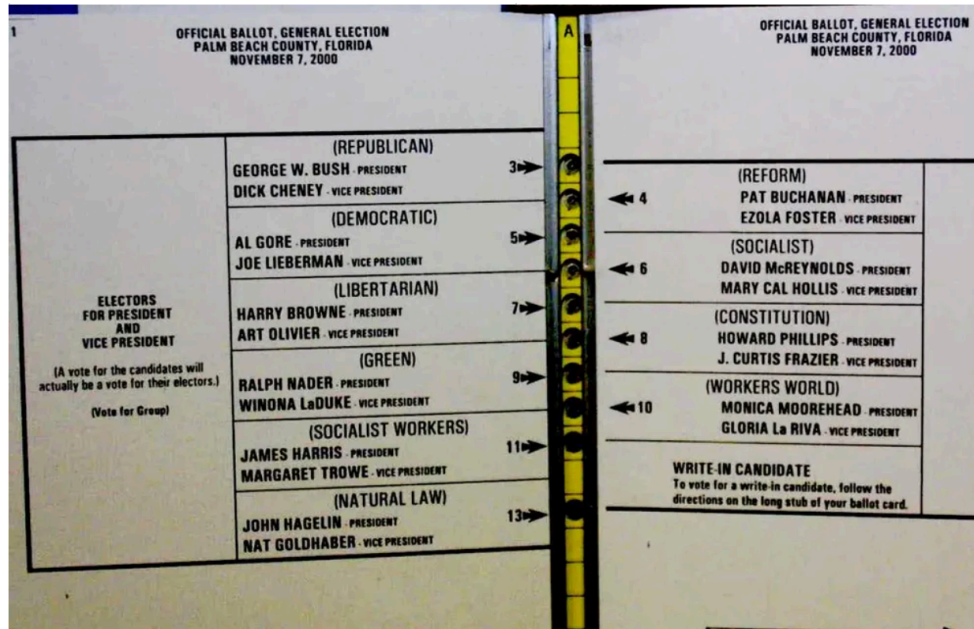


Figure 1.3 Example Ballot from the 2000 Presidential election used in Palm Beach County, Florida
Source: Google

The researchers also concluded that there was sufficient evidence beyond the doubt of circumstance that there was a problem with this election. The authors state the following:

We find that Buchanan's Palm Beach County vote total is not merely large but that in statistical terms it is extraordinary. Furthermore, we examined voting patterns within Palm beach County and find strong statistical evidence that Buchanan voters are concentrated in the most liberal precincts of Palm Beach County. We also find that invalid, double-punched ballots—presumably double-punched ballots for Gore and Buchanan—tend to come from relatively liberal precincts. These two findings are evidence for the claim that the ballot format in Palm Beach County led some Gore supporters to vote for Buchanan, and in some cases, to vote for multiple presidential candidates.³⁸

These findings were alarming at the time and even more distressing 11 years later. The fact that the electoral process and voters intent were threatened by a mechanism of elections that is 100% controllable is cause for great concern. Even more disturbing are the affidavits stating that voters were denied help after asking poll workers to assist with their selection of a candidate due to the

³⁸ *Ibid.*

confusing nature of the ballot.³⁹ The women's anecdote goes as follows. She asserts that she was familiar with the ballot structure after looking at the ballot before going to vote. This woman was also a poll worker, leading to the assumption that she knew the ins and outs of the electoral process that occurs on election day. This voter claims that she requested assistance from the poll worker to ensure she casted her vote for Al Gore. She was denied assistance and was embarrassed to ask for further assistance. Instead, the voter punched the hole she believed was right. Her husband received further clarification was told to punch the second and third holes to indicate Al Gore and his running mate.⁴⁰ This one example is a clear indication that the butterfly ballot made it more difficult for voters to cast their vote as they wished to.

The debate on how to handle the situation in Palm Beach County made its way into the legal system. Many judges in Florida recused themselves from the case brought to the courts by Florida Attorney, David Krathen.⁴¹ Looking to the courts for clarity on the 2000 election led to a slippery slope. The courts may not have been the best place to look for an answer. The courts look at two types of information: Case law that establishes precedent and the State and U.S. Constitution. The intricacies of elections and election law thwarted the willingness of judges to take on the case presented to the court. For this specific case, judges recused themselves left and right because they did not want to be the one to decide a case that was so unprecedented. The facts of this case were daunting and having to decide whether a revote was necessary in Palm Beach County was a decision that could tarnish their reputation. After a number of recusals, the judge assigned to the case was Judge Labarga.⁴² Judge Labarga explained during the hearing that

³⁹ *Ibid.*

⁴⁰ *Ibid.*

⁴¹ *Ibid.*

⁴² *Ibid.*

he was unsure that he had the constitutional authority to order a revote in Palm Beach County.⁴³ He asked each party to find a case where a revote was ordered during a presidential election and there was little out there.⁴⁴ The argument could be made that aspects of the ballot violated Florida law, but highlighting the design flaws of the ballot would not be sufficient to make a judge declare it as defective.⁴⁵

A few days later, the judge issued his opinion which points out that because of the dubious language, which makes up the Constitution required the electors to be elected on the same day.⁴⁶ Since every other state had certified a winner, it would be unsound to allow a revote to occur in Palm Beach County. The constitution also contains a clause that represents the fact that a revote could provide a disadvantage to one candidate and an advantage to the other which would be unconstitutional.⁴⁷ Brady et al., states an important insight. They state, “The facts of the butterfly ballot proclaimed a significant injustice, but the law appeared blind to the problem and unable to deal with it.”⁴⁸ It was recognized that there were flaws in the ballots design, but the judge did not find sufficient evidence to challenge the legality of the ballot and as a result, the court did not find it defective according to the law.⁴⁹ This set a damaging precedent and threatened the citizens constitutional right to elect officials. By the court not standing up for the constitutional right to vote, it put any ability to institute and instill change in how jurisdictions administer elections in a compromising condition.

The issue of the butterfly ballot brought great attention to the issues of election administration and more specifically, voting technology. Conversations about the implications of

⁴³ *Ibid.*

⁴⁴ *Ibid.*

⁴⁵ *Ibid.*

⁴⁶ *Ibid.*

⁴⁷ *Ibid.*

⁴⁸ *Ibid.*

⁴⁹ *Ibid.*

antiquated voting technology called for the investigation into the improvement of election administration. One action taken by the federal government was the creation of new legislation. The most notable form of election administration legislation crafted by the United States Congress was in 2002. The Help America Vote Act or HAVA aimed to appropriate funds of the federal government to state governments to revamp their voting technology and to modernize their technology, phasing out punch card systems and lever voting systems. This legislation was the Federal response to what occurred during the 2000 election. Besides providing funds to advance punch card voting machines and lever voting machines, the HAVA also required state election boards and governments to provide voting access to the disabled, created the Election Assistance Commission, created an updated voter registration form, and created new guidelines for testing and certification protocols for voting machine software and hardware.⁵⁰ It also called for a clearinghouse that aimed to hold resources, information, and mutual practices for states.⁵¹ This step by the federal government was undoubtedly necessary due to the state and local governments inability to recognize and facilitate these crucial changes on their own.

The HAVA wished to bring about change to a an array of issues within election administration. This is important to improve the overall administration of elections, but it is especially important for advancing voting technology. Before the HAVA, there was minimal legislation enacted by the federal government that focused on voting technology. By starting the conversation on the congressional floor, the federal government exemplified their commitment to investigating and improving election technology.

⁵⁰ U.S. Congress, House Committee, Help America Vote Act of 2002, 2.

⁵¹ Election Assistance Commission, "Help America Vote Act", 3/12/21, https://www.eac.gov/about_the_eac/help_america_vote_act.aspx

One important condition of the Help America Vote Act relating to voting technology was the federal funding provided to states to advance their voting technology from the previously noted punch card and lever voting systems. The HAVA provided specific guidelines for how the money should be spent, which included abiding by the protocols set forth in the act, education for the public on voting standards and voting technology, training those working the polls, and to implement some form of voting technology that is usable for those who are disabled.⁵² The act also “required voting systems to allow the voter to review, verify, and change their vote before casting it.”⁵³ As noted in The Brennan Center of Justice’s Report on United States voting machines, local board of elections do not have the funds to invest in and acquire new voting systems.⁵⁴ Additionally, if the federal government did not act sooner, then the risks associated with punch card systems and lever machines would be exacerbated. By the federal government providing monetary assistance to state and local governments, jurisdictions were able to make the big purchases they needed and take active strides to ensure democracy.

On a similar note, the HAVA also provided the disabled with the ability to cast their intent by keeping the secret ballot in play. This legislation ensured that a voting machine with accessibility features, such as an audio feature and a controller that helps the voter make a selection in a contest, which makes it possible for anyone who is disabled to vote without any assistance. I can speak for Suffolk County in New York State ensured that these machines were programmed and working. The machines used by Suffolk County are pictured below (Figure 1.5). These machines were produced by Dominion Voting Systems Inc., a well-known producer of election equipment. The voting machine pictured below works in the following way. The

⁵² U.S. Congress, House Committee, Help America Vote Act of 2002, 4

⁵³ Weinstein-Tull, “Election Law Federalism”, 758

⁵⁴ Norden and Famighetti, “America’s Voting machines at Risk”, 4

controller, which is similar to a Gameboy controller, allows the voter to maneuver through the candidates for each contest and select their choice. Figure 1.6 shows how a voter would use the controller to “vocalize” their intent of support. Along with this controller, there are headphones that connected to the machine allowing the voter to hear directions that assist in navigating the voting process. For those who are paralyzed or are unable to use the controller, there is a tube that attaches to the machine allowing the voter to use the force of their breath to pick their candidate for a given contest. The HAVA paved the way for those who are disabled to cast their vote with the same liberties as those free of any ailments.



www.alamy.com - BGERN3

Figure 1.4 Representation of a Tabulator that can be used by the disabled.
Source: Google

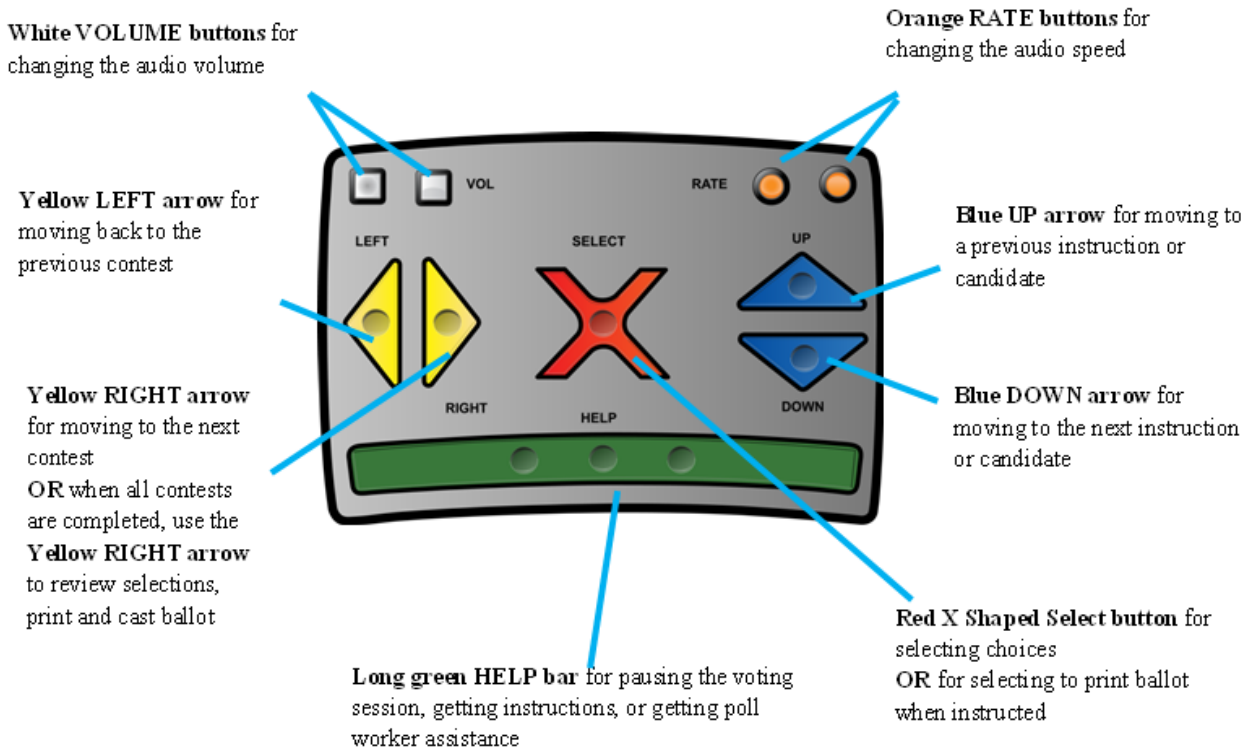


Figure 1.5 Diagram of controller with explanations on usage.
Source: Google

The establishment of the Election Assistance Commission (EAC) was essential to establishing a stronger relationship between the federal government and state and local jurisdictions. The EAC was created to act as a gateway to advisory panels and guidelines that were standard to Federal elections.⁵⁵ The EAC worked to create voluntary voting equipment guidelines and to ensure that the “clearinghouse of information” was accessible to state and local governments, so they could find all guidelines and recommendations.⁵⁶ This action taken by Congress is a step in the right direction to unify the approach to Federal elections taken on by state and local governments. One major drawback is that the protocols produced by the EAC were and still are voluntary, meaning that states and local jurisdictions could use discretion when

⁵⁵ U.S. Congress, House Committee, Help America Vote Act of 2002, 4

⁵⁶ *Ibid.*

choosing what to implement and if they implement these suggestions at all. The theoretical framework of electoral federalism, which is discussed in the next section, helps explain the intent of this arrangement.

In order to safeguard the transition to new technologies, there needed to be guidelines that explicitly pointed jurisdictions in the right direction when making these decisions. The committee commenced by HAVA, the Technical Guidelines Development Committee, intended to create guidelines for voting technology and its machinery.⁵⁷ Even if these guidelines are not adapted by all 50 states, the establishment of these guidelines is an important statement and commitment to advancing election technology. The HAVA exemplifies the commitment of the federal government to ensure the quality of U.S. elections.

1.3 Election Federalism

The standards associated with the certification and verification of election technology is dependent on the statutes, laws and regulations imposed by local governments, state governments, and the federal government. This convoluted, jurisdictional relationship between all levels of government is the result of election federalism. According to Weinstein-Tull, election federalism has two recognizable attributes. These attributes are categorized as, “(1) unusually expansive federal power to legislate pursuant to the Election Clause; and (2) widespread state prerogative to delegate election responsibilities to local government.”⁵⁸ Weinstein-Tull argues that election law federalism encompasses two apparent features- the wide power of the federal infrastructure to regulate and the state’s privilege to delegate responsibility to local jurisdictions.⁵⁹ This definition leads to a number of different analyses when it comes to

⁵⁷ U.S. Congress, House Committee, Help America Vote Act of 2002,17

⁵⁸ Weinstein-Tull, Election Law Federalism,1

⁵⁹ Weinstein-Tull, Election Law Federalism, 775

deciphering what parts of the electoral process are under each level of government's jurisdiction. The Election Clause in the United States Constitution states "*The Times, Places, and Manner of holding Elections for Senators and Representatives, shall be prescribed in each state by the Legislature thereof; but the Congress may at any time by Law make or alter such Regulations, except as to the Places of choosing Senators.*"⁶⁰ The creators of the Constitution aimed to give state governments a majority of the control when deciding how to administer elections. They also realized that the federal government (the legislative body) should be able to "check" other governing bodies and maintain the capacity to pass laws to assist in the process. The Founders intended for the Election Clause to give power to the states to plan elections according to their own specific procedures and nothing more.⁶¹

This interpretation of the Election Clause of the U.S. Constitution gives state governments immeasurable power when it comes to the administration of elections. As a result, the federal government has little control over how states choose to conduct elections. The Framers envisioned the Election Clause to operate in this manner because with so many jurisdictions, it would be impossible for the federal government to administer elections across the country and do it well. Currently, there are 3,006 counties located in the United States.⁶² If the federal government took on the burden of preparing elections across each state and within each county, there would be a number of significant challenges to overcome. Additionally, Weinstein-Tull calls elections "hyperfederalized"; that is, many key election decisions are made at the local level.⁶³ It is also important to note that election administration is not a high-ranked or important

⁶⁰ United States Constitution, art 1. sect.1, clause 1

⁶¹ Constitution Annotated, "Art.S4.C1.1.1.1.1. Role of the States in Regulating Federal Elections", 3/12/21, constitution.congress.gov.

⁶² U.S. Census, "States, Counties, and Statistically Equivalent Entities". 3/12/21. <https://www2.census.gov/geo/pdfs/reference/GARM/Ch4GARM.pdf>

⁶³ Weinstein-Tull, "Election Law Federalism", 752

issue of the federal government. This is one reason why the federal government delegates election administration to state governments. This transfer of responsibility helps ensure that elections are ran in accordance to federal and state law, since each state has their own laws and policies for administering elections. State governments further delegate these responsibilities to local governments. Local governments are tasked with carrying out the election administration from voter registration to the tabulation and certification of votes. Theoretically, the hierarchy of election administration used today should operate in a way that produces few issues. Each county will carry out elections as they see fit, keeping in mind the needs of their constituents and current election law. One concern that arises when looking at elections is that there are 3,006 different methods used. With each county having their own distinct ways of operating, there are many discrepancies that occur between counties and states. This may be appropriate for electing for local and state elections, but, for electing officials to the House, Senate, and Presidency, it may not be the best method. Interpretations of the Election Clause leads to the conclusions that it is up to state and therein local governments to administer state and local elections as they wish. But, the federal government has clear jurisdiction over the administration of federal elections and the federal government can require states to adapt its wishes. An example of this occurred in 2002 with the federal government requiring states to phase out punch card and lever voting systems. Indeed, they provided the funds for this advancement, but by doing so, the federal government was able to appeal to states to make the change. A similar application of this action was seen in 1984 when the federal government tied increasing the legal drinking age from 18 to 21 to federal funding for state highways.⁶⁴ Although it is not in the same realm of government administration, the application of this principle is sound. The notion that the federal government could use

⁶⁴Alcohol Policy Information System, “The 1984 National Minimum Drinking Age Act”, 3.12.21. <https://alcoholpolicy.niaaa.nih.gov/the-1984-national-minimum-drinking-age-act>.

money and other incentives as bait for states to follow their preferred course of action represents a clear economic power that the federal government holds compared to the “power” of state governments. The amount of money the federal government was able to provide to states for voting equipment was substantial and enough to cause jurisdictions to comply.

Election federalism takes into consideration the rights of each aspect of government and as a result, appears to be the most beneficial approach to election administration. Indeed, there are a number of different issues that arise within this infrastructure. Given that states could be at odds with the wishes of the federal government, they could choose to not hold up their end and not implement federal policies. This occurred in 2005 with the state of Alabama, not due to opposition of the legislation, but due to the fact the Attorney General felt the state did not have the authority to do so. Weinstein-Tull states,

In 2005, the Alabama attorney general issued an opinion stating that the Alabama secretary of state did not have the authority to select a particular voting system or designate a set of acceptable systems for Alabama counties in order to comply with HAVA. Nor did the secretary of state, according to the opinion, have the authority to prevent the counties from purchasing certain systems. When Alabama proposed a new law that would permit the secretary of state to select the available voting machines for the counties, county officials objected to surrendering the authority that they had long possessed. Alabama did ultimately enact that legislation, and brought the state into compliance with HAVA. The Alabama attorney general opinion demonstrates Alabama’s genuine belief that it lacked the ability to comply with HAVA until it enacted implementing legislation—that is, a belief that HAVA itself did not give Alabama sufficient authority to comply with its terms.⁶⁵

The Alabama attorney general’s opinion brings attention to a fallacy of election federalism. Just because the federal government passes legislation that gives states the power to implement the federal government’s wishes, there are other factors that thwart such advancement. Since counties are tasked with implementing voting technology, there was resistance by the state to

⁶⁵ Weinstein-Tull, “Election Law Federalism”, 769

start the process of phasing out lever and punch card voting machines. The fact that the attorney general felt that the secretary of state did not have the right to implement the act on a state level shows how laws and state constitutions can have an adverse effect on elections when states are in competition with each other. Election federalism makes it extremely difficult to make advancements in election administration because of the many players involved. In addition to the obstacle of implementing new policies, there is a lack of accountability between the levels of government. States use the organization of election administration to scapegoat and escape accountability by blaming county governments or by claiming that the laws of the state forbid them to act.⁶⁶

In a similar realm, state governments can make it extremely difficult for local jurisdictions to administer their part of the electoral process, whether it is done on purpose or as an unforeseen consequence. This was the case with the State of New York and Nassau and Putnam County. The Albany County Board of Elections wrote a memo which spoke to the challenges the law placed on counties. Weinstein-Tull remarks, “The State has made compliance impossible by failing to certify a list of approved voting systems in sufficient time for local boards to undertake all the necessary preparations for an orderly transition to the new machines.”⁶⁷ It was suggested that the time requirement set by the Help America Vote Act, to have the new technology implemented by the 2007 Primary Election, made it impossible for counties to implement the changes before New York State tested the security of these machines.⁶⁸ Putnam County stood to lose a momentous amount of funding because the county

⁶⁶ Weinstein-Tull, “Election Law Federalism” 770

⁶⁷ Weinstein-Tull, “Election Law Federalism”, 774

⁶⁸ Graziano and Clancy, “The County Dilemma- The Impact of the Help America Vote Act on New York State., 10/31/06. http://www.albanyweblog.com/2006/11-Nov/11-02-06_Ref_01.html

was unable to implement these changes due to the states failure to act.⁶⁹ In a similar light, Nassau County echoed the same argument, arguing that it was New York State's responsibility to comply with the act and they failed to do so.⁷⁰ The jurisdictional relationship between state and local governments leads to a lack of accountability that is detrimental to election administration and to democracy. The State further delegates election responsibilities to county governments, but does not yield the duty to be held accountable as they are the jurisdiction that further prescribes the authority of election administration to counties. In this case, the state of New York was at fault for not providing the necessary certifications and support for local jurisdictions. This echoes the numerous types of issues that arise when each level of government fails to work together and instead figures that another level of government would pick up the slack and make up for it.

Election federalism plays a critical role in the administration of elections. As seen with the implementation of the Help America Vote Act, the challenges of delegating of election responsibilities cause harm when the efforts are coordinated, but rather in competition with each other. This section provides a historical explanation to uncover the innerworkings of election administration based on the intent of the framework of the United States Constitution. Analyzing the role of election federalism in the overall infrastructure of elections, I argue, creates the necessary framework to analyze voting technology and the issues it continues to cause with the overall voting process. There needs to be better cooperation between all levels of government when implementing new policies and regulations. Federalism was not instituted to segregate the hierarchy of government. The Founders understood that state governments needed a prominent voice in the governing process, but they did not intend for different levels of government to stand

⁶⁹ Weinstein-Tull, "Election Law Federalism", 774

⁷⁰ *Ibid.*

back from their duties, burdening lower levels of government. Governing the electoral process is too large and too important to be a one level responsibility and the burden of election administration will lie one level of government if this delegation continues.

The history of voting technology is essential to our understanding of election administration. A historical perspective provides a gateway to a plethora of analyses to be made as well as to the political circumstances that sparked these important conversations and improvements. As the sequence of events personifies, voting technology ranges in specificity and purpose. It also speaks to the amazing advancements that have been made to ensure that the voters' intent is heard and that elections are ran smoothly and accurately. It is notable to recognize the path the process of election administration took to advance voting technology to where it is today. Since the times of the paper ballot, elections have been able to make remarkable progress, creating machines that accommodate those with disabilities as well making the process of casting a vote fairly easy. As election technology got more advanced, problems arose with its implementation which has lasting effects still to this today.

The crisis that was a result of the 2000 Presidential Election was a wake-up call to all about the fragility of the electoral process. The fact that an entire election was undermined by the structure of a ballot in one county is astonishing. This issue made it clear that something in the election process needed to be changed. The Help America Vote Act was a monumental act that led to many conversations about the necessary changes that needed to occur in order to update outdated voting technologies such as the lever voting machines and the punch card voting machines. In turn, election federalism helps explain the complexities of election administration, highlighting the many jurisdictions that are a part of the process. It leads to a lack of accountability from different levels of government adding to issues with election administration.

Although it is grounded in the United States Constitution, the application of federalism in election administration may do more harm than good and needs to be re-evaluated.

1.4 Election Technology As A Political Phenomenon

The ability of citizens and elected members of American society to debate, share concerns, and work together to achieve prosperity is fundamentally the practice of politics. It is defined by its reliance on a power differential between citizens and elected officials at every level of government- from local towns and villages to the most powerful positions in the United States' government. Many theories of democracy explore the relations between citizens and forms of government, which seek to justify and explain why choosing elected officials to represent citizens' desires and needs works. Democratic practices in the United States government leads, in theory, to being represented and heard. The means to this end are reliant on one democratic process that is often taken for granted: elections. The electoral process requires a medium that takes voter intent and transcribes it into a counted vote. This tangible medium, rather than the inherent systems that create electoral systems of administration, is election technology. This section seeks to argue and explain how election technology is a political entity and how its problems are untimely cured by practicing politics.

As previously mentioned that the research and development of voting technologies is carried out by private companies, free from the influence of political groups and organizations. Because the advancement of such technology is funded by private entities, it is not tied to the political apparatus of the United States. Although it appears on the surface that private companies such as Dominion Voting Systems Inc.⁷¹ or Election Systems & Software, LLC

⁷¹ U.S. Election Assistance Commission, "Dominion Voting Systems Inc." 3/12/21, <https://www.eac.gov/voting-equipment/registered-manufacturers/election-systems-software-inc-ess>

(ES&S)⁷² are responsible for such advancement, they are subjected to adhere to regulations and requirements created by the U.S. government. Additionally, voting machines created by private companies are used in government sanctioned processes. Based on this logic, voting technology is an issue of the body politic. The Help America Vote Act (HAVA) and its updated requirements for voting machines demonstrates this point. The HAVA, passed in 2002, required the phasing out of lever voting machines and punch card voting machines that led to the disastrous problem in Palm Beach County, Florida. This had a direct effect on these private companies because it changed the market for voting technologies. As time passed and the older technologies were phased out, the shift in market demand to a need for more advanced voting technologies. If it were not for this piece of election legislation, private companies would not be as motivated to invest in research and development to create new voting technologies.

The government, on a system level, interacts politically with election technology manufactures, making the relationship political. It is also elected officials and political groups that make voting technology a political issue. The recent actions taken by President Trump, the Trump Campaign and its allies in the 2020 Presidential Election to spread a misinformation campaign to discredit Dominion Voting Systems Inc. because President Trump lost the election is a political issue. To preface the subsequent argument, former President Donald Trump lost the popular vote 46.91% to President Joe Biden who obtained 51.38% of the popular vote.⁷³ In terms of the Electoral College vote, former President Trump lost to President Biden who obtained 306 electoral votes to Trump's 236 votes.⁷⁴ Additionally, the Cybersecurity & Infrastructure Security Agency (CISA) released a statement declaring the following:

⁷² U.S. Election Assistance Commission, "Election Systems & Software Inc," (ES&S)." 3/12/21, <https://www.eac.gov/voting-equipment/registered-manufacturers/election-systems-software-inc-ess>

⁷³ 2020 Presidential Election Results, <https://elections.ap.org/dailykos/results/2020-11-03/state/US>

⁷⁴ National Archives, "2020 Electoral College Results", 3/12/21, <https://www.archives.gov/electoral-college/2020>

The November 3rd election was the most secure in American history. Right now, across the country, election officials are reviewing and double checking the entire election process prior to finalizing the result. When states have close elections, many will recount ballots. All of the states with close results in the 2020 presidential race have paper records of each vote, allowing the ability to go back and count each ballot if necessary. This is an added benefit for security and resilience. This process allows for the identification and correction of any mistakes or errors. **There is no evidence that any voting system deleted or lost votes, changed votes, or was in any way compromised.** Other security measures like pre-election testing, state certification of voting equipment, and the U.S. Election Assistance Commission's (EAC) certification of voting equipment help to build additional confidence in the voting systems used in 2020.

While we know there are many unfounded claims and opportunities for misinformation about the process of our elections, we can assure you we have the utmost confidence in the security and integrity of our elections, and you should too. When you have questions, turn to elections officials as trusted voices as they administer elections.⁷⁵

In the days leading up to November 3, President Trump, with the help of his allies such as his private legal counsel Rudy Giuliani, Sidney Powell and news organizations like Fox News, claimed that if he was going to lose the election, it would be due to widespread election fraud.⁷⁶

They blatantly ignored the facts presented by numerous agencies of both state and federal governments. They prepared their response in case they lost the election. In the days after the Associated Press declared a winner of the 2020 Presidential Election, former President Trump and his co-actors went rampant with accusations that Dominion Voting Systems Inc. flipped votes to Joe Biden.⁷⁷ The former president himself, as well as the others mentioned above, barked inaccurate claims in press conferences, appearances on news segments, and postings on social media (Twitter) that directly undermined the results of the election and the reputation of

⁷⁵ Eric Coomer, Ph.D, vs. Donald J. Trump For President, Inc., Sidney Powell, Sidney Powell, p.c., Rudolph Giuliani, Joseph Oltmann, FEC United, Shuffling Madness Media, Inc. dba Conservative Daily, James Hoft, TGP Communications LLC dba The Gateway Pundit, Michelle Malkin, Eric Metaxas, Chanel Rion, Herring Networks, Inc. dba One America News Network, and Newsmax Media, Inc., 20

⁷⁶ Eric Coomer, Ph.D, vs. Donald J. Trump For President, Inc., Sidney Powell, Sidney Powell, p.c., Rudolph Giuliani, Joseph Oltmann, FEC United, Shuffling Madness Media, Inc. dba Conservative Daily, James Hoft, TGP Communications LLC dba The Gateway Pundit, Michelle Malkin, Eric Metaxas, Chanel Rion, Herring Networks, Inc. dba One America News Network, and Newsmax Media, Inc., 3

⁷⁷ Corasaniti, Nick, "Rudy Giuliani Sued By Dominion Voting Systems Over False Election Claims", The New York Times

Dominion Voting Systems Inc., since a portion of the public (Trump supporters) believed these false claims.

As a result, Dominion Voting Systems Inc. filed a lawsuit against Rudolph Giuliani, Sidney Powell, Mike Lindell, and Fox News based on the grounds of defamation. The New York Times says the following about the case against Giuliani--

The suit seeks damages of more than \$1.3 billion and is based on more than 50 statements Mr. Giuliani made at legislative hearings, on Twitter, on his podcast and in the conservative news media, where he spun a fictitious narrative of a plot by one of the biggest voting machine manufacturers in the country to flip votes to President Biden.”⁷⁸

One false claim plastered across the internet and voiced by the defendants is that Dominion has ties to a Venezuelan Dictator and was started in the country to fix the results of the Venezuelan election of Hugo Chávez.⁷⁹ Another lie that was shared by the defendants was that an employee of Dominion Voting Systems Inc. was a part of the terrorist group, ANTIFA.⁸⁰ The brunt of the blame was placed on Eric Coomer, the Director of Product Strategy and Security for Dominion Voting Systems Inc.⁸¹ Oltmann, a defendant of the case brought on by Dr. Coomer, took the issue to a Conservative Daily Podcast, stating,

Let’s not sugar coat this, we’re going to expose someone inside of Dominion Voting Systems specifically related to Antifa and related to someone that is so far left and is controlling the elections, and his fingerprints are in every state. So I want you guys to understand that what we’re about to show you, you have to share . . . The conversation will be about a man named Eric Coomer. C-O-O-M-E-R.⁸²

⁷⁸ *Ibid.*

⁷⁹ *Ibid.*

⁸⁰ *Ibid.*

⁸¹ Eric Coomer, Ph.D. vs. Donald J. Trump For President, Inc., Sidney Powell, Sidney Powell, p.c., Rudolph Giuliani, Joseph Oltmann, FEC United, Shuffling Madness Media, Inc. dba Conservative Daily, James Hoft, TGP Communications LLC dba The Gateway Pundit, Michelle Malkin, Eric Metaxas, Chanel Rion, Herring Networks, Inc. dba One America News Network, and Newsmax Media, Inc., 5

⁸² Eric Coomer, Ph.D. vs. Donald J. Trump For President, Inc., Sidney Powell, Sidney Powell, p.c., Rudolph Giuliani, Joseph Oltmann, FEC United, Shuffling Madness Media, Inc. dba Conservative Daily, James Hoft, TGP Communications LLC dba The Gateway Pundit, Michelle Malkin, Eric Metaxas, Chanel Rion, Herring Networks, Inc. dba One America News Network, and Newsmax Media, Inc., 23

This is only one example of the many accounts of the misinformation campaign that occurred before, during , and after the 2020 Election. The actions taken by these parties undermined the results of the election, causing many citizens to doubt the electoral process.

By targeting voting technology and its reliability as the main culprit of fraud, the Trump Campaign and its allies threatened democracy. As a result of the former presidents' incapability to accept his fate, the entire electoral process was questioned. If that is not a political issue, what is. Calling the United States electoral process fraudulent undermined the authority of the government to carry out fair elections as well and brought doubt about the results of the election. Voting technology is tied to the process by which citizens choose elected officials to represent their political needs and desires. Voting technology is no doubt an infrastructure that needs to be addressed by politics.

Chapter 2: Ethnographic Account of My Experience at the Suffolk County BOE

My time at the Suffolk County Board of Elections (SCOBE) contributed to the creation of this topic and to my basic understanding of voting technology. In this regard, the experiences I bring attention to are strictly observational. I bring a unique perspective to the issues facing election technology and its administration. I was not a long-term employee of the Suffolk County Board of Elections, allowing me to see a different perspective than other employees. Many employees worked at the BOE for decades and it was noticeable that they got bogged-down in the office culture and BOE operations. In short, many employees overlooked ways to reach optimum productivity and often times settled with methods they employed to complete their tasks. As a short-term employee of the Suffolk County Board of Elections, I was able to take a step back from the office politics and truly see the BOE operate in its truest form. This chapter will explore my experiences during my first “stint” at the Suffolk County Board of Elections. In the subsequent pages, I will delve into the office culture, my relationships with other employees, and my overall observations of how tasks are carried out.

I had gotten the opportunity to intern at the Suffolk County Board of Elections through my father. The Republican Commissioner, is a law student at the same Law School my father attended. The Commissioner reached out to my father to help him with some classwork and they became contacts and colleagues. My dad mentioned to him that I was a Political Science major at Union College and had an interest in law. That summer I had shoulder surgery and was unable to adhere to the requirements of a full time internship. I was in a immobilization sling for two months and with the demand of physical therapy and not being able to drive, it was safer for me to remain at home. This internship at the Suffolk County Board of Elections was the perfect

opportunity for me to gain more experience in the legal field as well as in the field of public service and local government, while still making my recovery a priority.

2.1 SCOBE Office Culture

The Suffolk County Board of Elections is located in Yaphank, New York. It is an older building off of a major roadway surrounded by the Health Department, the Sheriff's office, and other county government buildings. The SCOBE is a bi-partisan office, meaning that there were both Republican and Democrat "sides" to everything the BOE did. I worked for the Republicans, and was responsible only to the Republican administrators. Every action taken was carried out in a bi-partisan manner. A Democrat and Republican would work in tandem with each other, whether they were sitting at the front desk as the receptionist or if they were processing absentee ballots. Every major decision was made by both Democrat and Republican leaders. The hierarchy of the BOE was simple, but had drastic effects on office culture. Both sides (Democrat and Republican) had a Commissioner, Deputy Commissioner, Senior Assistant Commissioner, and an Assistant Commissioner. In the front office there were also assistants and office managers. Although not all those roles were filled, there were a handful of individuals who you knew were in charge. The rest of the employees at the BOE worked in different areas or departments. They ranged from the warehouse where they worked on voting machines, those who managed voter registration records, those who processed and manually implemented records, and those who were responsible absentee ballots. Within each department there was a Democrat and Republican who acted as the team leader, managing other employees within the department. Both those in charge and those at the bottom of the hierarchy often had to compromise and debate over certain issues and plans of action.

The bipartisan nature of the BOE created a tense environment at times. Very early on I learned who belonged to each party and the implications this label had on the work relationships in the BOE. I found that the Democrats were in the company of other Democrats while Republicans did the same. There was awkward tension between some individuals of different parties which was apparent an hour into my internship. When something went wrong, some were quick to place blame on those of the opposite party. This occurred a number of different times. I would contribute this to the employees' increased sense of partisanship which made them lose focus on the big picture which was that they were working for the greater good and for a greater cause.

It was also apparent that I was one of the most educated in the back office. Very few employees had a college degree. Most has some level of education but many others just had a high school education. As someone who was more tech savvy and in college, I approached problems differently and was able to change the way in which tasks were approached. For example, I was creating poll worker books for each early voting polling place. It was to be done by hand. I was tasked with drawing lines on a paper, making sure that it was neat and legible. I was given a guide to follow, but that was little help. The BOE was getting close to the start of Early Voting, working twelve hour days to ensure that everything was ready. It took me about six hours to get the lines and spacing perfect. When I went to show my supervisor, they changed the format but didn't tell me. So back to the drawing board I went. By 7pm, I was done reworking the book. I turned to the supervisors and said "You know, I could of done this on Excel and had it done in fifteen minutes." They were so surprised and said that whenever I had a new idea or a quicker way to get things done, to tell them. This is when I realized that the reason why the BOE carried out tasks the way they did was not because they were opposed to

innovation, it was because if the process wasn't flawed, there was no reason to fix it. This theme became apparent in many of the initiatives taken on by the BOE.

2.2 My Experiences and Observations

I worked in the Inspector's Office which was tasked with training and coordinating poll workers for each town and each polling place. This department was also responsible for ensuring that poll workers were paid for their training for the time they put in during early voting and election day. There were different levels of poll workers and their level was decided by a percentage identifying how well they performed in past elections. The best were designated as chairs and the ranged from coordinators to assistants. This hierarchy echoes the hierarchy that is experienced working at the Suffolk County Board of Elections.

My first stint at the SCOB E was two weeks long in August of 2019. I worked regular hours, 9am to 5pm. My other stint was for the month of June in 2020, during the Coronavirus pandemic. I will touch on this time period more specifically in the next section. During June 2020, I worked weekdays for 10-12 hours a day, weekends for a few hours, and on election day I worked from 4:40 AM to around 10:30 PM, leaving only because one of the police officers had COVID and I didn't want to be exposed to the people the officer had been around. I often came in early and was last to leave my department. I was given the option to not work on the weekend, but happily did. Working the 2020 Primary was a one in a lifetime opportunity and I was happy to give up my weekends to watch it all unfold. The more seasoned workers at the SCOB E were able to leave at 4pm and those who were just starting work had to arrive at 8:30am and were able to leave at 4:30pm. Although I was considered a "new worker" it was clear from the start that I would be allowed to come and go as I pleased and was given more leeway in terms of what I did around the office. For starters, I often times would be pulled away from my desk to complete

special tasks such as research for the Republican Assistant Commissioner or to listen in on the Commissioner and his team read through contracts. The Republican Deputy Commissioner went above and beyond to show me things she believed I would be interested in and showed me the cases she was working on. It didn't matter what I was doing, if they called me up to the front, I went. Alongside the access and exposure I was provided with, I received another luxury, the use of the internet. Back office employees did not get access to an internet browser. At the start of my internship, I did not have access to the internet. I needed it to work on a project for the commissioner and in five minutes, I had it.

When others in my department found out that I had received internet access, many did not care. One employee did have a lot to say about it. This employee's work ethic mimicked the work ethic of the many who worked there. There was a saying that meandered its way across the departments of the Suffolk County Board of Elections. It was "work on county time." I was told this early on, that those I worked with advocated and pushed me to work slower than I intended to. It seemed to become the anthem of the seasoned workers of the BOE. This woman did the bare minimum. With every assignment given, she would procrastinate. She would spend most of the day on her phone and complain about the work she did not complete. When the deadlines got close, she would still manage to complain while rushing to complete her work. One day, I was working on a project that required me to research and provide synopses of new election legislation that was recently passed for the Assistant Commissioner. My co-worker peered in my direction and saw what I was doing. She angrily asked what I was doing and how I managed to get internet service, given that I was an intern and in her eyes lowest on the totem pole. Before I could answer, she went on a 30 minute angered rant about how she has worked for the BOE for over 20 years and believes that she is entitled to have internet access. She further explained that

she should have internet access so she can pay her bills. The BOE is known to have terrible phone service as well, leading to her added difficulty of paying her bills from her desk. I started to realize that not giving internet access to all employees was the right call. Many employees would take advantage of it and use it to further procrastinate their work.

Beyond this one employee, there were a small amount of people in the Inspectors Department who partook in the same antics as this employee. It had a negative effect on the output of the department's work. The supervisors had to constantly remind other employees to do their work. In my department specifically, there were three employees that were famous for leaving their desk for hours. They would walk in and when questioned where they were, they were ambiguous with their answers. Their work was for the same town and it rarely got done on time without help from the supervisors or from myself. I viewed this behavior as laziness, but then came to realize that the structure and organization of the Board of Elections partially contributed to these behaviors.

At times, the work at the BOE was scarce for some departments, while other departments were bombarded with work. When there was not a lot of work to be assigned, people sat on their phones. Very few were proactive about finding work. Additionally, when there were tasks that involved more than one department, many hid in their perspective areas, hoping to escape work. I rarely saw an employee offer assistance to one another and the burden was on the supervisors of each department to ensure that their department was meeting the expectations of the commissioners. It was apparent that the stress often times lead to tension which resulted in certain employees putting in less effort than before. Many in my department would leave when they were needed the most. The work pace was already slow at the BOE, but when they left the work was always completed by those who stayed.

2.3 2019 Early Voting Experience

When we were preparing for Early Voting in 2019, it was the first time Early Voting was implemented in New York State. The Early Voting legislation was passed by the NYS Senate in January of 2019.⁸³ The hopes of this bill was to lessen the wait times for voters during election day and to provide more opportunities for citizens to cast their vote.⁸⁴ It was clear that everything we did was trial and error. There was no specific way to implement Early Voting practices in Suffolk County and the commissioners were tasked with figuring it out. The inspectors office was tasked with finding poll workers to work the Early Voting locations. At first, the hardest task was to convince people to sign up for ten days of Early Voting. And for me, the hardest task was to learn the ins and outs of this new legislation quickly and to be able to explain it to the poll workers. What amazed me was the knowledge set held by employees, not from formal education, but from the experiences they've had.

For days we worked on securing poll workers to work the 10 days of Early Voting. Over this time period, I learned a lot about the relationships those in my department had with the poll workers employed by the BOE. Many of these poll workers were long-term workers. The majority of poll workers I dealt with were older. They had an understanding of what their duties were, but many faced difficulty with voting machines and other technologies implemented at the voting site. Fortunately, NYS law requires BOE employees to be at every early voting location.⁸⁵ Having BOE employees at the polling site insures that things run smoothly and that if there are any problems, there are people who can fix them or call the right person to fix them.

⁸³ NYS Senate Bill S.1101, Pg.1

⁸⁴ *Ibid.*

⁸⁵ *Ibid*

Our main task during Early Voting was to coordinate between poll workers that called us with problems that had to be fixed by the other employees on the road and as well as those at the polling place. What made the process go smoothly was the knowledge set held by my co-workers and the relationships they had with those who worked the polls. As the election cycles went by, poll workers became friendly with the staff, often times having long, casual conversations with them. When they called and I answered, I got asked several questions as to who I was and what I was doing there. This wasn't meant to be malicious, but it was sometimes clear they would rather speak to their direct representative than me. It took about a week for the poll workers to be comfortable talking to me. Once they were comfortable, I would hear countless anecdotes about what being a part of the electoral process meant to them. I remember one phone call vividly. I received a call from an assistant coordinator who was very interested in working Early Voting. After I explained to him the ins and outs of what would be required, he talked to me for twenty minutes about how much he loves participating in the democratic process and how much he loves democracy. Although this conversation for me was mundane, I appreciated his sentiment. I appreciated his words not because I had to but because it was a feeling I rarely saw from those who worked for the BOE. The employees were bogged down by their partisanship which in turn, clouded their perceptions on what the electoral process is clearly about.

My first stint at the Suffolk County Board Of Elections opened my eyes to the electoral process. Just in two weeks I was able to see a side of elections that few people see. The nature of election administration is schizophrenic. To outsiders, the process, rules, regulations, and flaws are simplified or inherently unknown. Before this experience, I had little knowledge of what an election entailed: the bipartisanship nature, the vast number of laws that guide the electoral process, and the actual process of counting ballots. I thought the process ended at the polls—the

votes were casted and then there was a winner. There is so much more to elections than citizens see through the media as well as with our own voting experiences.

2.4 Second Work Period at the Suffolk County BOE

Like the first section of this chapter, this section focuses on the second part of my experiences at the Suffolk County Board of Elections. The time that I spent there, this time around, was vastly different than my first experience at the SCBOE. The most salient reason can be attributed to the fact that the world was in the midst of the coronavirus pandemic. In this chapter, I will share my experiences in helping prepare for the 2020 Democratic Primary in Suffolk County. I will share how the office culture has changed due to the impact of COVID-19 as well as my experiences working with voting technology.

2.5 COVID-19 and its Effects on the SCBOE

It was the beginning of June and the BOE had been closed since the start of the Coronavirus pandemic. The 2020 Primary was moved from April 28, 2020 to June 23, 2020⁸⁶ due to the increased risk of spreading COVID-19 at the polls. Late May, approximately two days before the start of June, my dad received a phone call from the Republican Commissioner asking if I would like to work for the month of June at the BOE. They were way behind in their preparations and needed all the help they could get. It was the second to last week of the spring trimester, but I was willing to commit to late nights of studying for this once in a lifetime opportunity. That Monday, I reported to Yaphank, NY and was ready to help prepare for the primary election.

⁸⁶ Williams and Dybdahl, "2020 State Primary Election Dates", 11/3/20, <https://www.ncsl.org/research/elections-and-campaigns/2020-state-primary-election-dates.aspx#Alphabetical>

When I walked in, the room was filled with scared, stressed out employees. The first thing came to my mind was how would we be able to accomplish all that the SCOB had to do given the primary election was on the horizon. Many shared the fear that going to work would mean exposure to the coronavirus and it was a concern of mine as well. The precautions that were in place were rarely followed. People worked on top of each other and maintaining a six-foot separation was difficult, since the office space was not laid out for this type of work. When working with the ballots, we had to work in pairs and that meant being less than six feet away from your partner. If an employee was uncomfortable with this layout, they did not have to participate. During my time, there was only one employee who was neurotic about social distancing and mask wearing. I was careful. I always wore my mask and took it off to eat or drink. I sanitized my hands multiple times an hour and wore gloves when touching absentee ballots. My supervisor poked fun at my habits, and I would joke back and tell him that he wished he had my supply of Purell. Many employees took their masks off at their desks which added to the concern that the coronavirus would spread. It was apparent that many did not take the rules and regulations seriously while others were more careful about the public health crisis. This was apparent and it undoubtedly played a role in the chaotic feel of the BOE.

2.6 Election Preparations and Office Culture

When Governor Cuomo extended absentee voting for all New Yorkers for the 2020 Primary, it created a vast surge of absentee ballots that needed to be processed. The governor signed this executive order to prevent long lines from occurring at polling places, as it increased the risk of exposure to the coronavirus.⁸⁷ This was the right call, but it presented the BOE with

⁸⁷ Khurshid, Samar, "Cuomo Announces Absentee Voting for All in June; What to Know", Gotham Gazette, 4/6/20, <https://www.gothamgazette.com/state/9299-cuomo-expands-absentee-voting-june-2020-what-to-know-new-york>

unique challenges. One challenge was waiting on the postal service to process the mail as well as ensuring that the mail was sorted through in accordance to NYS election law. There were designated people, mostly temporary employees who were employed to help out with the pre-election to-do list, which included examining these ballots. They were tasked with opening the envelope and separating the mail envelope and the oath envelope that contained the ballot(s). This was a tedious and long task that lasted for days. It needed to be done in a bi-partisan manner, which meant more workers around each other. I should preface this by saying that the tension spread to the front office and it was especially noticeable on the Democratic "side." One vivid memory was when the Democratic office manager/assistant commissioner walked into my department. I was working next to the Republican supervisor on my own laptop waiting to be told what to do. The room where the ballots were was packed with people. Rather than the supervisor throwing me in with the ballots and the people, he was preparing something for me to do. The office manager proceeds to question me. She demanded to know what I was doing. Not knowing that I did not have to report to her, I told her I was working on some work for class while I waited for something to do. This wasn't uncommon for me to do when I had downtime. Previously, I would study for the LSAT while waiting for more work, which was better than what other employees were doing. She started to yell at me and then storm off. I was shocked by the way she handled the situation. She ended up going straight to the Republican Commissioner and told him I wasn't working. As a precaution, he emailed the supervisor and told him to keep me busy so I wasn't in that situation again. There were many times that the Republican staff would walk by and see me studying, but knew that once a phone rang or if there was something to do, I would stop everything to handle it. This situation and others made me recognize the role partisanship played in the workplace. I should mention that at the end of my time at the BOE she

praised me, called me a good worker, and didn't want me to leave. She realized she was quick to judge me, which I think shows another common theme of the BOE.

For many, partisanship was the first attribute of a person they looked at. I was praised by other employees for working for the Republican Party. They would constantly say "Welcome to the right side" or "You made a right choice" without knowing my political beliefs. They just assumed my position based on my affiliation at the BOE. Partisanship was also heightened by the need for everything to be done in a bi-partisan manner. New York State election law states that ballots need to be handled by a Democrat and a Republican. This made the label of Democrat and Republican a salient identifier to the employees of the BOE. The absentee ballots took days to go through. While the temporary employees were sorting through the ballots, I was tasked with mailing out letters to all the poll-workers explaining their assignments for the primary election and a paper containing the link for a video containing COVID guidelines for the poll-workers to watch. This task was easy, but there were numerous obstacles. As I mentioned previously, there were a few employees who were notorious for not doing their work in a timely manner. I had to wait for the last town to be done until I was able to send them out. These letters had to go out far before we got to them, and it was because these employees chose to take smoke breaks and complete other activities outside of the BOE. I ended up finishing the work because of how time sensitive the task was. The person whose work I finished offered to buy me lunch. I was appalled by this offer since I knew that he knew he was wrong. This is in part how the BOE worked. Those who went above in terms of their work often made up for the "slackers" of the BOE workforce.

2.7 My Experience With Election Technology

One important task I helped oversee was the scanning of absentee ballots. There were about 80,000 ballots that were sent to the BOE by voters. The front office needed to come up with a way to manage the ballots as well as make sure they qualified. Qualifications included a time stamp and proper enclosure of the ballot in the oath envelope. A main motivator for creating a paper trail of absentee ballots is because voters would call to make sure their absentee ballot arrived on time. Frankly, there was no way to tell if their ballot came in on time because it was like finding a needle in a haystack. Scanning the ballots as they came in provided a way to have accessible evidence for when the lawyers of the candidates came to the BOE to examine the ballots. Although this was not conventional election technology, we turned it into one. There was a Republican and Democrat who scanned the ballots and others who helped smooth them out for us. It was to be one in a bi-partisan manner. If one of us stepped away, we could not touch the ballots. There were numerous problems with this process. One problem was that the ballots had to be folded in a specific way to go through the scanner. Many voters folded them terribly causing the scanner to jam. The ballots also got stuck in the machine which caused many to get damaged. Hopefully, it did not prevent them from being scanned and eventually tabulated in the future. Luckily, my counterpart and I managed to scan the 80,000 ballots in about seven or eight days. We worked long hours to ensure that we would get it done, since we were the only ones who knew how to carry out the task.

Another major task was the testing and programming of voting machines for the primary. I programmed about 15 BMD's (Ballot Marking Devices). One type of BMD's are voting machines that allow disabled voters mark a paper ballot before entering it into the tabulator. The BMD's were around 10-15 years old and constantly crashed while programming them. They had

multiple attachments for different people with different types of disabilities. For people who required least assistance, there was an attachment that looked like an old game boy controller. This technology allows the voter to navigate the printing process. For those with auditory disabilities, there were headphones and a voice guides them through the process. Finally, for those who are unable to use any of these assisting devices, there was a tube that could be connected to the machine where the voter could blow into the tube and select their candidate. This was used during the primary. On election day, they were not the most reliable technology in the voting place. The machines were crashing and to printer attached to the BMD often failed. It was a tedious and cumbersome process that took days to complete. The machine comprised of a printer, LCD screen, a scanner, and an attached screen that projected the steps and the contests for the voter's electoral district. One constant problem was the AVS stopped working. This led to delays in the overall process of preparing these machines for election day.

The tabulators worked identically to the BMD's used by the disabled. To program them, the machine needed to be turned on, then the two SD cards that hold the data had to be loaded. The programmer then waited for the AVS to fully load, and makes sure the date and time are correct. Most likely, the machine would have to be zeroed out from the previous time it was used. Then after that part of the process was completed, the test decks are put them through the machine as the test run. After that's complete, a receipt would be printed noting the process. The same thing would be done for the "run for the record". The first receipt is for the county's record and the run for the record receipt gets sent to the State BOE. When that run is complete, the SD card was taken out and send it to get verified. The verification process was done in a bi-partisan manner. I was afforded the opportunity to be one of the verifiers one time. The verification process involved us inserting the SD card into the computer and reading the votes off it. If the

votes matched what we had on paper, the individual was clear to move to the next step. If not, the programmer had to start all over again. The test decks contained as little as 12 ballots and as much as 212 ballots. If there was a problem, you hoped you didn't have the test deck with 212 ballots. If the ballots were kept in order, one could go through the receipt and the ballot to see which one was missed. This was a long process that took days to complete and having to work with flaws in the verification only made it worse. At one point, we were told to skip the first run and go straight to the "run for the record" because of we were running behind. It helped that any people who were programming the machines knew what they were doing, but they often would disappear for a few hours and leave their machines. The BOE did hire workers with no experience to help and they were the ones who frequently had issues with the programming and preparing. I and the more experienced employees ended up having to take over for them half of the time to speed up the process. I caught on quickly but many proceeded with caution.

My experiences with voting technology paved the way for my interest and adaptation of this thesis. I am grateful to have had great exposure to election administration, voting technology, and to the standards which are used to run elections. It is noteworthy to mention that my experiences have opened up the opportunity for someone outside the organization to analyze the operations of the SCBOE, but it is not a representation of every Board of Elections in the United States. There are numerous factors that play a role in the administration of elections that takes place within each county, some of which will be explored in this paper. From what I saw, there are many things that could be improved upon at the Suffolk County Board of Elections. In terms of election technology, there is no doubt that the technology needs to be updated. It is also apparent that the standards applied to voting technology need to be re-evaluated. The people programming these machines, should be knowledgeable about them, and in turn know how to

catch inaccuracies in tabulation and programming. From what I saw, the SCBOE is run well.

There is little concern surrounded by the accuracy of the election results they produce. Beyond the chaos that is within those four walls, the SCBOE is an example for other counties to follow in their footsteps.

Chapter 3: Quantitative Analysis on the Effects of Race on Voting Technology

Implementation

Quantitative analysis is the way by which variables can be examined to draw various conclusions on both a micro and macro level. This chapter seeks to establish that race is correlated to the advancement of election technology. This will be shown by analyzing counties in the United States. Investigating the impact on the advancement of voting technology will assist in uncovering the faults of election administration, some of which pertain to election technology. Previous research, which is discussed below, provides sufficient reasons to believe that race has an effect on the implementation and advancement of voting technology. This chapter focuses on comprehensive research comparing the racial composition of counties to the change implementation of voting technology over time.

3.1 Methodology

The challenges associated with election technology may not be fully due to the hierarchical structure of government that consists of local governments, state governments, and the federal government. The discrepancies seen across counties are partially tied to the citizens who reside there. Research from Tomz and Van Houweling (2003) concludes that analysis of county-level data from South Carolina and Louisiana shows a wide gap in voided ballots between Black and white populations. This gap is correlated to the type of equipment these groups used. The gap between white and Black voters was found to be between 4 and 6 percent.⁸⁸ The voting technologies these authors analyzed were optical scanners and punch card systems, which were the machines that faced much controversy after the 2000 Presidential Election.⁸⁹ At this point, there was little research in these particular areas of election technology

⁸⁸ Tomz and Van Houweling, 47

⁸⁹ Tomz and Van Houweling, 46

and election administration. Similarly, little research has looked into the differences in racial complexities or in complexities on the precinct-level.⁹⁰ Other research on this topic points to similar results. Hanson evaluated this phenomenon in Palm Beach County and found a correlation between the percentage of overvoting and the percentage of registered Black voters in the county.⁹¹ On a similar note, this research was also expanded to the surroundings of Palm Beach County. Herron and Sekhon (2001) found a similar phenomenon in Broward, Duval, and Miami-Dade counties.⁹² Additionally, Fessesnden (2001) and Keating and Mintz (2001) provided evidence that ballots that had to be rejected occurred more in black precincts compared to white precincts.⁹³

To combat this occurrence, Tomz and Van Houweling (2003) bring attention a possible explanation for why this phenomenon occurred to Black populations in the states they analyzed. Tomz and Van Houweling state, “By Preventing overvoting and making undervoting more transparent and correctable, lever and DRE machines reduce the influence of fundamental factors- socioeconomic status disadvantages, relative inexperience, and racial antagonism- that might lead blacks to make mistakes or fail to correct them more often than whites.”⁹⁴ There are a number of different factors that impact how a voter internalizes the steps to cast their vote. Many of these factors are most likely beyond the voter’s control. Although this research is from the early 2000’s, it is important to highlight the those who were Black in the counties studied were unable to cast their vote because of factors outside of the control of jurisdictions. In terms of election administration, variables mentioned by Tomz and Van Houweling are uncontrollable,

⁹⁰ *Ibid.*

⁹¹ *Ibid.*

⁹² Herron and Sekhon, 154

⁹³ Tomz and Van Houweling, 47

⁹⁴ Tomz and Van Houweling, 49

but the selection of voting machines used as well as the training of poll workers controllable by the county Board of Elections. It is an imperative that each county government takes active steps to address the challenges certain minority groups face when going to cast their vote at the polls.

The research conducted by these authors illuminates a fundamental issue. Every citizen, no matter how their racial identity, should be able to cast their vote and not have their aptitude, education level, or any other measure affect the result. Election administrations can address this issue with voting technology and by using their resources to properly address inconsistencies in the voting process. One limitation of the studies above is that they only looked at the residual votes of Black voters and not any other minority group. I hypothesize that Black populations within each county are not the only population that suffers from the lack of advancement of election technology. Additionally, there is limited research dedicated to election technology in today's world, creating a question of how this phenomenon can be addressed. I seek to show, through data analysis, that race is a prevalent issue in election administration today and that it stretches far beyond the Black populations of each county. I will examine demographic groups such as Asian Americans, Hispanics, Black and whites in the years of 2010 and 2018. I have shown that the advancement of election technology is a lethargic process. A 10 year period should be sufficient to see if change was implemented and if the results had an effect on the voting process.

At the beginning of this paper, I discussed how the mechanisms created to help administer elections are highly contingent on the resources provided to them by the different levels of the United States government. Resources such as funds to help assist in the administering of elections are highly impacted by the individuals who reside in each county. One way to measure this affect is looking at demographic data and analyzing the racial

composition of each county. Data was gathered on the racial composition of each county in the United States from the United States Census' Report- Annual County Resident Population Estimates by Age, Sex, and Hispanic Origins: April 1, 2010 to July 1, 2019.⁹⁵ Data on election technology used by each jurisdiction was collected from Verified Voting, a non-partisan organization that researches election administration.⁹⁶ Analyzing this data will bring attention to where the country is in terms of its advancement of voting technology and how the demographic composition of each county affects such technological advancement. Using Microsoft Excel, data was synthesized to make a number of different conclusions which will be presented in the next section. By comparing the percentage of each minority to the advancement of over time illuminates which counties are advancing and which counties are not. It can also lead to correlations based on the relationship between counties whose percentage above and below the national average to the phasing out of old voting technologies and to the number of voting technologies each county has.

With any national data set, there are fallacies with aspects of the data. For example, across the United States, states categorized the divisions of their state lines jurisdiction types other than counties. This presented an unique challenge when merging the U.S. Census demographic data with the voting technology data. To alleviate this challenge, any jurisdiction that was not categorized as a county was excluded. For example, the state of Connecticut categorically defined each geographic region as a county, but also as a town, village, etc. This led to each county being counted twice and to undefined numerical data. In a similar realm, counties that had data that was not recognized by the excel software was also removed from the

⁹⁵ U.S. Census, "States, Counties, and Statistically Equivalent Entities". 3/14/21.
<https://www2.census.gov/geo/pdfs/reference/GARM/Ch4GARM.pdf>

⁹⁶ Verified Voting, "The Verifier", Accessed 3/14/21

data set. The state of Michigan had to be removed for this reason. Although a sizeable amount of data had to be excluded, it does not have any significant effects on the results of this study. As previously mentioned, there are over 3,000 counties in the United States. The attributes of these counties are mimicked in other counties, allowing these differences to be taken into consideration as a whole. It is also noteworthy to explain that the racial components of each state and county on a grand scale are similar across the country. It is a common theme that cities are more diverse, whereas rural towns are homogeneous in nature, often times having a majority of white individuals.

As important as it was for the statistical analysis to account for the changes in voting technology usage, it was as important to create an understanding of the demographic components of each county. To calculate the national average, the regression used took the total for the specific demographic (White, Black, Asian, and Hispanic) to the total population of each county. The total population was calculated by adding the total female and male populations for each demographic group. To calculate these raw data points as a percentage, the total demographic was taken and divided by the total population for each perspective county to get the percentage of each demographic group. This was done for both 2010 and 2018. The goal of this maneuver was get an idea of where the country is in terms of its diversity. The reason why the percentages add to more than 100% is due to the fact that the Hispanic demographic is not a racial category. The U.S. Census states, “These standards generally reflect a social definition of race and ethnicity recognized in this country, and they do not conform to any biological, anthropological, or genetic criteria.”⁹⁷ For the data analysis presented in this paper, the same reasoning the U.S.

⁹⁷ U.S. Census, “About Hispanic Origin”, 3.14.21, https://scholar.google.com/scholar?hl=en&as_sdt=0%2C33&q=Herron+and+Sekhon&btnG=#d=gs_cit&u=%2Fscholar%3Fq%3Dinfo%3AyfgSaxUHsEJ%3Ascholar.google.com%2F%26output%3Dcite%26scirp%3D2%26hl%3Den

Census uses mimics the rationale for using Hispanics as a variable. The results of this regression and regressions related to the national demographic will be presented in the next section.

Using the national average as a base point, the demographic composition was analyzed for each state. The purchasing power of voting machines lies in the hands of counties. Due to this, the demographic composition of each county can provide various insights to county differences within a single state. To consolidate this approach, the highest and lowest averages were looked at in order to understand how drastic the variance was. If there is little variance, it would be plausible to assume that the number voting technologies would be similar per county. On the other hand, counties with a significant percent range of each minority group, could see a wide discrepancy of how many unique voting technologies are being used by majority white counties compared to other counties which are a minority majority. This will allow conclusions to be made on the county level.

The county level is not the only important measure being analyzed. As indicated before, the delegation of election administration stems from the federal government down to state governments. The state governments then further delegates this responsibility to local jurisdictions. Analyzing the fluctuations in state demographics is important to understanding the relationship between counties and their decisions acquire new voting technology. To represent this idea, the average percent of each demographic group was taken for the years 2010 and 2018. To make timely conclusions, a random sample of states was taken. Using a random number generator, 10 different numbers were generated which related to the list of states in alphabetical order. The states that were randomly selected were—Arkansas, California, Illinois, Maryland, Nebraska, Nevada, New York, Oregon, Utah, and Wyoming. These states span the country and provide sufficient differences in racial disparity and other factors such as population size.

The methods to analyze voting technology trends involved much more manipulation. With the voting technology data coming from two years, 2010 and 2018, voting technology advancement trends became apparent. These trends were calculated by using a count of the machine type, leading to the numbers 1, 0, and -1 to represent the loss (-1), gain (1), or no change (0) in the accumulation of voting technology. In order to see these trends, another regression was used to take the difference between the data for the year 2018 and the year 2010. The voting technologies with the most change were ballot marking devices, DRE touchscreens, batch-fed optical scanners, and hand-counted paper ballots. The change on a state and county level was interpreted by taking the average change over the two different years.

Due to the nature of the data, it became apparent that comparing the total white percentages to each other variable percentage would lead to insignificant conclusions. The percentages were too similar. This could be due to the fact that race identity is not monochromatic and individuals more often than not identify as a singular demographic category. For this reason, it would be most beneficial to analyze the total minority percentage. To get this percentage, the Black, Asian, and Hispanic percentages were added together.

Before the results of this inquiry are shared, it is necessary to reiterate and share my hypotheses. I hypothesize that the counties that are more racially diverse are more likely to be suffering from the lack of voting technology advancement. I also hypothesize that counties that have a majority white population will see the most advancement over the eight year time period. These sets of hypotheses set to provide evidence that the data will show a relationship between demographic composition of the county and its advancement with voting technology.

3.2 Results

The data collected and analyzed in this inquiry highlight important insights such as how race correlates to the advancement of voting technologies. The way in which the data was analyzed was done intentionally. The results are derived from correlations, comparing the percentage of minority populations to the change or lack thereof for specific voting machines. There are many factors that contribute to why or why not counties don't have the newest, most high-tech voting machines and it is for this reason that no monocausal argument can be made. Some factors outside the scope of this research include socioeconomic status, size of the county/jurisdiction, laws and statues regulating the electoral process, and the number of contests in each given election. These factors are no doubt important and do in fact partake in the overall explanation of the issues and challenges with advancing voting technology. Based on the historical significance of race in voting laws and elections in a general context, it is most important to analyze the effects race has on voting technology. More specifically, voting laws like the 1965 Voting Rights Act provides sufficient reasoning to believe that there is a strong correlation between race and aspects of election administration.

Regarding the demographic composition of each county and state, it is apparent that the demographic of each jurisdiction fluctuated in interesting ways. The previous section previously mentioned that 10 states out of the 50 U.S. states were randomly selected. Overall, the states selected represent the country in terms of geographic region. The states chosen were Arkansas, California, Illinois, Maryland, Nebraska, New York, Oregon, and Wyoming. Due to the widespread nature of these states, it can be determined that these states are representative of all states within the United States. The national averages, which incorporated every state minus any county that had an error when matching the U.S. Census data to the voting technology data, was

calculated for both 2010 and 2018. The white population increased by six percent from 2010 to 2018 while the average Black population dropped by one percent. Additionally, the Asian national population average remained the same over the eight year period and the Hispanic population average increased by one percent. When comparing the ten states chosen and their demographic composition percentages to the national percentages for both years, it is determined that each state isn't drastically above or below the national average. Rather, in the case of the white populations, these states were above the national average in both 2010 and 2018, below the average in both years for the black population, and at or one percentage point off from the national average for both the Hispanic and Asian populations. Out of the states selected, all of them have total minority percentages below the national average. These comparisons are represented in tables 3.1, 3.2, and 3.3. Significant conclusions can be drawn based on these national averages. The results confirm the belief that the states selected correspond with other states no matter if the state was selected for this study or not. Also, it formulates a specific prediction. If the demographic population for the four race variables are similar to the national average, then there should be little variance in the voting technology these states use. More specifically, the number of voting machines used should be similar and to each other as well as the phasing out of older voting technologies.

	2010	2018
White	79%	85%
Black	10%	9%
Asian	1%	1%
Hispanic	9%	10%

Table 3.1 Representation of demographic composition of the United States in terms of the four variables analyzed in 2010 and 2018.
Source: U.S. Census, Annual County Survey Results, 2019

State	White	Black	Asian	Hispanic
Arkansas	81%	16%	1%	5%
California	84%	3%	5%	28%
Illinois	92%	5%	1%	4%
Maryland	78%	17%	3%	5%
Nebraska	96%	1%	0%	5%
Nevada	90%	2%	2%	15%
New York	89%	7%	2%	7%
Oregon	92%	1%	2%	10%
Utah	95%	1%	1%	8%
Wyoming	95%	1%	1%	8%

Table 3.2 Breakdown of the average percent composition of white, Black, Asian, and Hispanic populations per each state for 2010.

Source: U.S. Census, Annual County Survey Results, 2019

State	White	Black	Asian	Hispanic
Arkansas	80%	16%	1%	6%
California	85%	3%	6%	30%
Illinois	91%	5%	1%	5%
Maryland	75%	18%	4%	6%
Nebraska	95%	1%	1%	7%
Nevada	87%	2%	2%	17%
New York	87%	7%	3%	8%
Oregon	91%	1%	2%	12%
Utah	94%	1%	1%	9%
Wyoming	94%	1%	1%	9%

Table 3.3 Breakdown of the average percent composition of white, Black, Asian, and Hispanic populations per each state for 2018.

Source: U.S. Census, Annual County Survey Results, 2019

The second part to this investigation was to analyze the implementation of new election technology over the eight year period. Results from this regression show that ballot marking devices (BMD's), batch-fed optical scanners, DRE touchscreens, and hand counted paper ballots underwent the most change over the eight year period, whether they were phased out or were newly implemented. These results are logically coherent since older technologies, theoretically, should be phased out and new technologies should be phased in. On a state level, the results of each state analyzed were in tandem with each other. For ballot marking devices, seven of the ten states had counties that eliminated this voting technology while the other three saw no change. For batch-fed optical scanners, a majority of states added this voting technology to its repertoire from 2010 to 2018. Only one state, the state of Arkansas, had counties that phased batch-fed optical scanners

out of use. DRE touchscreens were phased out by almost all the states analyzed. Counties within the states of Maryland, Nevada, and Utah phased out this voting technology completely. Other states such as New York and Oregon saw no change in its counties for this technology. Hand counted paper ballots are considered the oldest technology used for voting. Logically, the assumption that as time goes on, older voting technologies are removed from the voting process while more advanced technologies are implemented, is not justified by the results. In all but three states, counties didn't change how they implemented hand-counted paper ballots. Only two states, Arkansas and New York had counties that reduced the use of paper ballots.

State	Total Minority Percentage	Ballot Marking Device	Batch-Fed Optical Scan	DRE Touchscreen	Hand Counted Paper Ballots
Arkansas	12%	0%	-17%	96%	-19%
California	11%	-24%	19%	-62%	0%
Illinois	12%	-39%	3%	-59%	0%
Maryland	11%	0%	30%	-100%	0%
Nebraska	13%	-100%	2%	0%	0%
Nevada	11%	0%	88%	-100%	0%
New York	11%	-16%	31%	0%	-56%
Oregon	11%	-100%	0%	0%	0%
Utah	11%	0%	62%	-100%	0%
Wyoming	12%	-87%	4%	-13%	0%
Average		-37%	22%	-34%	-8%

Table 3.4 Categorization of each type of voting technology analyzed in terms of the average percent gain or loss for each of the ten states.

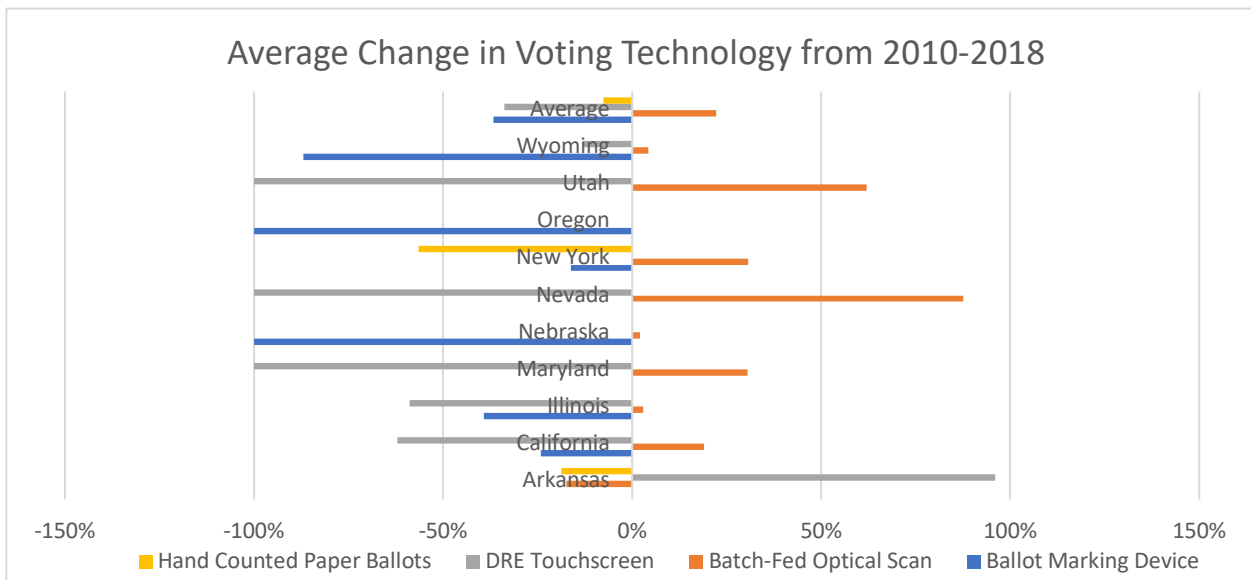


Figure 3.1 Visual representing the data in table 3.4. This graph brings to life the real change that occurred over the eight year time period.

Discussion

The manipulation of demographic and voting technology data brings significant insights to how the factor of race correlates to the incorporation of new technology into the voting process. Out of the ten states randomly selected, Nebraska had the highest total minority percentage, making it an outlier in the dataset. Overall, the trend seems to be that states and counties are phasing out more technology than they are implementing new technology. This is not necessarily a negative impact, but it does deem some concern. By removing technology from the voting process and not materializing new technology, it indicates that there may be a shift relying less on multiple voting technologies by a majority of the counties analyzed in this study. This could be due to a lack of resources, which is undoubtedly alarming. Counties with the lowest minority percentage show the highest percentages of eliminating voting technology. Overall, Nebraska and Oregon had all their counties phase out ballot marking devices completely while the other counties didn't see as much of a drastic change. This lends to the conclusion that counties that race may not have a significant impact the counties means to shift ballot marking

devices. It also points to the development that race is not the only variable to affect the implementation of new voting technology.

Another interesting dimension of the data produced is the continued dependence on hand-counted paper ballots. Of the counties looked at closely, all but the state of Arkansas kept this technology in use. This is most likely due to their significance in recounting ballots and their ability to be used with a number of different voting machines. The fact that Arkansas removed hand-counted paper ballots from their arsenal of voting technologies is interesting based on the general dependence on them in elections. Since all counties in Arkansas phased out hand-counted paper ballots, it would be beneficial to further investigate the reasoning behind this decision. Furthermore, the continued reliance on hand-counted paper ballots provides evidence that the historical relevance of paper ballots being an old technology does not affect the continued reliance on it. Nebraska had the highest minority percentage which was 13%, experiencing the highest rate of phasing out of selected voting technologies at the highest rate. Nebraska phased out two of their four voting technologies. On the other hand, for states that had a total minority percentage below the national average, the phasing out and implementation of new voting technologies more evenly divided. There was no clear direction as to if all the counties gained or lost a specific technology.

The evidence points to the conclusion that race is somewhat correlated to a county's ability to incorporate new voting technologies, but there is no clear relationship between the demographic composition of counties and the implementation of new voting technologies. Sporadic results like these confirm that there is no one cause contributing to a county's ability to advance voting technologies. Additionally, these results confirm the individualistic nature of the implementation of voting technology. If the percent change over time correlated strongly to be

similar like the demographic condition, there would be similar change across all voting technologies looked at.

Chapter 4: Conclusion

Election technology is instrumental to the administration of elections and to the essence of democratic practices in the United States. It is the way by which citizens of different backgrounds and beliefs elect officials to represent them in the government, allowing them to have a say in the decisions that are made. The electoral process, on the surface level, appears to be a seamless process with few faults. In this paper, I have shown that this perception is misguided. Once a voter leaves their intent on a piece of paper, they have no control over how their vote is transcribed. Additionally, reports by the media and what voters see on election day is a snapshot of the election process. This narrow view open to the public leads to the false perceptions held by many Americans.

Due to my experience at the Suffolk County Board of Elections, I am able to look past these perceptions and notice the imperfect process of election administration. As an intern at the SCBOE, I took part in many aspects of administering elections. My experiences are unique considering I was an outsider to the process. Unlike the employees at the BOE, I was an intern for six weeks in total. I focused on preparing for early-voting, programmed different types of voting machines, processed absentee ballots, and researched New York State election law. As I worked in these areas, I was able to see how the practices and processes to carry out these tasks were outdated. I previously noted that when I was told to make the sign-in sheets for the poll workers for early voting, I was told to do it by hand. I spent hours attempting to draw straight lines and make it presentable when it could have been done on the computer in a matter of minutes. This one example mirrors the bogged down mindset of election administration. If it ain't broke, don't fix it. As a result, the culture of the SCBOE was stagnant. It wasn't a coincidence that those who worked there took advantage of the nature of the job. By not

completing their job in a timely manner and by some employees not giving their best effort to the cause, they added to the difficulties of running an election. Mistakes were often made leading to the waste of time and resources, even though resources were always scarce. This is noteworthy to bring attention to because it highlights the attitudes of those within the BOE and can help explain why the overall architecture of election administration is the way it is. With the snapshot of how things are ran at the BOE, I can only ponder about what occurs at other BOE's across the country.

My time spent programming voting machines led to my complex understanding of their role in election administration. A voting machine's objective is to translate voter intent into an entity that can be counted. A machine that malfunctions or is programmed the wrong way can fail at transcribing voter intent. If this happens, the fragilities of democracy are exposed. The intricacies and time-consuming nature of programming and preparing voting machines made it a tedious process, but mistakes were made and valuable time was misappropriated. Even though many made minor mistakes along the way, it cannot be assumed that this did not have any effect on election day. Safeguards were implemented to catch these mistakes, but there is still a possibility that they could of gone unnoticed. It didn't take very long to get the hang of things and seasoned election workers were able to get through a number of machines a day. It was the people who were efficient who made up the time that was lost. Workers hid in their office areas because they knew that what they would be doing would be boring. Their lack of initiative with this task was no doubt harmful to election preparations.

The study of election technology has been put on the backburner by presidential administrations as well as by scholars and elected officials. Administrations have other pressing matters, and election administration and voting technology is not on their radar. When it is a

topic of discussion, those discuss campaign-finance issues and those running for candidacy. Additionally, the media only focuses on the problems on election day and not the overall process. When they came into the BOE and record two different segments, the administrators talked about the challenges of processing thousands of absentee ballots, something that worried voters. Not enough resources are dedicated to the study voting technology advancement and for that reason, the lack of attention is a threat to democratic practices in the United States.

A historical perspective of voting technology is essential to understanding the advancement of election technology and most importantly the temporal component of the process. Douglas Jones provides a comprehensive timeline of the history of election technology. From his perspective, one can understand how election technology evolved to what is known to be today. It is also noteworthy to acknowledge that some of the oldest technologies are still in use today such as the paper ballot. Furthermore, the timeline of advancement for some voting technologies is hundreds of years, while for other types of technology it takes less time. This may be due to a lack of emphasis on election technology or the lack of funds appropriated to this area of study. Today, the most advanced technologies on the market are direct recording electronic (DRE's) voting machines, ballot marking devices, and optical scanners. Finally, the implementation of voting technologies in a county is not aligned with the temporal component of the advancement of voting technologies. Currently, "old technologies" are being used in many counties. As previously mentioned, most technology is viable for a decade, and when many of these technologies have been in use for longer than the recommended time period, it is detrimental to the electoral process and threatens democracy.

The 2000 Presidential Election was a major wake up call to the United States government, election officials, and the general public and proves today, that issues with voting

technology are nothing new. In Palm Beach County, Florida, the Presidential Election was decided by the Florida Supreme Court because it was too close of a race between Al Gore and George W. Bush. For this election, Palm Beach County elected to use a new type of ballot which resulted in mass confusion among voters. Many who intended to vote for Al Gore had their vote misinterpreted, leading to Bush winning the election. The 2000 mishap shines an unfortunate spotlight on how voting technologies can have unforeseen consequences on election outcomes. In turn, the U.S. government responded to this disaster by passing the Help America Vote Act enacted in 2002. This act targeted multiple issues in election administration such as election technology and voter registration. For election technology, this act was the first act in decades that provided strict guidelines for states to follow and required that each jurisdiction have a voting machine for those who are disabled. This was to help provide the disabled voter with a sense of privacy while they cast their vote. The federal government tied monetary funds to this shift, giving jurisdictions the ability to purchase newer technologies. The HAVA required counties to phase out punch card voting systems and lever voting systems, since they were a source of problems in the 2000 election. Although legislation like the Help America Vote Act was essential to bringing about significant change in the application of voting technology, it only put a band-aid on a more serious problem. The HAVA is not a long-term solution to solve issues pertaining to the advancement of voting technology.

A reason why the federal government can only have a small role in election administration is due to the role of federalism in elections. Weinstein-Tull provides a thorough review of election federalism and the conflicts and limitations endured by the levels of government. The basis of Weinstein-Tull's argument is that the three branches of government-- federal, state, and local-- delegate tasks of election administration as ordered by the U.S.

Constitution. The Election Clause gives states the right to run elections, but the federal government has the power to oversee the states actions. Since the Elections Clause gives state governments a considerable amount of power, states can do as they please without little pushback from the federal government. Weinstein-Tull takes this argument further, arguing that states “hyperfederalize” elections by delegating election administration to counties and other localities. In theory, this hierarchal set-up should produce secure, unbiased, and reliable outcomes in elections. That is not the case. Local jurisdictions are burdened to carry the weight of elections and they do not have sufficient resources to ensure the reliability and accuracy of elections. There are also other liability issues between state and local governments when it comes to who is responsible for violations of statues and law. Overall, electoral federalism diffuses responsibility between levels of government and aids in the challenges of election administration.

Elections are in fact political. Elections are held for voters to pick who they would like to see in public office. Elected officials advocate for their constituents on a number of different issues. Besides the fact that elections are held by elected officials, the Help America Vote Act was enacted by the elected officials voters put into office. The mechanism by which voters show their intent is by using voting technology on election day, hence making it a part of the political apparatus. In 2020, election technology became a front page issue that grabbed the attention of many. During the 2020 election, President Trump and his allies made countless accusations against Dominion Voting Systems Inc., claiming that the company flipped voted intended for Trump and turned them into votes for Biden. It was also claimed that the company had ties to ANTIFA and that the company fixed the election of Hugo Chávez. Dominion Voting Systems Inc. filed a lawsuit against Rudy Giuliani and other allies of the former president arguing

defamation. Dominion Voting Systems Inc. is a manufacturer of voting machines used by many U.S. counties and the slandering of this company undermines the reliability and accuracy of the voting machines they produce. This is a political problem because it undermines the electoral process and the way Americans choose their representatives.

Based on everything previously discussed, it is apparent that elections are fragile and can be affected by the most minor and “harmless” occurrences. What this examination questioned, as a potential explanation for the variance of voting technology used by counties, is effects of the demographic composition of a county on the county’s ability to advance their arsenal of voting technology. This examination is based on the fact that there are a number of different legislation that aimed to combat racial inequalities in voting, most notably the Voting Rights Act of 1964. Additionally, research by Tomz and van Houweling and other scholars provides sufficient arguments to conclude that race has a negative impact on use of voting technology in counties. Research by these scholars focused on Black populations in select states and counties. The research in this paper takes a broader approach to the issue. I hypothesized that the counties that are more racially diverse are more likely to be suffering from lack of advancement in election technology and that counties that are mostly composed of white voters will have the most advancement of election technology over the eight year period. In order to test my hypothesis, I took data from Verified Voting, a non-partisan think tank, and the U.S Census. The data was then matched up to create a comprehensive dataset, allowing for a multitude of comparisons to be made. The results show no clear correlation between the racial composition of counties and their advancement of voting technologies from 2010 to 2018. This may be contributed to the fact that there is not one single cause that affects the advancement and implementation of voting technology. This is somewhat reassuring because if race played a significant role in the

advancement of election technology, the voting process would be biased and not be representative of all people. Another important finding is that counties are phasing out technology faster than they are implementing more advanced voting technologies. This is to some extent a concern because it shows that counties may be lacking resources and are indirectly threatening the reliability of elections. In terms of specific voting technologies, ballot marking devices were used in my states with counties composing mostly of white voters. This result presupposes the conclusion that race plays a role in election technology, but the extent to which it does is unknown.

The implications of this research represent the need for more research and more attention to this area of study. The most research dedicated to election technology occurred after the 2000 Presidential Election. Since then, it has been twenty-one years since any significant amount of attention given to this area of study. There needs to be more current research on this topic, since technology in a general sense is advancing rapidly. Additionally, this research has connected data on voting technology on a national scale to U.S. census data, opening up opportunity for these comparisons to be made with a new perspective. This paper should not be the end of this research, since only one factor that affects the advancement of voting technology was looked at. As previously mentioned, there is no monocausal factor that affects this phenomenon. There is much more research that needs to be done to get a full picture of how these factors affect voting technology implementation and how these factors interact with each other.

Additionally, federal, state, and local governments need to make it a priority to work together on election administration. The delegation of such power was done to recognize the sovereignty of state governments, not because they felt that county localities are entitled to administer elections. One way would be for the federal government to provide continued

assistance to state and local governments through funding research on voting technology and prescribing more resources to the Federal Election Commission and the Election Assistance Commission. These groups are subjected to the power of the executive branch, and history has shown that they have been disregarded under certain presidents. The federal government should also provide more assistance to counties that are impoverished and disadvantaged in terms of their funding and access to resources. The interactions between local and state governments should not be one of tension. State governments ought to take some responsibility for the burden states place on counties by delegating election administration to them. When legal challenges arise, they should not put the blame on local governments. Instead, they should recognize their role in assisting in the administration process and understand how they can ensure their state carries out fair elections. If the federalist relationship between the three levels of government change, the administration of elections would be carried out more equally across the country.

Free elections are what makes the United States a democracy. By putting them on the backburner, we threaten their intended existence. In this paper, I have shown how fragile the process is and what is at stake if we don't actively work to improve voting technology. From my experiences, Suffolk County (NY) worked diligently to conduct an election that survived the hiccups along the way. It is not because of any law or because of the demographic composition of the county, but rather the leadership of those elected to this office. The leadership of officials in BOE's across the U.S. are not the same which may add to this phenomenon. Voting technology is the way by which voters express their intent. When they fail, the ability of voters to express their choice is compromised, and in turn democracy is compromised. This research shows that there are factors that affect the implementation and advancement of voting technology, which need to be addressed. Government agencies, scholars, and voters ought to

demand more oversight and insight into election technology in order to ensure that they represent the people.

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Appendix A

Voting technology change over time for ballot marking devices, batch-fed optical scanners, DRE touchscreen devices, and hand-counted paper ballots.

Count of Model ST-County_M	Equipment Type	2010		2018 Change		2010		2018 Change		
		Ballot Marking Device	Ballot Marking Device	Batch-Fed Optical Scanner	Batch-Fed Optical Scanner	DRE-Touchscreen	DRE-Touchscreen	Hand Counted Paper Ballots	Hand Counted Paper Ballots	
ArkansasArkansas		0		0	1	-1	1	-1	1	-1
ArkansasAshley		0	1	-1	1	-1	1	-1		0
ArkansasBaxter		0		0	1	-1	1	-1		0
ArkansasBenton		0	1	-1	1	-1	1	-1		0
ArkansasBoone		0		0	1	-1	1	-1		0
ArkansasBradley		0		0	1	-1	1	-1		0
ArkansasCalhoun		0		0	1	-1	1	-1	1	-1
ArkansasCarroll		0	1	-1	1	-1	1	-1		0
ArkansasChicot		0	1	-1	1	-1	1	-1		0
ArkansasClark		0		0	1	-1	1	-1		0
ArkansasClay		0		0	1	-1	1	-1		0
ArkansasCleburne		0		0	1	-1	1	-1		0
ArkansasCleveland		0		0	1	-1	1	-1	1	-1
ArkansasColumbia		0		0	1	-1	1	-1	1	-1
ArkansasConway		0		0	1	-1	1	-1		0
ArkansasCraighead		0	1	-1	1	-1	1	-1		0
ArkansasCrawford		0		0	1	-1	1	-1		0
ArkansasCrittenden		0		0	1	-1	1	-1		0
ArkansasCross		0		0	1	-1	1	-1		0
ArkansasDallas		0		0	1	-1	1	-1		0
ArkansasDesha		0		0	1	-1	1	-1		0
ArkansasDrew		0		0	1	-1	1	-1		0
ArkansasFaulkner		0	1	-1	1	-1	1	-1		0
ArkansasFranklin		0		0	1	-1	1	-1		0
ArkansasFulton		0		0	1	-1	1	-1	1	-1
ArkansasGarland		0		0	1	-1	1	-1		0
ArkansasGrant		0		0	1	-1	1	-1	1	-1
ArkansasGreene		0		0	1	-1	1	-1	1	-1
ArkansasHempstead		0		0	1	-1	1	-1		0
ArkansasHot Spring		0		0	1	-1	1	-1		0

ArkansasHoward	0	1	-1	1	-1	0
ArkansasIndependence	0		0	1	-1	0
ArkansasIzard	0		0	1	-1	1
ArkansasJackson	0		0	1	-1	1
ArkansasJefferson	0		0	1	-1	0
ArkansasJohnson	0	1	-1	1	-1	0
ArkansasLafayette	0		0	1	-1	0
ArkansasLawrence	0	1	-1	1	-1	0
ArkansasLee	0	1	1	0	1	-1
ArkansasLincoln	0	1	1	0	1	-1
ArkansasLittle River	0		0	1	-1	0
ArkansasLogan	0	1	-1	1	-1	0
ArkansasLonoke	0	1	-1	1	-1	0
ArkansasMadison	0	1	1	0	1	-1
ArkansasMarion	0		0	1	-1	0
ArkansasMiller	0		0	1	-1	0
ArkansasMississippi	0		0	1	-1	0
ArkansasMonroe	0	1	1	0	1	-1
ArkansasMontgomery	0		0	1	-1	0
ArkansasNevada	0		0	1	-1	0
ArkansasNewton	0	1	1	0	1	-1
ArkansasOuachita	0		0	0	0	1
ArkansasPerry	0		0	1	-1	1
ArkansasPhillips	0		0	1	-1	0
ArkansasPike	0		0	1	-1	0
ArkansasPoinsett	0		0	1	-1	0
ArkansasPolk	0		0	1	-1	0
ArkansasPope	0		0	1	-1	0
ArkansasPrairie	0		0	1	-1	1
ArkansasPulaski	0	1	1	0	1	-1
ArkansasRandolph	0		0	1	-1	0
ArkansasSaline	0	1	1	0	1	-1
ArkansasScott	0	1	1	0	1	-1

ArkansasHoward	0	1	-1	1	-1	0
ArkansasIndependence	0		0	1	-1	0
ArkansasIzard	0		0	1	-1	1
ArkansasJackson	0		0	1	-1	1
ArkansasJefferson	0		0	1	-1	0
ArkansasJohnson	0	1	-1	1	-1	0
ArkansasLafayette	0		0	1	-1	0
ArkansasLawrence	0	1	-1	1	-1	0
ArkansasLee	0	1	1	0	1	-1
ArkansasLincoln	0	1	1	0	1	-1
ArkansasLittle River	0		0	1	-1	0
ArkansasLogan	0	1	-1	1	-1	0
ArkansasLonoke	0	1	-1	1	-1	0
ArkansasMadison	0	1	1	0	1	-1
ArkansasMarion	0		0	1	-1	0
ArkansasMiller	0		0	1	-1	0
ArkansasMississippi	0		0	1	-1	0
ArkansasMonroe	0	1	1	0	1	-1
ArkansasMontgomery	0		0	1	-1	0
ArkansasNevada	0		0	1	-1	0
ArkansasNewton	0	1	1	0	1	-1
ArkansasOuachita	0		0	0	0	1
ArkansasPerry	0		0	1	-1	1
ArkansasPhillips	0		0	1	-1	0
ArkansasPike	0		0	1	-1	0
ArkansasPoinsett	0		0	1	-1	0
ArkansasPolk	0		0	1	-1	0
ArkansasPope	0		0	1	-1	0
ArkansasPrairie	0		0	1	-1	1
ArkansasPulaski	0	1	1	0	1	-1
ArkansasRandolph	0		0	1	-1	0
ArkansasSaline	0	1	1	0	1	-1
ArkansasScott	0	1	1	0	1	-1

CaliforniaStanislaus	1	-1	1	1	0		0	0
CaliforniaSutter		0	1	1	0	1	-1	0
CaliforniaTehama		0	1	1	0	1	-1	0
CaliforniaTrinity		0			0	1	-1	0
CaliforniaTulare		0	1	1	0	1	-1	0
CaliforniaTuolumne	1	-1	1	1	0		0	0
CaliforniaVentura		0	1	1	0	1	-1	0
CaliforniaYolo		0	1	1	0		0	0
CaliforniaYuba		0	1	1	0	1	-1	0
Average Change		-0.241			0.1897		-0.6207	0
IllinoisAdams	1	-1			0		0	0
IllinoisAlexander	1	-1			0		0	0
IllinoisBond		0			0	1	-1	0
IllinoisBoone		0			0	1	-1	0
IllinoisBrown	1	-1			0		0	0
IllinoisBureau		0			0	1	-1	0
IllinoisCalhoun	1	-1			0		0	0
IllinoisCarroll		0			0	1	-1	0
IllinoisCass		0			0	1	-1	0
IllinoisChampaign	1	-1			0		0	0
IllinoisChristian		0			0	1	-1	0
IllinoisClark		0			0	1	-1	0
IllinoisClay	1	-1			0		0	0
IllinoisClinton		0			0	1	-1	0
IllinoisColes		0			0	1	-1	0
IllinoisCook		0	1	1	0	1	-1	0
IllinoisCrawford		0			0	1	-1	0
IllinoisCumberland		0			0	1	-1	0
IllinoisDeKalb	1	-1			0		0	0
CaliforniaLake		0	1	1	0		0	0
CaliforniaLassen		0			0	1	-1	0
CaliforniaLos Angeles	1	-1	1	1	0		0	0
CaliforniaMadera		0	1	1	0		0	0
CaliforniaMarin	1	-1		1	1		0	0
CaliforniaMariposa		0		1	1	1	-1	0
CaliforniaMendocino		0			0	1	-1	0
CaliforniaMerced	1	-1	1	1	0		0	0
CaliforniaModoc		0			0	1	-1	0
CaliforniaMono		0		1	1	1	-1	0
CaliforniaMonterey		0	1	1	0	1	-1	0
CaliforniaNapa		0	1	1	0	1	-1	0
CaliforniaNevada		0	1	1	0		0	0
CaliforniaOrange		0	1	1	0		0	0
CaliforniaPlacer		0	1	1	0	1	-1	0
CaliforniaPlumas		0			0	1	-1	0
CaliforniaRiverside		0	1	1	0	1	-1	0
CaliforniaSacramento	1	-1	1	1	0		0	0
CaliforniaSan Benito		0	1	1	0	1	-1	0
CaliforniaSan Bernardino		0	1	1	0	1	-1	0
CaliforniaSan Diego		0	1	1	0	1	-1	0
CaliforniaSan Francisco		0	1	1	0	1	-1	0
CaliforniaSan Joaquin		0	1	1	0	1	-1	0
CaliforniaSan Luis Obispo	1	-1	1	1	0		0	0
CaliforniaSan Mateo		0	1	1	0		0	0
CaliforniaSanta Barbara	1	-1	1	1	0		0	0
CaliforniaSanta Clara		0	1	1	0	1	-1	0
CaliforniaSanta Cruz		0		1	1	1	-1	0
CaliforniaShasta		0	1	1	0	1	-1	0
CaliforniaSierra		0			0	1	-1	0
CaliforniaSiskiyou	1	-1		1	1		0	0
CaliforniaSolano	1	-1	1	1	0		0	0
CaliforniaSonoma		0	1	1	0		0	0

IllinoisLivingston		0		0	1	-1	0
IllinoisLogan	1	-1		0		0	0
IllinoisMacon		0		0	1	-1	0
IllinoisMacoupin		0		0	1	-1	0
IllinoisMadison	1	-1		0		0	0
IllinoisMarion		0		0	1	-1	0
IllinoisMarshall	1	-1		0		0	0
IllinoisMason		0		0	1	-1	0
IllinoisMassac	1	-1		0		0	0
IllinoisMcDonough		0		0	1	-1	0
IllinoisMcHenry		0	1	1	1	-1	0
IllinoisMcLean		0		0	1	-1	0
IllinoisMenard	1	-1		0		0	0
IllinoisMercer	1	-1		0		0	0
IllinoisMonroe		0		0	1	-1	0
IllinoisMontgomery	1	-1		0		0	0
IllinoisMorgan		0		0	1	-1	0
IllinoisMoultrie		0		0	1	-1	0
IllinoisOgle	1	-1		0		0	0
IllinoisPeoria		0	1	1	0	0	0
IllinoisPerry		0		0	1	-1	0
IllinoisPiatt		0		0	1	-1	0
IllinoisPike		0		0	1	-1	0
IllinoisPope		0		0	1	-1	0
IllinoisPulaski		0		0	1	-1	0
IllinoisPutnam		0		0	1	-1	0
IllinoisRandolph		0		0	1	-1	0
IllinoisRichland		0		0	1	-1	0
IllinoisRock Island		0		0	1	-1	0
IllinoisSaline	1	-1		0		0	0
IllinoisSangamon	1	-1	1	1	0	0	0
IllinoisSchuyler		0		0	1	-1	0
IllinoisScott		0		0	1	-1	0

IllinoisDeWitt		0		0	1	-1	0
IllinoisDouglas		0		0	1	-1	0
IllinoisDupage		0	1	1	1	-1	0
IllinoisEdgar		0		0	1	-1	0
IllinoisEdwards	1	-1		0		0	0
IllinoisEffingham	1	-1		0		0	0
IllinoisFayette		0		0	1	-1	0
IllinoisFord		0		0	1	-1	0
IllinoisFranklin	1	-1		0		0	0
IllinoisFulton		0		0	1	-1	0
IllinoisGallatin	1	-1		0		0	0
IllinoisGreene		0		0	1	-1	0
IllinoisGrundy		0		0	1	-1	0
IllinoisHamilton	1	-1		0		0	0
IllinoisHancock	1	-1		0		0	0
IllinoisHardin		0		0	1	-1	0
IllinoisHenderson	1	-1		0		0	0
IllinoisHenry	1	-1		0		0	0
IllinoisIroquois		0		0	1	-1	0
IllinoisJackson	1	-1		0		0	0
IllinoisJasper		0		0	1	-1	0
IllinoisJefferson	1	-1		0		0	0
IllinoisJersey	1	-1		0		0	0
IllinoisJoDavies	1	-1		0		0	0
IllinoisJohnson		0		0	1	-1	0
IllinoisKane		0	1	-1		0	0
IllinoisKankakee		0		0	1	-1	0
IllinoisKendall	1	-1		0		0	0
IllinoisKnox		0		0	1	-1	0
IllinoisLa Salle	1	-1		0		0	0
IllinoisLake	1	-1	1	1		0	0
IllinoisLawrence	1	-1		0		0	0
IllinoisLee		0		0	1	-1	0

MarylandHoward		0		1	1	1	-1	0
MarylandKent		0				1	-1	0
MarylandMontgomery		0		1	1	1	-1	0
MarylandPrince George's		0		1	1	1	-1	0
MarylandQueen Anne's		0				1	-1	0
MarylandSomerset		0				1	-1	0
MarylandSt. Mary's		0				1	-1	0
MarylandTalbot		0				1	-1	0
MarylandWashington		0				1	-1	0
MarylandWicomico		0				1	-1	0
MarylandWorcester		0				1	-1	0
Average Change		0		0.3043			-1	0

NebraskaAdams	1	-1	1	1	0		0	0
NebraskaAntelope	1	-1	1	1	0		0	0
NebraskaArthur	1	-1			0		0	0
NebraskaBanner	1	-1			0		0	0
NebraskaBlaine	1	-1			0		0	0
NebraskaBoone	1	-1	1	1	0		0	0
NebraskaBox Butte	1	-1	1	1	0		0	0
NebraskaBoyd	1	-1			0		0	0
NebraskaBrown	1	-1			0		0	0
NebraskaBuffalo	1	-1	1	1	0		0	0
NebraskaBurt	1	-1	1		-1		0	0
NebraskaButler	1	-1	1	1	0		0	0
NebraskaCass	1	-1	1	1	0		0	0
NebraskaCedar	1	-1	1	1	0		0	0
NebraskaChase	1	-1			0		0	0
NebraskaCherry	1	-1			0		0	0
NebraskaCheyenne	1	-1	1	1	0		0	0

IllinoisShelby		0			0	1	-1	0
IllinoisSt. Clair		0			0	1	-1	0
IllinoisStark	1	-1			0		0	0
IllinoisStephenson	1	-1			0		0	0
IllinoisTazewell		0			0	1	-1	0
IllinoisUnion		0			0	1	-1	0
IllinoisVermilion	1	-1			0		0	0
IllinoisWabash	1	-1			0		0	0
IllinoisWarren		0			0	1	-1	0
IllinoisWashington		0			0	1	-1	0
IllinoisWayne		0			0	1	-1	0
IllinoisWhite		0			0	1	-1	0
IllinoisWhiteside		0			0	1	-1	0
IllinoisWill	1	-1		1	1		0	0
IllinoisWilliamson	1	-1			0		0	0
IllinoisWinnebago		0			0	1	-1	0
IllinoisWoodford	1	-1			0		0	0
Average Change		-0.392		0.0294			-0.5882	0

MarylandAllegany		0			0	1	-1	0
MarylandAnne Arundel		0		1	1	1	-1	0
MarylandBaltimore		0		1	1	1	-1	0
MarylandCalvert		0			0	1	-1	0
MarylandCaroline		0			0	1	-1	0
MarylandCarroll		0			0	1	-1	0
MarylandCecil		0			0	1	-1	0
MarylandCharles		0			0	1	-1	0
MarylandDorchester		0			0	1	-1	0
MarylandFrederick		0		1	1	1	-1	0
MarylandGarrett		0			0	1	-1	0
MarylandHarford		0		1	1	1	-1	0

NebraskaKeith	1	-1	1	1	0	0	0
NebraskaKeya Paha	1	-1			0	0	0
NebraskaKimball	1	-1			0	0	0
NebraskaKnox	1	-1	1	1	0	0	0
NebraskaLancaster	1	-1	1	2	1	0	0
NebraskaLincoln	1	-1	1	1	0	0	0
NebraskaLogan	1	-1			0	0	0
NebraskaLoup	1	-1			0	0	0
NebraskaMadison	1	-1	1	1	0	0	0
NebraskaMcPherson	1	-1			0	0	0
NebraskaMerrick	1	-1	1	1	0	0	0
NebraskaMorrill	1	-1	1	1	0	0	0
NebraskaNance	1	-1			0	0	0
NebraskaNemaha	1	-1	1	1	0	0	0
NebraskaNuckolls	1	-1	1	1	0	0	0
NebraskaOtoe	1	-1	1	1	0	0	0
NebraskaPawnee	1	-1			0	0	0
NebraskaPerkins	1	-1			0	0	0
NebraskaPhelps	1	-1	1	1	0	0	0
NebraskaPierce	1	-1	1	1	0	0	0
NebraskaPlatte	1	-1	1	1	0	0	0
NebraskaPolk	1	-1	1	1	0	0	0
NebraskaRed Willow	1	-1	1	1	0	0	0
NebraskaRichardson	1	-1			0	0	0
NebraskaRock	1	-1			0	0	0
NebraskaSaline	1	-1	1	1	0	0	0
NebraskaSarpy	1	-1	1	1	0	0	0
NebraskaSaunders	1	-1	1	1	0	0	0
NebraskaScotts Bluff	1	-1	1	1	0	0	0
NebraskaSeward	1	-1	1	1	0	0	0
NebraskaSheridan	1	-1	1	1	0	0	0
NebraskaSherman	1	-1			0	0	0
NebraskaSioux	1	-1			0	0	0
NebraskaClay	1	-1	1	1	0	0	0
NebraskaColfax	1	-1	1	1	0	0	0
NebraskaCuming	1	-1	1	1	0	0	0
NebraskaCuster	1	-1	1	1	0	0	0
NebraskaDakota	1	-1	1	1	0	0	0
NebraskaDawes	1	-1	1	1	0	0	0
NebraskaDawson	1	-1	1	1	0	0	0
NebraskaDeuel	1	-1			0	0	0
NebraskaDixon	1	-1	1	1	0	0	0
NebraskaDodge	1	-1	1	1	0	0	0
NebraskaDouglas	1	-1	1	2	1	0	0
NebraskaDundy	1	-1			0	0	0
NebraskaFillmore	1	-1	1	1	0	0	0
NebraskaFranklin	1	-1			0	0	0
NebraskaFrontier	1	-1			0	0	0
NebraskaFurnas	1	-1	1	1	0	0	0
NebraskaGage	1	-1	1	1	0	0	0
NebraskaGarden	1	-1		1	1	0	0
NebraskaGarfield	1	-1			0	0	0
NebraskaGosper	1	-1			0	0	0
NebraskaGrant	1	-1			0	0	0
NebraskaGreeley	1	-1			0	0	0
NebraskaHall	1	-1	1	1	0	0	0
NebraskaHamilton	1	-1	1	1	0	0	0
NebraskaHarlan	1	-1			0	0	0
NebraskaHayes	1	-1			0	0	0
NebraskaHitchcock	1	-1			0	0	0
NebraskaHolt	1	-1	1	1	0	0	0
NebraskaHooker	1	-1			0	0	0
NebraskaHoward	1	-1	1	1	0	0	0
NebraskaJefferson	1	-1	1	1	0	0	0
NebraskaJohnson	1	-1			0	0	0
NebraskaKearney	1	-1	1	1	0	0	0

OregonBaker	1	-1	1	1	0	0	0		
OregonBenton	1	-1	1	1	0	0	0		
OregonClackamas	1	-1	1	1	0	0	0		
OregonClatsop	1	-1	1	1	0	0	0		
OregonColumbia	1	-1	1	1	0	0	0		
OregonCoos	1	-1	1	1	0	0	0		
OregonCrook	1	-1	1	1	0	0	0		
OregonCurry	1	-1	1	1	0	0	0		
OregonDeschutes	1	-1	1	1	0	0	0		
OregonDouglas	1	-1	1	1	0	0	0		
OregonGilliam	1	-1	1	1	0	0	0		
OregonGrant	1	-1	1	1	0	0	0		
OregonHarney	1	-1	1	1	0	0	0		
OregonHood River	1	-1	1	1	0	0	0		
OregonJackson	1	-1	1	1	0	0	0		
OregonJefferson	1	-1	1	1	0	0	0		
OregonJosephine	1	-1	1	1	0	0	0		
OregonKlamath	1	-1	1	1	0	0	0		
OregonLake	1	-1	1	1	0	0	0		
OregonLane	1	-1	1	1	0	0	0		
OregonLincoln	1	-1	1	1	0	0	0		
OregonLinn	1	-1	1	1	0	0	0		
OregonMalheur	1	-1	1	1	0	0	0		
OregonMarion	1	-1	1	1	0	0	0		
OregonMorrow	1	-1	1	1	0	0	0		
OregonMultnomah	1	-1	1	1	0	0	0		
OregonPolk	1	-1	1	1	0	0	0		
OregonSherman	1	-1	1	1	0	0	0		
OregonTillamook	1	-1	1	1	0	0	0		
OregonUmatilla	1	-1	1	1	0	0	0		
OregonUnion	1	-1	1	1	0	0	0		
New YorkNiagara		0		1	1	0	1	-1	
New YorkOneida		0		1	1	0	1	-1	
New YorkOnondaga		0	1	1	0	0		0	
New YorkOntario		0		1	1	0	1	-1	
New YorkOrange		0	1	1	0	0		0	
New YorkOrleans		0			0	0	1	1	0
New YorkOswego		0			0	0	1	1	0
New YorkOtsego		0			0	0	1	1	0
New YorkPutnam		0	1	1	0	0			0
New YorkQueens	1	-1	1	1	0	0			0
New YorkRensselaer		0			0	0	1	1	0
New YorkRichmond	1	-1	1	1	0	0			0
New YorkRockland	1	-1	1		-1	0			0
New YorkSaratoga		0				0	1		-1
New YorkSchenectady	1	-1		1	1	0	1		-1
New YorkSchoharie		0		1	1	0	1		-1
New YorkSchuyler		0			0	0	1	1	0
New YorkSeneca		0			0	0	1	1	0
New YorkSt. Lawrence		0	1	1	0	0			0
New YorkSteuben		0		1	1	0	1		-1
New YorkSuffolk		0		1	1	0	1		-1
New YorkSullivan		0		1	1	0	1		-1
New YorkTioga		0			0	0	1	1	0
New YorkTompkins		0		1	1	0	1		-1
New YorkUlster		0			0	0	1	1	0
New YorkWarren		0		1	1	0	1		-1
New YorkWashington		0			0	0	1		-1
New YorkWayne		0			0	0	1	1	0
New YorkWestchester		0	1	1	0	0			0
New YorkWyoming		0			0	0	1		-1
New YorkYates		0			0	0	1		-1
Average change		-0.161			0.3065	0			-0.5645

UtahUtah		0		1	1	1	-1	0
UtahWasatch		0		1	1	1	-1	0
UtahWashington		0		1	1	1	-1	0
UtahWayne		0			0	1	-1	0
UtahWeber		0		1	1	1	-1	0
Average change		0		0.6207			-1	0
WyomingAlbany	1	-1	1	1	0		0	0
WyomingBig Horn	1	-1			0		0	0
WyomingCampbell	1	-1	1	1	0		0	0
WyomingCarbon		0			0	1	-1	0
WyomingConverse	1	-1			0		0	0
WyomingCrook	1	-1			0		0	0
WyomingFremont	1	-1	1	1	0		0	0
WyomingGoshen		0			0	1	-1	0
WyomingHot Springs	1	-1			0		0	0
WyomingJohnson	1	-1			0		0	0
WyomingLaramie		0			0	1	-1	0
WyomingLincoln	1	-1			0		0	0
WyomingNatrona	1	-1	1	1	0		0	0
WyomingNiobrara	1	-1			0		0	0
WyomingPark	1	-1	1	1	0		0	0
WyomingPlatte	1	-1			0		0	0
WyomingSheridan	1	-1		1	1		0	0
WyomingSublette	1	-1			0		0	0
WyomingSweetwater	1	-1	1	1	0		0	0
WyomingTeton	1	-1			0		0	0
WyomingUinta	1	-1			0		0	0
WyomingWashakie	1	-1			0		0	0
WyomingWeston	1	-1			0		0	0
OregonWallowa	1	-1	1	1	0		0	0
OregonWasco	1	-1	1	1	0		0	0
OregonWashington	1	-1	1	1	0		0	0
OregonWheeler	1	-1	1	1	0		0	0
OregonYamhill	1	-1	1	1	0		0	0
Average change		-1			0		0	0
UtahBeaver		0		1	1	1	-1	0
UtahBox Elder		0		1	1	1	-1	0
UtahCache		0		1	1	1	-1	0
UtahCarbon		0			0	1	-1	0
UtahDaggett		0			0	1	-1	0
UtahDavis		0		1	1	1	-1	0
UtahDuchesne		0		1	1	1	-1	0
UtahEmery		0			0	1	-1	0
UtahGarfield		0			0	1	-1	0
UtahGrand		0			0	1	-1	0
UtahIron		0		1	1	1	-1	0
UtahJuab		0			0	1	-1	0
UtahKane		0		1	1	1	-1	0
UtahMillard		0		1	1	1	-1	0
UtahMorgan		0			0	1	-1	0
UtahPiute		0			0	1	-1	0
UtahRich		0			0	1	-1	0
UtahSalt Lake		0		1	1	1	-1	0
UtahSan Juan		0			0	1	-1	0
UtahSanpete		0		1	1	1	-1	0
UtahSevier		0		1	1	1	-1	0
UtahSummit		0		1	1	1	-1	0
UtahTooele		0		1	1	1	-1	0
UtahUintah		0		1	1	1	-1	0

UtahUtah		0	1	1	1	-1	0
UtahWasatch		0	1	1	1	-1	0
UtahWashington		0	1	1	1	-1	0
UtahWayne		0		0	1	-1	0
UtahWeber		0	1	1	1	-1	0
Average change		0	0.6207			-1	0
WyomingAlbany	1	-1	1	1	0	0	0
WyomingBig Horn	1	-1			0	0	0
WyomingCampbell	1	-1	1	1	0	0	0
WyomingCarbon		0			0	1	-1
WyomingConverse	1	-1			0	0	0
WyomingCrook	1	-1			0	0	0
WyomingFremont	1	-1	1	1	0	0	0
WyomingGoshen		0			0	1	-1
WyomingHot Springs	1	-1			0	0	0
WyomingJohnson	1	-1			0	0	0
WyomingLaramie		0			0	1	-1
WyomingLincoln	1	-1			0	0	0
WyomingNatrona	1	-1	1	1	0	0	0
WyomingNiobrara	1	-1			0	0	0
WyomingPark	1	-1	1	1	0	0	0
WyomingPlatte	1	-1			0	0	0
WyomingSheridan	1	-1		1	1	0	0
WyomingSublette	1	-1			0	0	0
WyomingSweetwater	1	-1	1	1	0	0	0
WyomingTeton	1	-1			0	0	0
WyomingUinta	1	-1			0	0	0
WyomingWashakie	1	-1			0	0	0
WyomingWeston	1	-1			0	0	0
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Average change		-0.87	0.0435			-0.1304	0