May 2007

Power Politics: An Empirical Analysis of the Electoral College

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Submitted: April 30, 2007

Abstract:

This paper analyzes voting inequality created by the Electoral College. It focuses on the concept of "voting power," the ability of an individual to influence the outcome of an election, within the political context of the controversial 2000 and 2004 elections and resulting attempts to abolish the Electoral College. Unlike the bulk of scholarship which has used a priori measures of voting power, I develop empirical measures of voting power. These measures indicate that those individuals most advantaged by the Electoral College are those living in the large states tracking closely with the national popular vote.

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Foreward

At the beginning of high school, I became fascinated by "horse race"-type coverage of political races, watching candidates jockey for those so-called "swing" voters who would make the difference come Election Day. The Presidential election, in that sense, was the highlight of the political season—instead of one poll tracking two candidates in one state or congressional district, I was treated to a myriad of polls tracking Al Gore and George W. Bush in over a dozen "swing states". And, since these were swing states, the polls showed a close race in all of them.

The scenarios were endless: "If Gore wins in Iowa, New Mexico, Ohio….then he has to win either Tennessee or Florida," or "If Gore can win Ohio, then all he has to pick up is Florida," or any one of a number of options. It was a pundit's dream; commentators spoke about the varying likelihoods of these different scenarios, using colorful, red and blue maps to demonstrate their arguments.

I think that it was these quirks in the Electoral College which initially grabbed my attention. It certainly was a lot more interesting to follow than a national poll that would show Bush up two points. What interesting conclusions can be drawn from that figure? Gore needs more votes? That's pretty obvious. With the Electoral College, on the other hand, Gore could strategically choose states to target where he needed to make up ground, shooting for that critical 270 electoral vote threshold.

And yet, there was something disconcerting about the process. Why did my parents in Iowa deserve so much more attention than my grandparents in Utah or my uncle in Idaho? Having been born and raised in Iowa, I may think Iowans are, on the whole, a better lot than those in other states—but I doubt this opinion is shared throughout the country.

And yet, for a few months at least, we were treated as if we were substantially more important.

This unease about the seeming inequality produced by the Electoral College grew during the 2004 Presidential campaign. My grandparents who live in Salt Lake City wanted to campaign for John Kerry. The problem was that they didn't know what to do—they knew Bush was going to win Utah by a landslide. They felt that their votes, the votes of their friends, and the votes of those they spoke to in their community were irrelevant in deciding who would be President. And they were, for all practical purposes, right.

My personal situation contrasted greatly with their predicament. Instead of having no state in which I could make a difference, I had the opportunity to choose between voting in either of two "swing states": Iowa or Minnesota. As a student, I could realistically claim to "live" in either. And I wasn't alone in trying to answer this difficult question—a number of friends asked me where I thought they should vote. Occasionally, there was an easy answer but in cases where both states in question were relatively close, I had no idea what advice to give. I was sure there had to be a way to answer the question—I just had to figure out how.

This project is a result of these experiences and is my attempt to, if belatedly, finally deliver an answer to these questions. The paper is concerned with the Electoral College—its equitability in both design and practice, as well as the power with which it provides individual voters. It will not address types of voting systems, such as instant runoff voting, approval voting, or any other of the number of voting systems proposed by scholars. These systems are interesting areas of study but are beyond the scope of my research.

Chapter 1: Introduction

The election of 2000 sparked enormous controversy and brought a great deal of scrutiny upon the Electoral College. Vice President Albert Gore of Tennessee, the Democratic candidate, received approximately 500,000 more popular votes than Governor George W. Bush of Texas, the Republican candidate (Leip 2006). Bush, however, won the election by a narrow electoral vote tally of 271-266[1] (Leip 2006). The state which put Bush over the top, Florida, inspired the greatest amount of debate. There Bush's margin was a mere 537 votes and the Gore campaign requested a partial recount (i.e. that votes in selected counties were recounted to check for machine errors in processing ballots cast). The recount process produced something of a spectacle. Workers examined Florida's punch ballots to determine if the "chad" (or hole) had been sufficiently punched to clearly indicate a desired vote (Guggenheim 2000). The recount continued until Florida's Secretary of State, Katherine Harris, ordered an end to the recount. This move, of course, only added to the controversy because the Governor of Florida, Jeb Bush, was the brother of would-be President George W. Bush. The Gore campaign challenged, but Harris's decision was upheld by the Supreme Court in a 5-4 decision (*Bush v. Gore* 2000).

Additional contention was sparked by the use of the now infamous butterfly ballot in Palm Beach County. On the ballot a series of holes down the middle separated a list of candidates flanking the holes on either side. What was particularly confusing to voters was that the holes down the middle corresponded to candidates on alternating sides of the ballot. Thus, the second hole down the ballot corresponded to the first candidate on the right side,

[1] The final vote tally was one short of the normal total of 538 electoral votes because one Gore elector from the District of Columbia abstained from voting.

Patrick Buchanan, and the third hole down the ballot corresponded to the second candidate on the left side, Gore (See Figure 1).

Figure 1: The infamous butterfly ballot used in Palm Beach County.

[See: www.asktog.com/images/palmballot.jpg]

Many voters reportedly accidentally cast their votes for Buchanan instead of Gore by punching the second hole from the top (CNN 2001). Adding insult to injury, Palm Beach County has a particularly large Jewish population, many of whom ended up voting for Buchanan (who has made anti-Semitic remarks in connection with the Holocaust) (Glazov 2002).

When the dust settled, the confidence of the American people in the Presidential electoral process was greatly shaken. The Electoral College had not only chosen a candidate who failed to win a plurality of the popular vote but had left the election to be determined by a few 'pregnant' chads and voters admittedly confused by the ballot style in Florida. These electoral mishaps would have been a mere sidebar in an election decided by a national popular vote. Furthermore, the election begged a more fundamental question: what qualified Floridians to choose who would be President? While voters in fifty states and the District of Columbia cast votes for the President, it was those in one lone state which proved to be decisive.

Nationally, voters expressed great dissatisfaction with the manner in which the campaign was conducted. The two major party candidates, Bush and Gore, had spent nearly the entire campaign in just a handful of so-called "battleground states", where the popular vote totals were expected to be close. The vast majority of the states were largely ignored, as their electoral votes were considered to be a foregone conclusion.

Calls for the abolition of the Electoral College were immediate and widespread. A Constitutional amendment was introduced in both the House and Senate which would allow for choosing the President by national popular vote instead of electoral vote. Senator Dick Durbin (D-IL) went so far as to call the Electoral College a "constitutional dinosaur" (Guzy 2000). Public opinion polls showed that a majority of Americans (61%) were in agreement with the amendment (Warner 2000).

Despite this public sentiment, the attempt to amend the Constitution was unsuccessful. The threshold for passing an amendment is quite high—two-thirds of the members of the House and Senate and three-quarters of the states have to agree. And, with a handful of states standing to lose substantial leverage from an amendment, this high threshold proved unattainable.

This failure to abolish the Electoral College did not quell the debate surrounding its fairness. As the 2004 campaign entered the home stretch, similar dissatisfaction with the Electoral College emerged. In August, the New York Times published a harsh editorial once again calling for its abolishment:

> This election has been making clear how the Electoral College distorts presidential campaigns. A few swing states take on oversized importance, leading the candidates to focus their attention, money and promises on a small slice of the electorate. We are hearing far more this year about the issue of storing hazardous waste at Yucca Mountain, an important one for Nevada's 2.2 million residents, than about securing ports against terrorism, a vital concern for 19.2 million New Yorkers. (New York Times, August 29, 2004)

As the editorial indicates, the campaign was, once again, largely restricted to a handful of competitive states. Nevada, which Bush carried by a mere 2.6%, was considered to be a competitive state, while New York, which Kerry carried by over 18%, was not (Leip 2006).

Polls leading up to the election of 2004 showed the two candidates, incumbent President Bush and Senator John Kerry, running neck and neck, raising concerns that we would witness a repeat of the 2000 fiasco. On Election night, President Bush emerged victorious. This time he had been elected by the hefty electoral margin of 286 electoral votes to Kerry's 252. Bush carried Ohio, the decisive state in the election, by just over 100,000 votes. While the nation was spared from having to endure another recount, the election did generate fairness concerns. These concerns swirled around the use of electronic voting machines in Ohio, machines manufactured by companies with strong ties to the Republican Party. Wally O'Dell, the chief executive of one of the companies, Diebold, had famously (or infamously) committed "to helping Ohio deliver its electoral votes to the President." (Fitrakis and Wasserman 2004). However, Bush's popular vote margin of over three million votes hushed this opposition as the bulk of the public felt that he had legitimately obtained a popular mandate.

While the public turned their attention away from the Electoral College, one innovator was hatching a new strategy to end it. John Koza, a Professor of Computer Science at Stanford, suggested that states cooperate to abolish the Electoral College through an interstate compact. This compact would require a group of states controlling a majority of electoral votes to agree to cast their electoral votes for the winner of the national popular vote.[2]

Interstate compacts were relatively rare until recent decades, during which they have mushroomed to cover a wide range of issues. These include agreements to: "share natural resources, such as water; build regional electric power sources; share parks and parkways; conserve fish and wildlife; protect air quality; manage radioactive and other hazardous

[2] While it is generally accepted that states allocate their electoral votes to the state popular vote winner, the Constitution grants them the ability to divvy them out as they see fit.

wastes; control natural disasters, such as floods; share educational resources and facilities; share police and fire departments; and grant reciprocity for driver's licenses." (West's Encyclopedia of American Law 1998) Because they are not federal policy, these agreements achieve enforcement through binding members to the terms of the agreement only when other members comply as well. For example, consider reciprocity between states in offering in-state tuition. If State A stops offering in-state tuition to students from State B, then State B simply responds in kind by no longer offering in-state tuition to students from State A. In the case of the compact to elect the winner of the national popular vote, the agreement does not go into force until states controlling the majority of electoral votes (270 or more) agree to the terms of the compact.

Thus, if California had agreed to the compact it would not yet be bound to its terms. Until the compact had been signed by states controlling 270 or more electoral votes, California's electoral votes would continue to be cast for the winner of the state popular vote and not the national popular vote.

The first state to consider Koza's proposal was, in fact, California, a potentially fertile ground given its large size and non-swing state status—California went to Gore by nearly 12% and Kerry by nearly 10% (Leip 2006). As one Los Angeles Times editorial explained: "Under the current system, California issues—water, immigration, offshore drilling—don't get debated because candidates never show up here, except to bum money off rich people. But in Iowa, there's full discussion of corn and ethanol." (Skelton 2006) The California legislature passed the bill by a party-line vote with the majority of the Democrats supporting the measure and the majority of the Republicans opposing the bill. However, the Austrian born governor, Arnold Schwarzenegger, vetoed the bill on the grounds that it ran "counter to the tradition of our great nation." (New York Times, October 3, 2006)

Schwarzenegger's veto was certainly a large setback for the movement; with California's 55 electoral votes, his signature would have put the compact over one-fifth of the way toward controlling the 270 electoral votes it needs to take effect. But the movement is far from dead. The group headed by Koza, National Popular Vote, has sponsors in twenty-nine states who plan to introduce the bill during their respective 2007 legislative sessions. The measure is not dead within California either; the group has pledged to re-introduce the measure in California as a ballot initiative.

It is still too early to tell just how much success the movement will have, but it is certain to reignite the national debate about the merits of the Electoral College. It is within this context that I will investigate the following question: is the Electoral College systematically biased in favor of particular states? Unlike the anecdotal examples used by many commentators to argue that a bias exists, such as the aforementioned *New York Times* editorial, I will conduct an empirical examination of Presidential elections since the advent of the Modern Presidency in 1932[3]. This empirical analysis will also contrast greatly with the majority quantitative scholarship on the topic, which focuses more on the general tendency of the Electoral College to advantage large or small states instead of focusing on the tendency of particular states to be competitive (Banzhaf 1968; Lee and Openheimer 1999). My hypothesis is that a bias does exist, whereby certain individual states are advantaged when their large size and corresponding electoral votes combine with a tendency to be a closely contested state.

The paper will proceed as follows: Chapter 2 will provide a background on the Electoral College, providing necessary context to understand the subsequent analysis. Chapter 3 will introduce the concept of voting power, which measures the ability of

[3] The Modern Presidency refers to the manner in which Franklin Roosevelt reshaped the Presidency to place the President at the center of the federal policy-making process (Hess 2002).

individuals to determine election outcomes, and examine previous applications of voting power to the Electoral College. Chapter 4 will introduce two original voting power indices created for this project to evaluate biases in the Electoral College since 1932. One index calculates how close each state has been to the pivotal position deciding the Electoral College vote (the Proximity Index) and the other estimates a state's probability of being within 1% of the national popular vote (the Probability Index). Chapter 5 will analyze the results of these two new indices and use them to determine whether a bias exists and if that bias exists, which states are advantaged. Finally, Chapter 6 will consider possible improvements on the voting power indices I propose and provide potential directions for future research on the equity of the Electoral College.

Chapter 2: A Brief History of the Electoral College

Before analyzing the equity of the Electoral College, a bit of background would serve to inform the discussion. In this section, I will first explain how the Electoral College works, as its idiosyncratic structure is at the heart of a number of arguments against its equitability. Subsequently, I will discuss the undemocratic motivations for creating the Electoral College and discuss how our conceptualization of the Electoral College evolved to its current state, where it is expected to behave democratically.

I. How the Electoral College Works

While most citizens probably assume that they're voting directly for a Presidential candidate when they cast their ballot every four years, they are actually voting for a group of intermediaries known as "electors". In most states, written in small print next to the name of each presidential candidate is the phrase: "Electors for:". These electors combine to form what is known as the Electoral College, which has been the method for choosing the President since the passage of the Constitution.

The Electoral College is composed of 538 electors, each of which is permitted to cast one electoral vote. Electoral votes are assigned to each state according to their congressional delegation. Each state receives two electoral votes for their U.S. Senators as well as one for each member of the U.S. House. The state of Minnesota, for example, has ten electoral votes—two for its Senators and eight for its Congressmen. The District of Columbia receives a number of electoral votes equivalent to that of the least populous state, which translates to three electoral votes. Thus, the final tally of 538 electoral votes corresponds to the 100 members of the Senate, 435 members of the House and the 3 electoral votes given to the District of Columbia (see Table 1 for a breakdown of electors by state).

Table 1: Electoral Votes by State

State	Electoral Votes	State	Electoral Votes
California	55	Connecticut	7
Texas	34	Iowa	7
New York	31	Oklahoma	7
Florida	27	Oregon	7
Illinois	21	Arkansas	6
Pennsylvania	21	Kansas	6
Ohio	20	Mississippi	6
Michigan	17	Nebraska	5
Georgia	15	Nevada	5
New Jersey	15	New Mexico	5
North Carolina	15	Utah	5
Virginia	13	West Virginia	5
Massachusetts	12	Hawaii	4
Indiana	11	Idaho	4
Missouri	11	Maine	4
Tennessee	11	New Hampshire	4
Washington	11	Rhode Island	4
Arizona	10	Alaska	3
Maryland	10	Delaware	3
Wisconsin	10	District of Columbia	3
Alabama	9	Montana	3
Colorado	9	North Dakota	3
Louisiana	9	South Dakota	3
Minnesota	9	Vermont	3
Kentucky	8	Wyoming	3
South Carolina	8		

Each state has the ability to choose electors according to whatever method they deem to be appropriate. Today, every state and the District of Columbia choose their electors according to a state popular vote. This practice has become so institutionalized that it is easy to forget that states still possess the ability to choose electors by alternate manners.

Forty-eight states and the District of Columbia use the *unit rule* to assign electors. The unit rule dictates that the candidate receiving the most popular votes (or plurality) within a state is given all of the electoral votes within a state. States utilizing the unit rule treat each vote for a candidate as a vote for their entire slate of electors meaning that if

Candidate A receives just one more vote than Candidate B, then all of Candidate A's electors will be individually elected by a margin of one vote. The unit rule evolved as a strategy for states to increase their leverage in the electoral process. Originally, states elected individual electors who could vote for the candidate of their choice. However, they realized that their strategic importance increased when they controlled a bloc of votes as a state as opposed to a series of individual votes.

The other two states, Maine and Nebraska, use a slightly different system to assign their electors. Two electoral votes are given to the candidate who receives the most popular votes statewide. The rest of the electoral votes are assigned according to the candidate who receives the most votes within each congressional district. The rationale for this plan is to make their states, which would otherwise be uncompetitive, into smaller, more competitive districts.

The voting process has gradually evolved to the current state whereby individual electors are no longer listed on the ballot or even known by more than a handful of members of the general public. Some states have attempted to remedy the problem of "faithless electors", where an elector who has agreed to support the candidate from one party chooses not to vote for that candidate, by legally binding them to vote for a particular candidate. A faithless elector can, depending on a state, face legal consequences.

II. Undemocratic Origins: The Founders and the Electoral College

The Electoral College has not always functioned as it does now; like many aspects of American government, it has evolved with changing political norms and whenever electoral difficulties have inspired reform. However, in order to understand this evolution, one must first understand why the Electoral College was even included in the Constitution at all.

The two potential electoral systems which were first considered by the Founders were selection of the President by Congress and selection of the President via popular vote (Milkis and Nelson 1994; 32). Holding a national popular vote was rejected as being too democratic—the Founders did not have sufficient confidence in the general public to entrust them with such an important decision (Milkis and Nelson 1994; 32). They were concerned that they would be ill-informed and prone to violent swings in opinion (Hamilton 1788).

Election via Congress was the leading option for a period of time but there was great reluctance to adopt such a system. In particular, they were concerned that such an electoral system would prevent the President from having sufficient independence from the legislature, particularly if he were wishing to seek re-election (Milkis and Nelson 1994; 32). Moreover, small states feared that the large states would dominate the process because the House of Representative was so much larger than the Senate (Milkis and Nelson 1994; 33). As a result, there was much searching for an intermediate solution which would provide for election via a more informed and stable group but that came from outside of the government.

It was within this context that the Electoral College emerged as a compromise. The system of electors ensured that election of the President was done according to the judgment of fewer and better informed individuals. Alexander Hamilton explains in Federalist No. 68:

> A small number of persons, selected by their fellow-citizens from the general mass, will be most likely to possess the information and discernment requisite to such complicated investigations. It was also particularly desirable to afford as little opportunity as possible to tumult and disorder…The choice of SEVERAL, to form an intermediate body of electors, will be much less apt to convulse with the community with any extraordinary or violent movements, than the choice of ONE who was himself to be the final object of the public wishes. (Hamilton 1788)

Electors were also not allowed to hold national office in order to avoid a conflict of interest. Thus, there were seen as informed and impartial arbiters who would serve as the optimal agents for choosing the President.

The manner in which electors are to be elected is not specified in the Constitution, leaving it up to each state to choose instead. This was a compromise on two levels. First, it was a concession to those hoping to maintain a strong state role relative to the federal government. Second, it resolved the disagreement over whether it would be better to select electors using the state legislature or using a statewide popular vote. This division in how electors are chosen persisted until 1836 by which time all states except South Carolina had begun using the popular vote as the electoral selection method. South Carolina became the final state to switch to the popular vote in 1860 (Kimberling 1992).

III. Reexamination of the Electoral College: The "One Man, One Vote" Principle

Despite its undemocratic beginnings, our understanding of the Electoral College has since changed. During the civil rights movement of the 1960's, greater attention was paid to voting equality, with the landmark case, *Baker v. Carr* (1962), providing a legal basis for protecting this right. The principle of "one man, one vote" first outlined in Carr was subsequently justified in *Wesberry v. Sanders* (1964) as follows: "To say that a vote is worth more in one district than it is in another would…run counter to our fundamental ideas of democratic government." Similarly in *Reynolds v. Sims* (1964) the Court stated: "The right of suffrage is denied by debasement or dilution of a citizen's vote in a state or federal election." It should be noted, however, that these rulings only applied to congressional elections and not to Presidential elections, which are governed separately by Article II, Section I in the Constitution.

In subsequent years there were a series of challenges to the Electoral College based upon the "one man, one vote" principle. Most notably, there as an extended debate in Congress over a constitutional amendment that would have abolished the Electoral College in favor of a national popular vote. The main proponents of the amendment were Rep. John B. Anderson of Illinois and Senator Birch Bayh of Indiana. The amendment passed the House and ultimately failed by only a few votes to reach the required super-majority within the Senate in 1970 and 1979 (Broder 2007).

Despite failing to amend the Constitution, this debate did fundamentally alter the way Americans think about the Electoral College. Concerns that the Electoral College is undemocratic have continued to be voiced since the amendment failed in the 1970's. Yet for the frequency with which this criticism is leveled, there is relatively little systematic data to support it. The following section will discuss some of the techniques which have been offered as well as their relative advantages and shortcomings.

Chapter 3: Voting Power

I. Introduction

In this chapter, I will begin the process of analyzing the Electoral College. The basis for this analysis will be the concept of "voting power". "Voting power…is generally defined in terms of the possibilities that a given voter or set of voters can affect the outcome of an election" (Gelman, Katz and Tuerlinckx 2002; 420). The power of an individual voter is assigned a value between zero and one, where zero indicates that the voter has no impact on the election outcome and one indicates the voter has complete control over the election outcome. Calculations of voting power are more difficult when applied to the Electoral College because it is a two-stage voting process—individuals vote for electors who then vote for the President. Thus, in order to determine the voting power of an individual, one must first determine their power in choosing particular electors and then determine the power of those electors in determining the outcome of the Presidential election. These two results are then multiplied together because they can be treated as independent results.

Within the scholarship, there are two broad categories of voting power analysis: *a priori* and empirical. *A priori* measures of voting power have emerged as the dominant lens through which scholars evaluate the equitability of the Electoral College. *A priori* measures mean that we adopt a sort of "veil of ignorance" whereby we design an election system based on its ability to produce equitable election results in theory. (Felsenthal and Machover 2004; 14) We do not consider known partisan tendencies of particular states or regions of the country, nor do we consider know partisan tendencies of individuals. The base

assumption, therefore, is that each individual voter is equally likely to vote for each of the two candidates[4].

While such an approach seems to omit critical information, this omission is intentional. *A priori* measures determine whether an electoral system is equitable in a purely theoretical sense (i.e. if it would produce fair election results if partisan preferences were randomly distributed throughout the country). Besides testing the theoretical legitimacy of an electoral system, *a priori* models also have the benefit of making no assumptions about the continuity of historical voting patterns. Over the years, voting tendencies within states have shifted greatly and often unpredictably. While empirical analysis could be undermined by such shifts, *a priori* analysis insulates itself from such concerns by simply not taking them into account.

Empirical analysis, on the other hand, focuses on past election results in order to understand potential biases within the electoral system. These analyses have traditionally been neglected within the scholarship; scholars have lavished far more attention on *a priori* measures. For this reason, I will begin by explaining the two dominant measures of *a priori* voting power, the Banzhaf Index and the Shapley-Shubik Index. Subsequently I will outline the extent of the empirical research that has been done and provide the methodology I will use to conduct my analysis.

II. A priori Voting Power

As indicated above, two indices of voting analysis have dominated scholarly treatment of *a priori* voting power. The central difference between the two indices is that the Banzhaf Index is based upon the idea of a *decisive* vote while the Shapley-Shubik Index is

[4] We do not consider third party candidates as their inclusion would greatly complicate the calculation.

based upon the idea of a *pivotal* vote.[5] A voter is said to cast a *decisive* vote when he/she is a tie-breaking vote (meaning that the rest of the electorate is evenly split). A voter is said to cast a *pivotal* vote when he/she casts the vote which secures a victory for a particular candidate (e.g. in an electorate of three voters the pivotal vote is the second for a candidate, in an electorate of five voters the pivotal vote is the third for a candidate, etc.).

The following are examples to further illuminate the distinction. Let's say that we have an electorate of three voters and they vote for Candidate A by a 2-1 margin. Both of the votes for candidate A are considered decisive because with their vote removed the tally would be 1-1. However, only the second vote for Candidate A is considered pivotal because after the first vote for Candidate A, victory had not yet been secured.[6] Now let's imagine that the voters supported Candidate A by a 3-0 margin. In this case, none of the voters would be considered decisive. However, the voter who casts the second vote for Candidate A is still considered to be pivotal.

It should be noted that these two concepts aren't mutually exclusive; a voter can be both decisive and pivotal within an electorate. Let's again assume that three voters are choosing between two candidates. If the first two voters split their votes between the two candidates, the third voter will be both decisive and pivotal because the electorate is tied prior to the vote and because the vote will constitute the second, or pivotal, vote for the winning candidate.

Given this basic definition, I will now outline how the indices themselves are calculated. I will start with the Banzhaf Index because it has received the bulk of scholarly

[5] This distinction between the two terms is not clearly established within the literature, but I believe it provides a convenient nomenclature for separating the concepts.

[6] With the Shapley-Shubik Index order is typically assigned according to intensity of support. However, this is not possible in an electoral context—we know nothing about how strongly citizens supported a particular candidate, only that they chose to (or not to) vote for that candidate. Thus, order is randomly assigned such that all those within a winning coalition are considered equally likely to cast the pivotal vote.

attention paid to *a priori* voting power measures. I will then discuss the Shapley-Shubik Index, another measure of *a priori* voting power. Finally, I will discuss empirical measures of voting power.

III. The Banzhaf Index

The most studied measure of voting power, at least in the context of the Electoral College, is the Banzhaf Index. The index is named after the lawyer, John Banzhaf III, who popularized the method in the 1960's during the last heated national debate over the Electoral College. In a series of articles throughout the decade, Banzhaf developed the index (Banzhaf 1965; Banzhaf 1966) and applied it to the Electoral College (Banzhaf 1968). He found that the largest state in the union, which at the time was New York, had 3.312 times the voting power as the District of Columbia.[7]

Banzhaf's work received substantial attention following its publication. His work proved quite influential in informing opposition to the Electoral College during the congressional debate of an amendment which would have abolished it (Bayh 1968). It has also been used as a baseline for subsequent scholarship considering the question of voting power. Scholars still use the index to determine state biases in the Electoral College (most recently, Longley and Dana Jr. (1992) updated the index based upon changes in state population and electoral vote distribution).

As stated earlier, the Banzhaf Index is an *a priori* index, meaning that we have no information about the preferences of individual voters, and relies on the notion of a decisive, or tie-breaking, vote as the source of voting power. The index then calculates the probability,

[7] While Banzhaf often receives credit for developing the method used in his articles, it is actually a re-creation of earlier work done by L.S. Penrose. Penrose had developed the index nearly two decades earlier as a method for apportioning vote weight within the United Nations (Penrose 1946). Scholars attribute this re-creation to a case of "mistaken reinvention" (Felsen and Machover 2005).

given an electorate of size *n*, of the first *n-1* voters casting the same number of votes for two candidates[8]—for simplicity, we will refer to them as Candidate A and Candidate B. The formula for the Banzhaf Index is as follows (where *id* refers to an individual voter being decisive, and *n* refers to the population of the state):

Equation 1: Banzhaf Index determination of an individual's voting power.

$$Power_{id} = \binom{n-1}{(n-1)/2} * \frac{1}{2^{n-1}} = \frac{(n-1)!}{((n-1)/2)!*((n-1)/2)!} * \frac{1}{2^{n-1}} \approx 0.8/\sqrt{n}$$

Let's start with some basic examples to demonstrate the calculation of the index. Assume that there is an electorate of three voters choosing between Candidate A and Candidate B. To measure the voting power for a single voter, we look at the potential combinations of votes from the other two voters which are: AA, AB, BA, BB (where AA represents two votes for Candidate A, AB represents the first voter voting for Candidate A and the second for Candidate B, etc.). All of these combinations are equally likely because we're assuming that we have no information about voter preferences. Accordingly, the probability of a single voter being decisive is one-half; the voter is decisive in the AB and BA cases but not in the AA and BB cases. This same result can be obtained by substituting $n = 3$ into Equation 1:

Calculation 1: Determination of voting power under the Banzhaf Index given a population of three voters.

$$Power_{id} = \binom{3-1}{(3-1)/2} * \frac{1}{2^{3-1}} = \binom{2}{1} * \frac{1}{2^2} = \frac{2!}{(2-1)!*(2-1)!} * \frac{1}{2^2} = 2 * \frac{1}{4} = \frac{1}{2}$$

[8] The calculation of the index becomes a bit more complicated if we allow for the possibility of n-1 being odd, such that the closest possible margin between the candidates is one vote and not a tie. The voting power of a voter, then, would derive from their ability to cause or avoid a tie. However, because the calculation works out nearly identically over large sample sizes whether n-1 is even or odd, we will assume n-1 is even for conceptual simplicity.

We could continue with such examples, but writing out the potential combinations of votes quickly becomes unwieldy. Luckily, the binomial distribution allows one to quickly calculate these probabilities without tediously writing out the combinations. Table 2 shows a series of population sizes and the corresponding voting power of an individual within a population that size. The third column is a function inversely related to the square root of population size. As the population size increases voting power tracks closely with this function, allowing one to approximate voting power for large populations.

Table 2: Banzhaf Index Probability that a Voter is Decisive According to Population Size

Population Size	**Voting Power**	$0.8/\sqrt{n}$
3	0.500	0.462
5	0.375	0.358
9	0.273	0.267
15	0.209	0.207
45	0.120	0.119
101	0.080	0.080
1001	0.025	0.025
10,001	0.0080	0.0080
100,001	0.0025	0.0025
1,000,0001	0.0008	0.0008

The Electoral College, however, is a two-staged voting process, making the calculation of voting power more complicated. Individuals first vote to determine a slate of electors for their state. These electors then vote to determine which candidate will be elected President. Thus, an individual's voting power is the joint probability that their vote will swing their state's electoral votes *and* that their state's electoral votes will prove to be the decisive margin in electing the President. Mathematically, we can treat these as independent events, so that the probability of both events occurring is simply the product of the probability of each of the individual events. Thus, voting power is equal to the probability of an individual's vote being decisive within their state times the probability of their state being

decisive in the Electoral College (*EC* refers to the Electoral College, *id* refers to an individual voter being decisive, and *sd* refers to the state being decisive within the Electoral College):

Equation 2: Voting power of an individual within the Electoral College—expressed as the product of an individual's voting power with a state and that state's voting power within the Electoral College.

$$Power_{EC} = Power_{id} * Power_{sd}$$

For example, let's refer back to our basic example with two candidates, A and B, three voters, and now three states as well. We've already calculated the probability of casting a decisive vote within each state as being equal to one-half. The probability of that voter's state being decisive is also equal to one-half by an identical calculation—there are four potential outcomes for the other two states (AA, AB, BA and BB), half of which would make the third state decisive. Thus we can say that the net voting power is equal to one-fourth (one-half multiplied by one-half).

In the example in the preceding paragraph, the states are all considered to have one electoral vote. However, the calculation is far more complicated because the Electoral College is an example of a weighted voting system—states have different numbers of electoral votes depending on their size. Thus, we can't treat them as interchangeable units; instead we have to look at specific combinations of states in order to determine whether they provide a decisive margin. This produces an impossible calculation when you consider that there are fifty states and the District of Columbia, producing over two quadrillion potential divisions of states between the two parties. While we could reduce the calculation a bit by treating states with the same number of electoral votes (such as Wyoming and Alaska) interchangeably, it would still prove unreasonably complicated[9].

[9] This analysis assumes that all states use the unit rule (meaning that all the state's electors go to one candidate). However, two states, Maine and Nebraska distribute their electoral votes in a different manner—assigning two electors to the winner of the state popular vote and assigning each additional elector according to the candidate which carries the popular vote within each of the state's congressional

Conveniently, the calculation works out such that each state has voting power approximately proportionate to the number of electoral votes it has. Thus, Minnesota, a state with ten electoral votes, has approximately twice the voting power of Nebraska, a state with five electoral votes. This does not mean that each voter in Minnesota has twice the power of each voter in Nebraska, but simply that the state, as a whole, has twice the power. We can extrapolate this relationship between electoral votes and population size by using the fact that electoral votes are approximately proportional to a state's population (where *sd* refers to the state being decisive, *EV* refers to electoral votes, *s* refers to a state, and *US* refers to the national total):

Equation 3: Banzhaf Index determination of a state's voting power within the Electoral College.

$$Power_{sd} \approx EV_s / EV_{US} \approx n_s / n_{US}$$

Thus, in order to determine the voting power of an individual voter in choosing the President, we must multiply the probability that the voter will be decisive within their state by the probability that the state is decisive within the Electoral College. From the initial calculations of voting power, we saw that voting power within a state decreases at a rate proportional to the square root of population size (see Equation 1). However, that state has a number of electoral votes approximately proportional to its population and those electoral votes have a directly proportional effect on that state's ability to choose the President (see Equation 3). Multiplying those two results together, we find that an individual's voting power in choosing the President increases at a rate proportional to the square root of population size:

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districts. In practice, the electoral votes of these two states all tend be won by one candidate during each election cycle, meaning we can effectively treat them as using the unit rule (to simplify our analysis).

Equation 4: Banzhaf Index determination of an individual's voting power under the Electoral College.

$$Power_{EC} = Power_{id} * Power_{sd} \approx 0.8/\sqrt{n_s} * n_s/n_{US} \approx \left(0.8/n_{US}\right) * \sqrt{n_s}$$

This result has led scholars utilizing the Banzhaf Index to conclude that there exists the aforementioned large state bias, such as the discrepancy between New York and the District of Columbia identified by Banzhaf (see Table 3).

These results were the standard in the field for a number of decades but have come under fire in the last few years. The main thrust of the criticism is that the *a priori* model of voting behavior is not accurate. In particular, critics take issue with the claim that the probability of casting a decisive vote within a particular state is inversely related to the square root of population size. Gelman, Katz and Bafumi (2002) conducted an empirical study using regression analysis where they found that the probability of casting a decisive vote is far closer to being inversely related to population size. The problem with the *a priori* model is that it assumes that candidate vote shares will converge toward 50% with a large enough sample size, as you would expect with other random processes such as coin flips and, as such, not reflecting the observed preferences of voters. However, in most states there is at least a slight bias toward one candidate or another. Given this bias, as the voting population increases, the net percentage received by each of the candidates will converge toward the unbalanced proportion instead of toward 50%.

Not all scholarship argues against the Banzhaf Index; Brams and Davis (1974) attempt to correct for this shortcoming by allowing the expected vote distribution to vary from 50% within the binomial model and find that the large state bias persists. If Gelman, Katz and Bafumi (2002) are correct, however, the argument for a large state bias is severely undermined. A decrease in individual voting power within a state which is proportional to

Table 3: Banzhaf Index calculation from 1968 showing a large-state bias (this table is a modified version of that published in Banzhaf 1968)

State Name	Population (1960 Census)	Electoral Votes (1964)	Banzhaf Index*
New York	16,782,304	43	3.312
California	15,717,204	40	3.162
Pennsylvania	11,319,366	29	2.638
Ohio	9,706,397	26	2.539
Illinois	10,081,158	26	2.491
Texas	9,579,677	25	2.452
Michigan	7,823,194	21	2.262
New Jersey	6,066,782	17	2.063
Florida	4,951,560	14	1.870
Alaska	226,167	3	1.838
Massachusetts	5,148,578	14	1.834
North Carolina	4,556,155	13	1.807
Georgia	3,943,116	12	1.789
Wisconsin	3,951,777	12	1.788
Indiana	4,662,498	13	1.786
Virginia	3,966,949	12	1.784
Tennessee	3,567,089	11	1.721
Missouri	4,319,813	12	1.710
Maryland	3,100,689	10	1.675
Nevada	285,278	3	1.636
Louisiana	3,257,022	10	1.635
Alabama	3,266,740	10	1.632
Minnesota	3,413,864	10	1.597
Iowa	2,757,537	9	1.596
Washington	2,853,214	9	1.569
Oklahoma	2,328,284	8	1.541
South Carolina	2,382,594	8	1.524
Kentucky	3,038,156	9	1.521
Wyoming	330,066	3	1.521
West Virginia	1,860,421	7	1.506
New Hampshire	606,921	4	1.499
Connecticut	2,535,234	8	1.477
Hawaii	632,772	4	1.468
North Dakota	632,446	4	1.468
Idaho	667,191	4	1.429
Montana	674,767	4	1.421
South Dakota	680,514	4	1.415
Vermont	389,881	3	1.400
Kansas	2,178,611	7	1.392
Mississippi	2,178,141	7	1.392
Colorado	1,753,947	6	1.327
Oregon	1,768,687	6	1.321
Arkansas	1,786,272	6	1.315
Delaware	446,292	3	1.308
Arizona	1,302,161	5	1.281
Rhode Island	859,488	4	1.259
Utah	890,627	4	1.237
Nebraska	1,411,330	5	1.231
New Mexico	951,023	4	1.197
Maine	969,265	4	1.186
District of Columbia	763,956	3	1.000

* The Banzhaf Index represents the relative probability of an individual voter being decisive within the Electoral College. The probability is calculated by multiplying the probability of an individual voter being decisive within a state by the probability that the state is decisive within the Electoral College (see Equation 4).

the population size would balance out the proportional increase in voting power the state possesses within the Electoral College, producing no net bias (except, possibly, toward the smaller states due to the constant two electoral votes).

A more important shortcoming of the Banzhaf Index is its *a priori* assumptions. While these assumptions may be appealing from a theoretical perspective, they ignore well-established partisan tendencies of particular segments of the population and, more broadly, particular regions of the country.

IV. The Shapley-Shubik Index

The other classic measure of voting power is known as the "Shapley-Shubik Index". This index was proposed in a 1954 paper examining the distribution of power within the legislative process, determining the relative influence of the House of Representatives, Senate and President (Shapley and Shubik 1954). In the Shapley-Shubik Index an individual's voting power "depends on the chance he has of being critical to the success of a winning coalition" (Shapley and Shubik 1954; 787), which is equivalent to the concept of a pivotal vote, as introduced earlier. Using our simple three person electorate, the second person to cast a vote for the winning candidate casts the pivotal vote and is considered to possess all of the voting power. The other two voters in this case are treated as having no voting power.

This, however, assumes that there is an ordering to the votes. Such an ordering could be chronological or based upon intensity of preference. To differentiate these two orderings, let's assume that the U.S. Senate is considering a bill to cut taxes. A chronological ordering would look at a floor vote, and credit the member casting the 51st vote in one direction or the other to be pivotal. An ordering based upon intensity of preference would order senators according to their position on the issue—ranging from those completely opposing a tax cut

to the senator supporting the largest cut in taxes. The senator, or senators, occupying the central position along this spectrum would represent the pivotal votes as their support is critical to forging a winning coalition (assuming, of course, that the only question is how big the tax cut should be and not from where the tax cut should come)[10].

In the case of Presidential elections, such orderings of individual voters are not possible, as data are not released on when individuals cast their votes, nor is there any indication of intensity of preference other than the dichotomous decision to vote or not vote for a particular candidate. The impact on the voting power calculation can be demonstrated again using our three person electorate. If two out of three voters supported Candidate A, then they both have a voting power of one-half, as they have the same probability of casting the "second" vote (if we were to randomly order the votes). Meanwhile, the voter supporting Candidate B has a voting power of zero as the vote did not form a part of the winning coalition.

Unlike the Banzhaf Index, the Shapley-Shubik Index does not require an extremely close election for an individual to have voting power. In a 3-0 "landslide" election, all three voters are considered equally likely to have cast the pivotal second vote and are assigned a voting power of one-third. Thus, the Shapley-Shubik avoids a common criticism leveled against the Banzhaf Index: that Presidential elections are never close enough for a voter to have more than negligible voting power.

Using the *a priori* assumption that we have no information about the preferences of individual voters, each individual within the population will have an equal probability of

[10] This concept of pivotal voter in an ideological spectrum also serves as the basis for the Median Voter Theorem, which argues that this pivotal voter will act as the decision-maker. The most common application of the theorem is to argue that candidates should race to the middle in order to position themselves as close as possible to the pivotal (or median) voter. For a more complete discussion of the theorem see, for example: Congleton, Richard. 2002. "The Median Voter Model." *Encyclopedia of Public Choice*. Available online at: http://rdc1.net/forthcoming/medianvt.pdf.

occupying the pivotal position (*ip* refers to the individual voter being pivotal, and *n* refers to the population size):

Equation 5: Shapley-Shubik determination of the probability of an individual voter being decisive.

$$Power_{ip} = 1/n$$

Again, the fact that the Electoral College is a two-tiered voting system makes it more difficult to calculate the Shapley-Shubik Index. It is relatively easy to determine the voting power within each state—an individual voting for the winning candidate has a power inversely proportional to the number of total voters supporting that candidate. An individual voting for the losing candidate, of course, has no voting power. States then have power according to the probability that their state was the decisive one. This is not as simple as dividing power equally among the states supporting the winning candidate because they have different weights. Instead, all possible orderings of states must be considered and voting power is equal to the proportion of combinations that make a particular state decisive. However, there is a calculative shortcut—states tend to occupy the pivotal position which a frequency proportional to the number of electoral votes the state possesses. As we did with the Banzhaf Index, we can then translate this voting power to population sizes (where *sp* refers to the state being pivotal, *EV* refers to electoral votes, *s* refers to an individual state, and *US* refers to the national total):

Equation 6: Shapley-Shubik determination of a state's voting power within the Electoral College.

$$Power_{sp} \approx EV_s / EV_{US} \approx n_s / n_{US}$$

Applying *a priori* assumptions to the Shapley-Shubik Index, we do not find a large-state bias, as there was with the Banzhaf Index. Individuals within a state are all equally likely to occupy the pivotal position, such that the voting power is inversely proportional to the

population of a state. States are allocated electoral votes approximately proportional to their population, and these states in turn occupy the pivotal position with a frequency proportional to the number of electoral votes. Thus, the decreased voting power from living in a large state is precisely balanced out by the increased voting power stemming from influencing a greater number of electoral votes:

Equation 7: Shapley-Shubik voting power of an individual voter within the Electoral College.

$$Power_{EC} = Power_{ip} * Power_{sp} \approx 1/n_s * n_s/n_{US} = 1/n_{US}$$

Like the Banzhaf Index, however, there are some problems with using the Shapley-Shubik Index to measure *a priori* voting power. At the state level, the *a priori* assumption that all orderings are equally likely is untenable. In recent elections, we have seen certain states, such as Utah, are strongly Republican, while other states, such as Massachusetts, are strongly Democratic. Instead, the Shapley-Shubik Index would be far more instructive if applied to empirical data. Each election provides the information necessary to order each state from most Republican to most Democratic, while, in the process, revealing which state occupied the pivotal position.

Moreover, empirical determinations using the Shapley-Shubik would be superior to empirical determinations using the Banzhaf Index. While the Banzhaf Index is limited by the lack of elections sufficiently close for an individual voter to cast a "decisive" vote or an individual state to cast a slate of decisive electoral votes, each election produces a pivotal state using the Shapley-Shubik methodology.

V. Empirical Estimates of Voting Power

The most notable empirical work on voting power is scholarship published in recent years evaluating the validity of the assumptions underlying the Banzhaf Index. This analysis

has had to overcome one substantial obstacle: the paucity of actual election results close enough for a tie-breaking vote to be cast. Mulligan and Hunter (2003; 37) summarize this difficulty in analyzing their data set: "Of the 16577 US returns analyzed, only one…was decided by a single vote…Two others were decided by 4 votes, one by 5, and two by 9 votes. All 16577 [sic] others were decided by at least 14 votes. Of the 40036 STATE elections…analyzed, two were tied and seven were decided by a single vote."

Nevertheless, Gelman, Katz and Tuerlinckx (2002) and Gelman, Katz and Bafumi (2004) used regression analysis on state legislature, U.S. House and U.S. Senate election returns to test the proposition that the probability of a voter casting a decisive vote decreases proportional to the square root of population size. They found that the probability decreases approximately proportional to the population size. This finding led both sets of scholars to question Banzhaf's conclusion that there exists a large state bias.

Mulligan and Hunter (2003) conduct a similar empirical analysis, using the aforementioned data set. Their study also concluded that voting power decreases at a rate approximately proportional to population size, although they concede that these findings are cast into doubt by the few elections which prove to be sufficiently close for a decisive vote to exist.

Other scholars have used empirical data to craft their own models for voting power. Gelman, King and Boscardin (1998) used regression analysis to develop a model for the voting power of individual states. This regression model allows them to predict the range of possible state-level election results. From this range, they are able to calculate the probability that a state election will be close (defined in the paper as both major party candidates receiving within 2% of half the two-party popular vote). This propensity to be "close", coupled with the state's empirical propensity to be decisive within the Electoral College is

used to determine the voting power of individuals within each state. They conclude that there is no bias according to state size, but that there is a bias toward certain states which tend to be competitive and against those which tend to have one-sided election results (the examples of Utah and the District of Columbia are given).

Rabinowitz and Macdonald (1986) develop a spectrum where both the ideology and partisanship of each state is considered. Each election is weighted according to the degree to which is draws upon the ideological and partisan factors respectively. Accordingly, Rabinowitz and Macdonald determine which states occupy the Shapley-Shubik pivotal position for each election such that the candidate who carries that state will be guaranteed to carry the election as well. They determine the voting power of each state and highlight those states they believe to be advantaged by the Electoral College (California, Texas, Illinois, and Ohio ranking as the greatest benefactors) and those who they believe to be disadvantaged (Massachusetts, Georgia, Arizona and Nebraska rank as the biggest losers).

The method developed in the following section of my paper will focus on the importance of occupying the pivotal position, just as Rabinowitz and Macdonald did. However, I will simplify the process of ordering states by considering only partisan preference. I believe that Rabinowitz and Macdonald's focus on both ideology and partisanship within the "political space" (Rabinowitz and Macdonald 1986; 73) unnecessarily complicates the analysis. The important feature of a state in any given election is occupying the pivotal position between the Democratic and Republican parties. This simplification is advantageous because it makes the results more easily interpretable and subsequently more useful in public debate on the topic. People are generally skeptical of results they don't understand, so my hope is that my methodology will represent a clearer, more intuitive revision of Rabinowitz and Macdonald's approach.

Second, my methodology will re-order states for each election, allowing for evolution in partisan tendencies. Rabinowitz and Macdonald unrealistically assume that states occupy a static position within the political space. Thus, I believe that my method will not only be easier to understand, but also provide a more accurate understanding of voting power.

Chapter 4: Methodology

Based upon the above discussion, this project will utilize empirical methods to determine the voting power of different states. These empirical methods will avoid the problematic assumption, inherent in *a priori* models, that there are no known partisan tendencies. While empirical analyses have been used to modify, criticize and improve existing *a priori* models, no scholarship has established a manner for determining voting power in a purely empirical manner. It is this gap which I will attempt to fill with the following indices of voting power and subsequent analysis.

My indices of voting power will draw upon the methodology used in the Shapley-Shubik Index by focusing on the importance of occupying the pivotal position. I will simplify the analysis by focusing only on the voting power of states within the Electoral College. This is not to say that the variation in voting power of individuals within the state is unimportant, but simply that its importance is trumped by the variation in voting power among different states. And, since an individual's vote is only powerful if the state is pivotal within the Electoral College, the state having voting power is a prerequisite to an individual within that state having voting power.

In determining the relative voting power of states, I reject the *a priori* assumption that any ordering of states is equally likely and instead choose to order them by *intensity of preference* as per the Shapley-Shubik methodology[11]. States are treated as expressing a partisan preference according to the difference in the percent of the popular vote which goes to the Democratic candidate and the percent of the popular vote which goes to the Republican

[11] This ordering is quite similar to that used by Rabinowitz and Macdonald (1986). It is simplified in that it considers only partisan ordering of states and does not consider the ideological aspects examined by Rabinowitz and Macdonald. The advantage of this simplification is discussed at the end of Chapter 3.

candidate. In the 2004 election, for example, the extremes of this ordering would be Utah (where Bush carried the state by a margin of 45.5%) and the District of Columbia (where Kerry carried the state by a margin of 79.8%). Table 4 shows how states would be ordered for the 2004 Presidential election as an example. The directionality of the ordering of states (from most Republican to most Democratic) is arbitrary, and could be reversed without any substantive change. The goal is simply to provide a stable orientation for the analysis[12].

Analysis will be conducted using data[13] from 1932, the beginning of the Modern Presidency, to the present. While this data set excludes some potentially interesting close elections (such as those of 1824, 1876 and 1888), it best captures the modern political landscape. The data includes the percentage of the popular vote received by the Democratic and Republican candidates respectively as well as the number of electoral votes the state possessed at the time. Thus, to obtain the partisan differentials necessary for the subsequent analysis, the Republican popular vote percentage is subtracted from the Democratic popular vote percentage. Relevant electoral vote totals can be obtained by summing the electoral votes in the table for each relevant state.

Given this ordering of states, we can then look at the elections within the data set to see which states have occupied the Shapley-Shubik pivotal position, meaning that the state's electoral votes where the ones which allowed the candidate to reach the critical threshold of

[12] The exclusion of third party votes from consideration is justified by the fact that a third party candidate has not carried an election within the relevant data set. This is not to say that third party candidates have not had an important effect on election outcomes during this period; most recently, with the formation of segregationist parties in the South following World War II, third party candidates have carried a handful of states as well as potentially swinging the election results within other states. However, in none of these elections have third party candidates carried enough states to deny either major party candidate a majority of electoral votes. Thus, we can consider the carrying of some states by third party candidates to be essentially inconsequential to the election outcome. Regardless of which major party candidate those states would have gone to in the absence of a third party, the same candidate would have been elected President. The critical votes come from those states casting their electoral votes for major party candidates and, accordingly, the votes of interest in those states are those for one major party candidate or another.

[13] State by state election returns are available at a number of locations, but I will use the data set contained in Dave Leip's Presidential Atlas (available online at www.usaelectionatlas.org) because the site has compiled all of this data into a single Microsoft Excel spreadsheet, allowing for quick and easy analysis.

Table 4: Shapley-Shubik ordering of states for the 2004 election from most Republican to most Democratic.

State	Partisan Margin (%)	Deviation from National Vote	Cumulative Electoral Votes
Utah	-45.54	-42.10	5
Wyoming	-39.79	-36.35	8
Idaho	-38.12	-34.68	12
Nebraska	-33.22	-29.78	17
Oklahoma	-31.14	-27.70	24
North Dakota	-27.36	-23.92	27
Alabama	-25.62	-22.18	36
Alaska	-25.55	-22.11	39
Kansas	-25.38	-21.94	45
Texas	-22.86	-19.42	79
South Dakota	-21.47	-18.03	82
Indiana	-20.68	-17.24	93
Montana	-20.50	-17.06	96
Kentucky	-19.86	-16.42	104
Mississippi	-19.72	-16.28	110
South Carolina	-17.08	-13.64	118
Georgia	-16.59	-13.15	133
Louisiana	-14.51	-11.07	142
Tennessee	-14.27	-10.83	153
West Virginia	-12.86	-9.42	158
North Carolina	-12.43	-8.99	173
Arizona	-10.47	-7.03	183
Arkansas	-9.76	-6.32	189
Virginia	-8.20	-4.76	202
Missouri	-7.20	-3.76	213
Florida	-5.01	-1.57	240
Colorado	-4.67	-1.23	249
Nevada	-2.59	0.85	254
Ohio	**-2.11**	**1.33**	**274**
New Mexico	-0.79	2.65	279
Iowa	-0.67	2.77	286
Wisconsin	0.38	3.82	296
New Hampshire	1.37	4.81	300
Pennsylvania	2.50	5.94	321
Michigan	3.42	6.86	338
Minnesota	3.48	6.92	348
Oregon	4.16	7.60	355
New Jersey	6.68	10.12	370
Washington	7.17	10.61	381
Delaware	7.59	11.03	384
Hawaii	8.74	12.18	388
Maine	9.00	12.44	392
California	9.95	13.39	447
Illinois	10.34	13.78	468
Connecticut	10.37	13.81	475
Maryland	12.98	16.42	485
New York	18.29	21.73	516
Vermont	20.14	23.58	519
Rhode Island	20.75	24.19	523
Massachusetts	25.16	28.60	535
District of Columbia	79.84	83.28	538

270 electoral votes. Starting with the state most Democratic in partisan preference, we count up in electoral votes until the total reaches 270. The third column in Table 4 (above) demonstrates this process using the 2004 election as an example. As expected, Ohio, the state which generated the most controversy following the election is the state located in the pivotal position. And, while this result will also produce an intuitive result for the 2000 election (with Florida occupying the pivotal position), it will be more instructive for less close elections where the pivotal state is less obvious.

This, in effect, allows us to enhance the data set by constructing a series of counterfactual election examples to see which states would have been decisive, like Florida and Ohio, had the election been close. As Rabinowitz and Macdonald explain:

> Electoral tides may make an election overwhelmingly Democratic or Republican, but the state in the pivotal position is always the fulcrum that divides the states into those which are relatively Democratic and those which are relatively Republican. In a sufficiently close election it is the pivotal state which determines the outcome. (Rabinowitz and Macdonald 1986; 69)

The basic assumption is that as the national popular vote shifted to make the election closer, the basic ordering of states by partisan preference would have been maintained. Any resulting tendencies in which states have occupied the pivotal position provide for the first analyzable result. Given a data set of nineteen elections, we can analyze the frequency with which large states have occupied the pivotal position and how that result compares with what *a priori* models would predict. Similarly, we can test to see if certain regions of the country tend to occupy the pivotal position more or less frequently than would be expected if there were no regional tendencies. Finally, we can look at individual states to see if there are anomalous results, where states occupy the pivotal position with a frequency substantially different than *a priori* models would predict.

The data set can be further enhanced by considering not only those states which have occupied the pivotal position, but also those which have been proximate to the pivotal position. A state, for example, may not have occupied the pivotal position since 1932, but may have been one spot away three times indicating a propensity to be quite important in deciding election outcomes. To account for these "close calls", I will construct a table where states are listed according to how often they have occupied the pivotal position, how often they have been one spot away from the pivotal position, and so on, up to five spots away from the pivotal position.

To weigh the relative importance of each of these positions, I propose an arbitrary, but I believe reasonable, weighting of their importance. Ten points will be assigned for occupying the pivotal position, six for being one away from the pivotal position, four for two away, three for three away, two for four away and one for five away. The summation of these point totals over the data set will provide an index of how likely a state is to occupy the pivotal position, our second analyzable result. While this index is imperfect, it does help us to approximate state voting power, as well as order the table such that comparably influential states are displayed close together.

A more systematic measure of proximity to pivotal status, the "competitiveness index", will provide us with our third analyzable result. This "competitiveness index" will ask how well the state popular vote total tracked with that of the national popular vote. The theory is that states which track most closely with national movements in partisan sentiment are likely to occupy the pivotal position when it matters most—in close elections. A data set of nineteen election results will allow us to calculate the basic mean and standard deviation test statistics necessary to model each state's partisan tendencies relative to the national average. These test statistics, when combined with the assumption that the data is normally

distributed[14], allow us to calculate the probability that the state's popular vote will be within1% of the national popular vote.[15]

Because this proximity indicates a high likelihood that the state will occupy the pivotal position (or a position close to the pivotal position), we can treat these probabilities as proportional to the probability that a state will occupy the pivotal position. These resulting index values will then be compared with what would be predicted under *a priori* assumptions to determine states which have unexpectedly large or small amounts of voting power.

While the above indices are based upon the Shapley-Shubik notion of proximity to the pivotal position in a vote, there is one important difference. In their index, Shapley and Shubik would only assign voting power to those individuals within each state who formed a part of the victorious coalition, and those states within the country who also formed a part of the winning coalition. The process with the above indices I propose draws no distinction between being on the winning or losing side of the pivotal position—it is only concerned with proximity to the pivotal position.

The theoretical justification for considering those within the losing coalition to have voting power is drawn from one of the core principles of the Banzhaf Index. With the Banzhaf Index, power is only leveraged when a voter occupies the decisive voting position—i.e. the election is a tie prior to his/her vote and the direction of his/her vote determines the winner of the election. Given this assumption, it makes no sense to say that a voter's

[14] The use of the normal distribution is justified by the Central Limit Theorem, which states that most distributions with thirty or more observations can be approximated using the normal distribution. While the nineteen elections making up the sample are short of the thirty necessary, the theorem's underlying principle, that distributions tend toward the normal as sample size increases, still makes the normal distribution the best choice.

[15] This strategy is quite similar to that used by Gelman, King and Boscardin (1998). However, in their study they considered a window of 2% and looked only at the closeness of a state's popular vote in isolation, instead of comparing it to the national popular vote, as I will do.

partisanship determines his/her leverage, as it has no impact on the partisanship of the greater population. Thus, while I have previously rejected the *a priori* assumptions of voting behavior inherent in the Banzhaf Index (i.e. that all voters in all states should be treated as being equally likely to vote for both parties), I accept the idea that a vote derives its value from its ability to act as a tie-breaker and not as a part of a larger winning coalition (as per the Shapley-Shubik Index).

Given the list of states having occupied the pivotal position and the two indices the question is how they should be combined. The list of states having occupied the Shapley-Shubik pivotal position is the best for a few reasons. First, it considers states that actually occupy the position of interest as opposed to merely being proximate. Second, it accounts for both state competitiveness and state size, while the two indices only consider competitiveness. Nevertheless, the two indices play a critical role. Because the data set only consists of nineteen elections, it is difficult to get a read on the relative importance of all fifty states within the Electoral College. There will be no indication of the relative importance of at least thirty-one states. And, without additional indices it would be impossible to distinguish between two states which had each occupied the pivotal position on one occasion.

Within this context, the Proximity Index provides supplementary information about each of the nineteen elections and the Probability Index functionally seeks to expand the data set beyond the limitations of the nineteen observations drawing upon the underlying data to construct a distribution of likely election outcomes. Thus, these two indices will not be used as a means of primary analysis but as a means to supplement the first index when necessary.

The combination of indices will fill a large gap within the existing literature. While there is significant attention given to determining *a priori* voting power, and empirical determinations of how voting power changes for individual voters according to the population of their state, there is little empirical work on the voting power of particular states within the Electoral College. Filling this gap is particularly important because it is precisely this question—how much voting power different states have within the Electoral College—which is most hotly debated by the general public. Particularly in the context of the latest attempts to abolish the Electoral College, this research can serve to instruct states whether it would be in their best interest to shift to a direct popular vote.

Chapter 5: Results

I. Introduction

The results of the analysis are displayed in Tables 5-7. Table 5 shows the states which have occupied the pivotal position in the nineteen elections within the data set. The only anomaly contained within the table stems from the 1972 election, when both Ohio and Maine could be considered pivotal states. If they voted for separate candidates, both candidates would have had 269 electoral votes, throwing the election to the U.S. House.

Table 5: States occupying the pivotal position beginning in 1932.*

State	Number of times occupying pivotal position
Ohio	4
Michigan	3
Florida	2
Illinois	2
Pennsylvania	2
Iowa	1
Maine	1
New York	1
Oregon	1
Tennessee	1
Washington	1
Wisconsin	1

*The pivotal position is the state which occupies the central position, once states are ordered from most Republican to most Democratic, such that whichever party receives that state's votes will win.

Table 6 shows the calculation of the Proximity Index, which considers not just states which have occupied the pivotal position but also those which were close to the pivotal position. The index awards ten points for each election in which the state occupies the pivotal position, six points for each election a state is one spot away, four points for each election two spots away, etc. The columns to the right of the index itself indicate the origin of the state's index points—i.e. how many times the state was in the pivotal position, one spot away, two spots away, etc. The final two columns in the table indicate which party

Table 6: Calculation of the Proximity Index: the relative proximity of states to the pivotal position in Presidential elections since 1932. The range of scores is 0 to 190, where 0 indicates a state has never been within five spots of the pivotal position and 190 indicates the state has always held the pivotal position.

State	Proximity Index*	Number of times at pivotal position	Number of spots away from pivotal position					State easily carried by (when not close to pivotal)	
			1	2	3	4	5	D	R
Ohio	77	4	3	2	3	0	2	0	5
Michigan	41	3	0	0	2	2	1	6	5
New Mexico	40	0	3	3	1	2	3	4	3
Iowa	37	1	1	3	2	1	1	3	7
Pennsylvania	37	2	1	0	3	0	2	7	4
Illinois	36	2	0	1	1	4	1	6	4
Missouri	33	0	0	6	0	4	1	7	1
Wisconsin	33	1	1	3	1	0	2	6	5
Oregon	30	0	2	3	0	3	0	7	4
Connecticut	27	0	3	2	0	1	1	5	7
Delaware	27	0	2	1	0	4	3	7	2
Florida	27	2	0	0	2	0	1	6	8
New Hampshire	25	0	2	2	1	1	0	0	13
New Jersey	23	1	2	0	0	0	1	4	11
Colorado	21	0	1	1	3	1	0	2	11
New York	20	1	1	1	1	1	0	12	2
Louisiana	19	0	2	1	0	1	1	9	5
Minnesota	18	0	2	1	0	0	2	12	1
Nevada	18	0	2	0	1	1	1	5	9
Maine	17	1	0	0	2	0	1	6	9
California	15	0	1	0	2	1	1	10	4
Idaho	15	0	1	1	1	1	0	1	14
Maryland	15	0	1	1	1	0	2	12	2
Washington	15	1	0	0	0	1	3	12	2
Kentucky	14	0	1	0	1	2	1	8	6
Montana	14	0	1	1	1	0	1	5	10
Tennessee	14	1	0	0	1	0	1	9	7
Alaska	12	0	2	0	0	0	0	3	7
Texas	12	0	0	1	1	2	1	6	8
Wyoming	12	0	0	1	2	1	0	0	15
Massachusetts	9	0	1	0	1	0	0	14	3
Hawaii	6	0	0	1	0	1	0	9	1
Mississippi	6	0	1	0	0	0	0	9	9
South Dakota	6	0	0	1	0	1	0	2	15
Utah	6	0	1	0	0	0	0	4	14
Vermont	6	0	0	1	0	1	0	6	11
West Virginia	6	0	1	0	0	0	0	14	4
Virginia	4	0	0	0	0	1	2	5	11
Arkansas	3	0	0	0	1	0	0	12	6
Georgia	3	0	0	0	1	0	0	10	8
Indiana	3	0	0	0	1	0	0	0	18
Rhode Island	3	0	0	0	1	0	0	16	2
Oklahoma	1	0	0	0	0	0	1	7	11
Alabama	0	0	0	0	0	0	0	10	8
Arizona	0	0	0	0	0	0	0	5	14
District of Columbia	0	0	0	0	0	0	0	11	0
Kansas	0	0	0	0	0	0	0	0	19
Nebraska	0	0	0	0	0	0	0	1	18
North Carolina	0	0	0	0	0	0	0	10	9
North Dakota	0	0	0	0	0	0	0	2	17
South Carolina	0	0	0	0	0	0	0	10	9

* The Proximity Index assigns states ten points for occupying the pivotal position, six points for falling one spot away from the pivotal position, four points for falling two spots away from the pivotal position, three points for falling three spots away from the pivotal position, two points for falling four spots away from the pivotal position, and one point for falling five spots away from the pivotal position.

carried the state in elections where it was not proximate to the pivotal position. This column is important because it shows whether or not these states have tended to be more Democratic or Republican. Ohio, for example, has gone Republican every time it has been more than five spots from the pivotal position. Missouri, on the other hand, has gone Democratic in seven of the eight elections it has been more than five spots from the pivotal position.

Table 7 shows the calculation of the Probability Index, which determines the probability that a state election outcome will be close enough that the state has a chance to occupy the pivotal position. This probability is calculated using the differentials between the state popular vote and the national popular vote for each of the nineteen elections in the data set. For example, if a state goes Democrat by a margin of 5% while the national popular vote goes Republican by a margin of 5%, then the state would be 10% to the Democratic side of the national popular vote. The mean and standard deviation are the test statistics for the differentials calculated using these nineteen elections. A positive mean indicates a tendency of the state to be more Democratic and a negative mean indicates a tendency for as state to be more Republican[16]. The probability of a state lying within one percent of the pivotal position is then calculated by assuming that these test statistics come from a normal distribution.

II. Resolving the Large-State/Small-State debate

A long-running debate surrounding the Electoral College is whether large states or small states are advantaged. The tables provide some insight toward answering this question. The five states which have occupied the pivotal position on more than one occasion (Ohio,

[16] This is true because differentials are calculated by taking the Democratic percentage of the popular vote and subtracting the Republican percentage. Hence positive values indicate a Democratic leaning and negative values indicate a Republican leaning.

Table 7: Calculation of the Probability Index: the probability that a state's popular vote will lie within one percent of the national popular vote.

State	Probability Index*	Proximity Index	Mean*	Standard Deviation*
New Mexico	16.24	40	-0.11	4.86
Ohio	14.08	77	-3.37	3.95
Michigan	12.70	41	0.31	6.32
Missouri	12.61	33	2.19	5.94
Illinois	12.51	36	1.14	6.22
California	11.86	15	3.02	5.94
Oregon	11.56	30	1.63	6.53
Washington	10.84	15	4.48	4.46
Pennsylvania	10.71	37	0.52	7.41
Wisconsin	10.19	33	1.27	7.54
Delaware	9.92	27	0.59	7.81
Kentucky	9.88	14	-0.89	7.82
New Jersey	9.63	23	-2.03	7.90
Maryland	8.86	15	5.28	6.45
Connecticut	8.70	27	-1.08	8.87
Iowa	8.38	37	-2.69	8.91
West Virginia	8.27	6	5.17	7.68
Montana	7.36	14	-2.51	10.50
New York	7.01	20	5.70	9.62
Nevada	6.60	18	-2.60	11.12
Tennessee	6.59	14	2.67	11.41
Colorado	6.54	23	-6.73	5.17
Virginia	6.33	4	-1.34	12.15
Minnesota	6.19	18	7.48	6.50
New Hampshire	5.29	25	-9.11	8.35
Arizona	5.15	0	-5.36	13.12
Maine	4.77	17	-6.21	15.36
Florida	4.74	27	2.45	17.45
Oklahoma	4.73	1	-6.50	15.37
North Carolina	4.58	0	4.89	16.23
South Dakota	4.30	6	-10.76	11.27
Vermont	4.18	6	-8.94	18.19
Alaska	4.17	12	-5.91	18.89
North Dakota	4.02	0	-12.33	12.80
Hawaii	3.98	6	11.98	10.17
Massachusetts	3.63	9	12.27	14.54
Utah	3.02	6	-15.94	18.33
Rhode Island	3.01	3	14.99	12.77
Texas	2.99	12	9.05	25.35
Louisiana	2.90	19	11.98	27.26
Arkansas	2.80	3	14.42	20.48
Idaho	2.78	15	-16.74	12.93
Wyoming	2.77	12	-15.09	10.97
Georgia	2.39	3	17.13	30.86
Alabama	2.23	0	7.41	32.66
Mississippi	1.93	6	10.86	44.00
South Carolina	1.88	0	12.71	36.90
Nebraska	0.81	0	-20.43	9.45
Indiana	0.40	3	-10.21	3.47
Kansas	0.34	0	-17.38	6.48
District of Columbia	0	0	71.72	10.69

*Mean and standard deviation are test statistics calculated from the partisan differentials between the state popular vote and the national popular vote. A positive mean indicates the state tends to fall to the Democratic side of the national popular vote, a negative mean indicates the state tends to fall to the Republican side of the national popular vote. By assuming that these test statistics come from a normal distribution, we can then calculate the probability that a state's partisan differential will lie less than one percent away from the national partisan differential.

Michigan, Florida, Illinois and Pennsylvania) are all large states which had seventeen or more electoral votes in the 2004 election.

This pattern of large-state bias holds, but to a lesser extent with Tables 6 and 7, which display the results for the Proximity Index and the Probability Index respectively. While there is still an abundance of large states scoring quite highly on these indices (Ohio, Michigan, Illinois, and Pennsylvania especially), the top of these lists is also sprinkled with smaller states (New Mexico, Iowa, Missouri, Wisconsin, etc.). I should note that this is partially because these indices minimize the impact of larger electoral vote totals—for example, while more electoral votes make it more likely that a state will occupy the pivotal position, these additional electoral votes have no impact on the likelihood of a state lying one spot away from the pivotal position. Similarly, with the Probability Index, no consideration is given to size—the index only considers competitiveness.

Despite this limitation, some important conclusions can be drawn, particularly from the Proximity Index. While state size can be a tremendous advantage, that size is only beneficial to that state if it has a tendency to be competitive. California is now the largest state with fifty-five electoral votes and has yet to occupy the pivotal position. This can be attributed to a tendency to be less competitive than other large states such as Ohio and Michigan, and also somewhat to bad luck (it ranks 6th on the Probability Index, indicating that the state's election results don't tend to stray too far from the national average). Additionally, smaller states have occupied the pivotal position on a handful of occasions—Iowa, Maine, Oregon, Tennessee, Washington and Wisconsin have all done so once.

Thus, while the combination of size and a tendency to be competitive marks those states which have had the most power within the Electoral College, the more important aspect appears to have been this tendency to be competitive. Those states which are

consistently track with national swings and lie close to the pivotal position have possessed and will continue to possess power within the Electoral College disproportionate to their size. The reverse is also true—those states which have partisan leanings which push them away from the pivotal position will have less power than their size should grant them.

The remainder of my analysis, then, will focus on the tendency of certain states to remain competitive over a long period of time and the tendency of certain states to display partisan tendencies which prevent them from lying close to the pivotal position. While this paper is not concerned with partisan behavior of states as an end in itself, this partisan behavior highlights states which are more politically homogenous and, therefore, disadvantaged by the Electoral College.

III. Competitiveness and Partisan Orientation

An additional table, Table 8, provides an overview of the partisan paths of each state as well as the eras in which they were most competitive. Boxes that are blacked out indicate that the state occupied the pivotal position in that election year. Those boxes with numbers indicate how close the state came to occupying the pivotal position. Positive numbers indicate that the state fell to the Democratic side of the pivotal position and negative numbers indicate that the state fell to the Republican side of the pivotal position. Thus, an entry of "2" indicates the state was two spots to the Democratic side of the pivotal position, while an entry of "-3" indicates the state was three spots to the Republican side of the pivotal position. Finally, the bulk of the entries within the table are either D's or R's indicating that the state lied substantially to either the Democratic or Republican side of the pivotal position respectively. Both the numbers as well as the D's and R's are color coded

Table 8: Relative proximity of states to the pivotal position election-by-election beginning in 1932.*

State	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	00	04	Proximity Index
AL	D	D	D	D	R	D	D	D	R	D	R	D	D	R	R	R	R	R	R	0
AK								R	D	-1	-1	D	R	R	D	R	R	R	R	12
AZ	D	D	D	D	D	R	R	R	R	R	R	R	R	R	R	R	R	R	R	0
AR	D	D	D	D	D	D	D	D	R	3	R	D	D	R	R	D	D	R	R	3
CA	3	D	D	D	-1	R	D	-5	R	-3	D	R	R	4	D	D	D	D	D	15
CO	-3	4	D	R	D	R	R	R	-3	R	R	R	R	R	1	-3	R	R	-2	23
CT	R	R	1	1	R	-2	R	D	D	D	5	R	-1	R	4	2	D	R	D	27
DE	R	R	4	5	-5	D	D	2	-4	-4	1	D	D	-1	-5	4	D	D	D	27
DC									D	D	D	D	D	D	D	D	D	D	D	0
FL	D	D	D	D	D	3	[redacted]	R	R	R	R	D	R	R	R	R	-5	[redacted]	-3	27
GA	D	D	D	D	D	D	D	D	R	R	R	D	D	-3	R	R	R	R	R	3
HI								-4	D	D	R	2	D	D	D	D	D	D	D	6
ID	2	D	3	-4	1	R	R	R	R	R	R	R	R	R	R	R	R	R	R	15
IL	-4	-4	R	-5	[redacted]	4	R	-3	R	-2	4	R	[redacted]	D	D	D	D	D	D	36
IN	R	R	R	R	-3	R	R	R	R	R	R	R	R	R	R	R	R	R	R	3
IA	[redacted]	R	R	R	2	R	R	R	-2	R	D	-4	-5	D	D	1	3	3	2	37
KS	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	0
KY	1	-3	D	D	D	D	D	R	D	R	R	D	D	-5	-4	-4	R	R	R	14
LA	D	D	D	D	D	D	2	D	R	D	R	D	5	R	-1	-1	4	R	R	19
ME	R	R	R	R	R	R	R	R	D	D	[redacted]	-3	D	R	-3	5	D	D	D	17
MD	D	5	D	-3	R	-1	R	D	D	5	-2	D	D	D	D	D	D	D	D	15
MA	R	R	-1	3	D	D	R	D	D	D	D	D	D	D	D	D	D	D	D	9
MI	R	-5	R	R	R	[redacted]	4	4	D	D	D	R	3	[redacted]	[redacted]	3	D	D	D	41
MN	D	D	R	2	D	1	D	1	5	D	D	D	D	D	D	D	D	5	D	18
MS	D	D	D	D	D	D	D	D	R	D	R	1	R	R	R	R	R	R	R	6
MO	D	2	-4	R	D	D	D	-2	D	2	-4	5	2	-2	D	D	-4	-2	-4	33
MT	5	D	D	D	D	R	1	D	R	R	2	R	R	R	3	R	R	R	R	14
NE	D	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	0
NV	D	D	D	D	3	R	-1	D	R	R	R	R	R	R	R	-5	R	-4	-1	18
NH	R	R	-2	-2	R	R	R	R	3	R	R	R	R	R	R	R	1	-1	4	25
NJ	R	-1	R	R	R	R	R	[redacted]	D	1	-5	R	R	R	R	R	D	D	D	23
NM	D	D	5	4	D	2	-2	-1	-5	R	-3	R	R	-4	5	D	-2	1	1	40
NY	-5	-2	R	[redacted]	-4	-3	R	D	D	D	D	D	D	D	D	D	D	D	D	20
NC	D	D	D	D	D	D	D	D	R	R	R	D	D	R	R	R	R	R	R	0
ND	D	D	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	0
OH	R	[redacted]	-5	R	-2	-5	R	R	1	[redacted]	[redacted]	-1	-3	1	-2	R	-3	-3	[redacted]	77
OK	D	D	D	D	D	D	D	R	R	R	R	-5	R	R	R	R	R	R	R	1
OR	4	D	2	-1	R	R	D	R	4	R	D	-2	-2	D	D	D	-1	4	D	30
PA	R	R	[redacted]	R	R	D	3	5	D	D	3	3	1	D	D	D	[redacted]	D	5	37
RI	R	R	D	D	D	D	-3	D	D	D	D	D	D	D	D	D	D	D	D	3
SC	D	D	D	D	D	D	D	D	R	R	R	D	D	R	R	R	R	R	R	0
SD	D	R	R	R	R	R	-4	R	R	R	D	R	R	R	2	R	R	R	R	6
TN	D	D	D	D	D	D	D	R	R	R	R	D	D	3	R	[redacted]	R	-5	R	14
TX	D	D	D	D	D	D	5	3	2	4	R	4	R	R	R	R	R	R	R	12
UT	-1	D	D	D	D	R	R	R	R	R	R	R	R	R	R	R	R	R	R	6
VT	R	R	R	R	R	R	R	R	D	R	R	R	4	2	D	D	D	D	D	6
VA	D	D	D	D	D	-4	-5	R	R	R	R	R	R	R	R	R	R	R	-5	4
WA	D	D	D	D	D	5	D	R	[redacted]	D	D	R	-4	5	D	D	5	D	D	15
WV	R	1	D	D	D	D	D	D	D	D	R	D	D	D	D	D	D	R	R	6
WI	D	D	R	R	5	R	R	R	-1	-5	D	[redacted]	D	D	D	-2	2	2	3	33
WY	-2	3	-3	R	4	R	R	R	R	R	R	R	R	R	R	R	R	R	R	12

* Blacked out squares indicate states which occupied the pivotal position. Number within the table indicate how close the state was to the pivotal position (negative numbers indicate the state fell to the Republican side, positive numbers indicate the state fell to the Democratic side). "R" indicates that the state fell to the Republican side of the pivotal position but was not proximate, and "D" indicates that the state fell to the Democratic side of the pivotal position but was not proximate.

(blue for Democrat and red for Republican) to make the table easier to read. The final column includes the Proximity Index, which is calculated according to the method explained above.

The states break down into three broad categories: those which are competitive on a regular basis (or at least for an extended period of time up until the present), those which are uncompetitive because they are Republican strongholds and those which are uncompetitive because they are Democratic strongholds. This broadly drawn separation of states is not very precise but it will be used, nevertheless, to provide a stable organization of states. Table 9 provides a breakdown of those states by basic party affiliation. It should be noted that the length of the Republican list is far longer than that of the Democratic list because of the electoral vote distributions of the states making up those lists—the Democratic list includes far more states with large electoral vote totals (i.e. California, Illinois, etc.).The ordering of the states is done alphabetically and indicates nothing as to the relative degree of partisan preference.

Within each of these divisions, particular groups of states which have exhibited similar electoral behavior over the course of elections will be identified. These groupings will highlight particular electoral characteristics of each of the fifty states and the District of Columbia without having to devote attention to each state individually. Moreover, these groupings provide the basis for a better understanding of patterns of electoral preference throughout the country. The South (defined by many political commentators as the southeastern-most thirteen states), for example, does not always act as one ideological unit but rather as a series of smaller units, which will be discussed below.

Table 9: Breakdown of states by partisan tendencies.

Republican Stronghold	Competitive	Democratic Stronghold
Alabama	Connecticut	California
Alaska	Florida	Delaware
Arizona	Iowa	District of Columbia
Arkansas	Michigan	Hawaii
Colorado	Missouri	Illinois
Georgia	New Mexico	Maine
Idaho	New Hampshire	Maryland
Indiana	Ohio	Massachusetts
Kansas	Oregon	Minnesota
Kentucky	Pennsylvania	New Jersey
Louisiana	Wisconsin	New York
Mississippi		Rhode Island
Montana		Vermont
Nebraska		Washington
Nevada		
North Carolina		
North Dakota		
Oklahoma		
South Carolina		
South Dakota		
Tennessee		
Texas		
Utah		
Virginia		
West Virginia		
Wyoming		

IV. Republican States

The following table provides an overview of four sub-groupings within the Republican stronghold states. These sub-groupings consider both when the state became a Republican stronghold as well as the degree to which it has acted as a Republican stronghold. Those states within the Absolute Republican Stronghold group are states which have been Republican strongholds since the beginning of the period under analysis. Those states within the "R52" group have been Republican strongholds since the 1952 election.

Those states within the "South" group are Southern states (or states which have behaved similar to Southern states) which have been Republican strongholds beginning with the 1964 election. Finally, Oklahoma and West Virginia are in an "Other" category because they have not followed a pattern similar to those of the other states. Again, states within each column are listed alphabetically.

Table 10: Sub-groupings among Republican stronghold states.

Absolute Republican Strongholds (ARS)	**Republican Strongholds since 1952 (R52)**	**South**	**Other**
Indiana	Arizona	Alabama	Oklahoma
Kansas	Colorado	Alaska	West Virginia
Nebraska	Idaho	Arizona	
North Dakota	Montana	Arkansas	
South Dakota	Nevada	Georgia	
	Utah	Kentucky	
	Wyoming	Louisiana	
		Mississippi	
		North Carolina	
		South Carolina	
		Tennessee	
		Texas	
		Virginia	

A. Absolute Republican Strongholds (ARS)

The five states included within the Absolute Republican Stronghold (hereafter ARS) column are those states which have been Republican strongholds for essentially the duration of the data set. Two of these states, Indiana and Kansas, have fallen to the Republican side of the pivotal position in each of the nineteen elections considered. Nebraska has fallen to the Republican side of the pivotal position in eighteen straight elections (beginning in 1936) and North Dakota has fallen to the Republican side of the pivotal position in seventeen straight elections (beginning in 1940). Only South Dakota has displayed somewhat deviant

behavior, falling to the Democratic side of the pivotal position in 1932, 1972 (when George McGovern, a Senator from the state, was the Democratic presidential nominee) and 1988.

As a group, these states are the least competitive states in the Electoral College. None of them has occupied the pivotal position, and only two of the states, Indiana and South Dakota, have fallen within five spots of the pivotal position. This is not just a case of bad luck—the second index, which constructs a distribution using all nineteen election outcomes, shows these five states all scoring near the bottom: Kansas (0.34, 50th), Indiana (0.40, 49th), Nebraska (0.81, 48th), North Dakota (4.02, 34th) and South Dakota (4.30, 31st). Moreover, it does not appear as if any of these states is trending toward the pivotal position—Indiana was the closest in the 2004 election, lying 17.24% to the Republican side of the national popular vote.

The consistency with which these states have been handily carried by Republican candidates indicates not just a party bias, but a political homogeneity which casts doubt upon their ability to play a pivotal role in any presidential outcomes for decades to come. This problem is compounded because these five states see relatively low turnover in their populations as they are not popular destinations for either immigration or emigration. Thus, it is safe to conclude that these states have been substantially disadvantaged by the workings of the Electoral College, and this disadvantage will continue into the indefinite future.

B. South

The block of Southern states (and those which have behaved as Southern states, such as Alaska) is the most difficult to analyze. While a great deal of popular discussion of electoral politics treats this group of states as a single monolithic unit, distinct differences in behavior emerge, as shown in Table 8, such that further division will better inform

subsequent analysis. There are four separate groups identified within the following table (Table 11). "Deep South" refers to those states which have behaved as Republican strongholds since the 1964 election. "Moderate Deep South" states have behaved similarly to those states within the "Deep South", except they have been more competitive. "R80" refers to those states which have behaved as Republican strongholds beginning in 1980. Finally, Virginia defies classification, as it is a Southern state, but made the transition to a Republican stronghold in 1952, twelve years before the other Southern states.

Table 11: Sub-groupings within the Southern block of states.

Deep South	R80	Moderate Deep South	Other
Alabama	Alaska	Arkansas	Virginia
Georgia	Texas	Kentucky	
Mississippi		Louisiana	
North Carolina		Tennessee	
South Carolina			

i. Deep South

The states comprising the "Deep South" group rate just behind the "ARS" states mentioned above in the degree to which they are disadvantaged by the Electoral College. Only Georgia (in 1984) and Mississippi (in 1976) have fallen within five spots of the pivotal position on any occasion. Moreover, these states consistently rank near the bottom on the second index: South Carolina (1.88, 47th), Mississippi (1.93, 46th), Alabama (2.23, 45th), Georgia (2.39, 44th), North Carolina (4.58, 30th).

Unlike the aforementioned "ARS" block, however, these states have been both Republican *and* Democratic strongholds during the period under consideration. Each of these states definitively switched from the Democratic to the Republican column in 1964, following the enactment of the Civil Rights Act by Lyndon Johnson and Barry Goldwater's

successful attempt to cement a lasting Republican majority in the South. Each of these states has remained in the Republican column with the exception of the 1976 and 1980 elections, when the presence of Jimmy Carter, who had served as Governor of Georgia, swung these states to the Democratic side of the pivotal position (excluding Mississippi in 1980).

The similarity between the "Deep South" and "ARS" blocks of states is that both demonstrate a high degree of political homogeneity. When the states swung in their partisan preference, the data indicates that they did so in a violent manner. It therefore appears unlikely that they will make the gradual transition which would allow them to lie at or near the pivotal position. As with the "ARS" block of states, this means the Electoral College has relegated these states to practical irrelevancy and is likely to do so into the future.

ii. Moderate Deep South

The states constituting the "Moderate Deep South" have followed a similar political trajectory to those of the "Deep South" in one important respect—they switched from being relatively safe Democratic states to being relatively safe Republican states in 1964. However, they have been far more competitive than those aforementioned states. While only Tennessee has occupied the pivotal position, all of them have been proximate on a number of occasions, as indicated by the Proximity Index: Louisiana (19, 17th), Kentucky (14, 25th), Tennessee (14, 25th) and Arkansas (3, 39th).

Moreover, Kentucky and Tennessee rank especially high on Index 2: Kentucky (9.88, 12th) and Tennessee (6.59, 21st). Louisiana and Arkansas rank substantially lower, but a closer examination of these data indicates that this low ranking is greatly due to the due to the distance of the state's position—to the Democratic side—from the pivotal position prior to

1964. In recent elections, Louisiana and Arkansas have tended to lie as close or closer to the national popular vote than Kentucky and Tennessee.

All four of these states have transformed into swing states with the presence of an identifiably Southern candidate—both Jimmy Carter and Bill Clinton either brought the states within a few percentage points of the national popular vote or made them into Democratic strongholds. The presence of Al Gore on the Democratic ticket in 2000 did not have this effect. It is hard to say for sure why this happened, but some possible explanations would be his decision to distance himself from the popular Southern incumbent, Clinton, and the presence of another Southern candidate on the opposing ticket in George W. Bush.

Thus, these states could be considered moderately more competitive than those composing the "Deep South" block. The election results indicate a greater degree of political heterogeneity which offers a greater possibility for approaching pivotal status. Nevertheless, these states still display a tendency to drift away from the pivotal position such that it can safely be stated that they are disadvantaged by the Electoral College.

iii. R80

Texas and Alaska are included within this Southern grouping although they aren't traditionally considered Southern states (indeed, Alaska is geographically the least southern state in the Union). However, they became enduring Republican strongholds at approximately the same time as those states within the "Deep South" block. Both Texas and Alaska had been quite competitive in the two decades preceding the 1980 election.

C. Republican Strongholds Since 1952 (R52)

The seven states composing the "R52" block all made a definitive swing toward the Republican Party in the 1952 election. It is difficult to determine the cause of this swing, as

there is a lack of scholarly literature answering that question. Since that election, these states have functioned as Republican strongholds with only a few exceptions. These states have not been quite as uncompetitive as those composing the "ARS" and "Deep South" blocks, but do not rank particularly well on either index. Colorado ranks the highest on the Proximity Index (21, 15th) while Utah ranks the lowest (6, 32nd). Montana ranks the highest on the Probability Index (7.36, 18th) while Wyoming ranks the lowest (2.77, 43rd).

In recent years two of these states, Nevada and Colorado, have tended to lie closer to the pivotal position—an indication that they may soon join the group of "Competitive" states. In 2004, for example, Nevada was only one spot to the Republican side of the pivotal position and Colorado was only two spots to the Republican side of the pivotal position.

V. Democratic States

Those states within the Democratic column are far more difficult to separate than those within the Republican column because they became Democratic strongholds on a more gradual basis while Republican strongholds were, more or less, formed by the elections of 1952 and 1964. Instead of breaking the states down into sub-groupings, Table 12 lists each state with the year in which it began to behave as a solidly Democratic state.

Within this group of Democratic states, there are a few interesting cases to note. The first is the District of Columbia, which has been carried by the Democratic candidate by an unusually large margin in each of the elections since it was granted electoral votes in 1964. The District, according to both indices, ranks as the singularly least competitive member of the Electoral College. Nor is the District trending toward becoming more competitive—the 2004 election marked the second furthest the District has been from the pivotal position since 1964.

Table 12: Democratic states listed by year they became Democratic strongholds.

State	Year
Rhode Island	1940
Minnesota	1944
Massachusetts	1960
New York	1960
District of Columbia	1964
Maryland	1976
Hawaii	1980
Vermont	1980
Illinois	1984
Washington	1984
California	1988
Delaware	1992
Maine	1992
New Jersey	1996

The second state of interest within this group is Minnesota. In eighteen of the nineteen elections, Minnesota has fallen to the Democratic side of the pivotal position. Yet, Minnesota has remained remarkably competitive despite this partisan leaning. The state ranks above average on both the Proximity Index (18, 18th) and the Probability Index (6.19, 24th). In this sense, then, the state is a less competitive version of Ohio—it has a tendency to be close despite a consistent partisan leaning.

Finally, there are the cases of Illinois, California and New York. These three states were among the most competitive states in the country before becoming Democratic strongholds. They score quite well on the both the Proximity Index—Illinois (36, 6th), New York (20, 16th), and California (15, 21st)—and the Probability Index—Illinois (12.51, 5th), California (11.84, 6th) and New York (7.01, 19th). Nevertheless, they have subsequently become strongly Democratic; in the 2004 election, California was the most competitive of these large Democratic states, but was still 13.39% to the Democratic side of the national popular vote.

VI. Competitive States

How is it possible that thirty-nine states and the District of Columbia are all losers under the Electoral College? Because the remaining eleven states have been and will likely continue to be huge winners. The following table isolates the states which have been competitive on a consistent basis. Note that this does not mean that they were competitive states (i.e. close to the pivotal position) in every election, but more essentially that they have shown a tendency to drift back toward the pivotal position when they have strayed.

Table 13: The performance of the competitive states on the two indices.

State	Pivotal Positions	Proximity Index*	Probability Index**
Ohio	4	77 (1)	14.08 (2)
Michigan	3	41 (2)	12.70 (3)
New Mexico	0	40 (3)	16.24 (1)
Iowa	1	37 (4)	8.38 (16)
Pennsylvania	2	37 (4)	10.71 (9)
Missouri	0	33 (7)	12.61 (4)
Wisconsin	1	33 (7)	10.19 (10)
Oregon	1	30 (9)	11.56 (7)
Connecticut	0	27 (10)	8.70 (15)
Florida	2	27 (10)	4.74 (28)
New Hampshire	0	25 (13)	5.29 (25)

*Score for each state on the Proximity Index with the state's rank on the index in parentheses. The index measure the frequency with which the state has been close to the pivotal position.
**Score for each state on the Probability Index with the state's rank on the index in parentheses. The index measures how closely the state tracks with national partisan swings.

A. Ohio

Among these eleven competitive states, Ohio stands out as easily the most competitive. It has occupied the pivotal position on four occasions, ranks far above the other states on the Proximity Index (with a total nearly twice as high as Michigan, the closest state), and ranks second on the Probability Index. In this context, the truly pivotal role of Ohio in determining the 2004 election outcome (if Kerry had carried the state then he would have been elected President), is hardly surprising.

Despite this competitive history, Ohio has shown a tendency to fall to the Republican side of the pivotal position. In two of the elections examined, Ohio fell one spot to the Democratic side of the pivotal position, it has occupied the pivotal position four times and has fallen to the Republican side of the pivotal position a total of thirteen times. Few other states have fallen to the Republican side of the pivotal position with such regularity, and yet Ohio still manages to remain competitive enough that it has been within five spots of the pivotal position on all but five occasions. The explanation for this behavior lies in the distribution of state outcomes relative to the national popular vote. Ohio's mean outcome is -3.37, or 3.37% more Republican than the national popular vote with a standard deviation of 3.95% (the smallest of any states in the data set). Thus, Ohio has displayed the most stable, predictable partisan behavior of any of the states within the data set. And the state appears to be becoming more competitive with time—it has occupied the pivotal position three times in the last eleven elections and has been within three spots of the pivotal position in ten of those elections.

B. Michigan, Iowa, Missouri, Wisconsin

The most identifiable group of states within the competitive states is the Midwest. The geographic concentration of these four states as well as Ohio has made this region a campaign hot-spot. Moreover, the states share common interests on a number of issues—particularly those related to agriculture. Michigan is the member of this group which most merits separate consideration, as the tremendous importance of the automobile industry distinguishes their electoral priorities from those of Iowa, Missouri and Wisconsin.

C. Florida and New Hampshire

Florida and New Hampshire are grouped together despite their lack of geographical proximity and extreme size difference because they have shared partisan tendencies. Both states have been Republican strongholds for the bulk of the data set, but have been incredibly competitive in the last three election cycles (1996-2004). Both states have been within five spots of the pivotal position in all three elections and Florida famously (or infamously) occupied the pivotal position in 2000. Both states rank toward the middle of the two indices but are likely to play a crucial role in upcoming elections, justifying their inclusion within the "Competitive" state grouping.

D. The Rest

The remaining states (New Mexico, Pennsylvania, Oregon and Connecticut) lack the clear identifying characteristics of the previously listed states and, thus, are listed separately. These states represent great geographical diversity as well as varying performances on both the Proximity and Probability indices. New Mexico performs quite well on both indices—ranking first on the Probability Index, and third on the Proximity Index—despite never having occupied the pivotal position. This case most clearly shows the utility of the indices by uncovering a state which is often overlooked in popular discussion and does not show up as having occupied the pivotal position.

Pennsylvania occupied the pivotal position in 1996, and also ranks quite well on both the Proximity Index (37, 4th) and the Probability Index (10.71, 9th). Oregon and Connecticut do not perform quite as strongly on the two indices, and both fell to Democratic side of the pivotal position in the 2004 election. Nevertheless, both states have sufficiently competitive histories that one would expect them to be close to the pivotal position in the near future.

Chapter 6: Conclusion

In this paper, I have developed new empirical measures of voting power which I believe provide a more accurate understanding of biases present in the Electoral College. These indices focus on the importance of occupying the pivotal position. Once states are ordered from most Republican to most Democratic, the pivotal state is that which occupies the central position, such that whichever party receives their votes will emerge victorious. The Proximity Index considers states which have occupied the pivotal position, or been close to occupying the pivotal position. The Probability Index examines how closely a state's popular vote tracks with the national popular vote—those states which track closely will be more likely to occupy the pivotal position.

These indices represent an improvement upon previous measures of voting power for three reasons. First, traditional *a priori* measures require unrealistic assumptions about the behavior of voters by ignoring known partisan tendencies of voters in particular states. The new empirical measures, however, do draw upon concepts developed as part of these *a priori* measures. In particular, I focus on the importance of states occupying the pivotal position, a concept central to the Shapley-Shubik Index. Second, these indices represent an improvement upon previous empirical measures of voting power by simplifying the calculation to only consider partisan orientation of a state, potentially distracting information is omitted. Finally, these indices represent an improvement upon previous measures of voting power because they are dynamic, allowing for changes in the partisan tendencies of states over time.

Applying these new voting power indices to Presidential election data from 1932 to present provides partial confirmation of the findings of *a priori* measures—large states do

appear to be advantaged by the Electoral College. However, these indices reveal a significant qualification to this bias: states must be politically heterogeneous in order to exercise this additional leverage. Large states (such as New York, California and Illinois in recent elections) which are carried by one party by a large margin and on a consistent basis**,** possess less voting power than small states where the two parties are more competitive (such as Iowa, New Mexico, Missouri and Wisconsin). Moreover, this finding corresponds closely to what we observe on the campaign trail, where "swing states" receive the bulk of the attention from Presidential candidates.

A second, more unexpected finding, was that the process of ordering states according to partisan tendency revealed electoral tendencies and trends which could inform Presidential campaign strategy in upcoming elections. In Chapter 5, the most competitive eleven states were identified, as well as other states which could become competitive states in the near future (such as Colorado, Nevada, Louisiana and Arkansas).

This research raises some interesting questions as well. First, it would be instructive to know the impact of the assigned weights on the Proximity Index. What would happen if the index placed more importance on occupying the pivotal position itself? What if the index further de-emphasized occupying the pivotal position relative to proximal positions. Second, findings of bias could be more conclusive if more elections were considered. If the data set was expanded beyond elections since 1932, would the findings be different? This additional analysis would tell us more about both the large-state versus small-state debate as well as whether advantages enjoyed by particular states in recent elections have been persistent throughout the history of the Presidency.

Despite these questions, this analysis has much to offer in the context of renewed debate over the Electoral College, as states around the country argue the merits of an

interstate compact which would effectively abolish the Electoral College. For some states, of course, it's quite clear how the Electoral College affects them; it doesn't take an analysis of voting power to know that Ohio and Florida are advantaged by the Electoral College, while Indiana and Kansas are disadvantaged. The analysis of voting power, however, does help separate the relative influence of states not so clearly advantaged or disadvantaged.

Accordingly, this analysis of voting power has two uses. First, it can potentially inform citizens and state legislatures what course of action would be in their best interest. States, such as Connecticut and Oregon, which are not commonly recognized as states advantaged by the Electoral College but perform quite well on both the Probability and Proximity indices, could find this analysis of tremendous use.

Second, this analysis offers predictive insight as to how likely different states are to agree to the proposed interstate compact. We would intuitively expect that those states most disadvantaged by the Electoral College would be more likely to join the compact and those most advantaged by the Electoral College would be less likely to join the compact. The party-line votes in the California legislature indicate that partisan concerns will also play a part in determining which states choose to adopt the compact. While it's tough to tell if the compact will eventually enter into force, the two indices suggest most states would emerge winners under the compact and a select few states (i.e. the eleven "Competitive" states, as identified in Chapter 5) would emerge as big losers.

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