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Spring June 3rd, 2016

Height in Politics: The Role of Height in Electoral Success in the State of Washington

Joseph Wayne Rebbe
Seattle Pacific University

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HEIGHT IN POLITICS: THE ROLE OF HEIGHT IN ELECTORAL SUCCESS IN THE STATE OF

WASHINGTON

by

JOSEPH W. REBBE

FACULTY ADVISOR, DR. CALEB HENRY

SECOND READER, DR. RODNEY STILING

A project submitted in partial fulfillment of the requirements of the University Scholars

Program

Seattle Pacific University

2016

Approved: _____Dr. Jeff Keuss_____

Date:_____

Abstract: Throughout the history of American presidential elections, the height of candidates has proven to be a statistically significant factor relative to success. This analysis examines whether the same trend applied to Washington State elections over the period 1994-2014. Ultimately, the data shows that Washington electoral results are not subject to change on the basis of candidate height – Washington elections do not reflect the presidential election trend.

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Acknowledgements

An immense thank you to all of the dedicated professors who made this project come together. A first thank you to Adrienne Meier, who assisted with the preliminary research of the project and gave me some brainstorm ideas that got me off the ground.

This project would not have been possible without the guidance of Dr. Caleb Henry. From helping formulate the breadth and depth of the study, to keeping me on pace to finish throughout the year, to refining the final product, Dr. Henry has been crucial to the project's success. Dr. Henry's insights on the nature of American politics partially inspired my interest on this topic, and his knowledge of political science writing styles greatly influenced my own brand of writing.

Also deserving of thanks is Dr. Rod Stiling. Dr. Stiling served as a superb mentor and brought me up in the History discipline when I decided to add it as a second undergraduate major. Dr. Stiling taught me the importance of perspective in academic work and the reality of methodological constraints in any given discipline. Dr. Stiling heavily impacted the style and format of this project's literature review.

An extra special thank you to Dr. Katya Drozdova, who aided in the project's statistical analysis content. Dr. Drozdova's knowledge of proper data selection, statistical integrity, and correlative functions was paramount to the project's completion. Even though she was not a reader for the project, Dr. Drozdova dedicated time and energy over multiple quarters to help me properly prepare, effectively obtain, and wholly understand the data.

1. Introduction

1.1 Research Question and Objectives

Since 1929, the Office of the Press Secretary has served as a bridge between the president and the media. As politicians like Howard Dean can attest, a simple slip of the tongue can derail a career. Thus, those with the ability to handle the press and positively spin negative news find employment in all areas of the political spectrum. Public image is an unfortunate but prevalent part of American politics.

This project seeks to discover how prevalent that role is. Public image as a concept is far too broad to analyze with any particular project, so this essay will focus purely on the physical height of candidates. The study aims to determine what role height has on electoral success. A potential relationship between these factors has been postulated and substantiated by many scholars. While the majority of previous studies focus on the presidential elections, this research will apply this analysis to elections in the state of Washington.

This project will answer the question: does height affect a candidate's electoral success in Washington State? Washington electoral history is a unique case study for this topic, as many elections in recent decades were between male and female candidates of starkly differing heights. Unlike presidential elections, which historically have featured two males in all general elections (2016 notwithstanding), Washington provides electoral gender diversity. Moreover, both Republican and Democrat ideologies permeate Washington. Metropolitan Seattle is predominantly progressive with like-minded counties along the coast, while the larger Eastern half of the state largely votes conservative (WA Secretary of State Office, 2012). The balance

aids this research by preventing large imbalances of voting data from affecting the eventual results.

This project's primary objective is to ascertain the extent of "heightism" in the Washington electoral world. Conclusions from myriad social scientists, as denoted in the literature review below, deem that tall individuals are unfairly pre-selected for success by their peers and superiors. "Heightism," the neologism pertaining to this phenomena, is rampant throughout social interactions, the business world, and the political arena. One would expect height-based discrimination to be a foreign concept in a progressive state like Washington (WA House Democrats, 2013). Confirmation or disavowal of heightism in Washington, via the results of this study, could inform Washington's commitment to progressive equality.

Secondarily, the study will offer a note on gender-specific heightism. Research that concerns only presidential elections is intrinsically self-contained: only men appear in the data set. Washington's past two decades have seen numerous women rise to political prominence, such as longstanding Senator Patty Murray and former governor Christine Gregoire. By analyzing a state that has elected many female candidates to political office, it may be possible to determine the extent to which heightism affects both genders.

Furthermore, multi-gendered races (where the two runoff candidates include one male and one female), provide a platform to analyze elections where gender is not a controlled variable. Washington has featured such races myriad times during the period 1994-2014. In these circumstances, it may be possible to find out if heightism applies differently. If shorter female candidates can consistently beat taller male candidates, it could effectively nullify any understanding of heightism in such races. This possibility represents the "null hypothesis" that

the data will be testing. Ultimately, studying Washington state allows for more gender-diverse

data, expanding upon the necessarily limited analysis of entirely male-dominated presidential

elections.

2. Literature Review

Height has been a consistent subject of query for academics across multiple disciplines.

The data show correlation between height and success in most realms of interpersonal

interaction. Common thought holds that taller individuals are better communicators and are

more easily able to impose on others. Plentiful research in multiple fields exists affirming that

resolution. This literature review will explore articles pertaining to the role of height in the

business and social worlds, leading into a detailed overview as to the status quo of height in the

political world. The extrapolations from this review will then provide a springboard for the

statistical analysis portion of the essay.

2.1 The Significance of Height

Communication and psychology literature alike tell of human beings' intrinsic

association between height and leadership qualities. Taller men, in particular, experience a

plethora of advantages related to their height. Such height-proficient men tend to be physically

stronger (Carrier 2011; Set et all. 2009), maintain a higher capacity for dominating submissive

individuals of their respective social groups (Maner and Baker 2007), react more temperately to

assertive signals from rival men (Watkins et all. 2010), and feel less social envy than shorter

men do (Buunk et all. 2008). This research highly suggests that taller men are "more likely to

emerge in leadership positions and attain high social status within groups and broadly within society" (Stulp et all. 2012).

Height aids success in the business world. Tall businessmen, especially, tend to receive more frequent promotion (Melamed and Bozionelos 1992), higher starting salary (Loh 1993), and larger overall earnings (Judge and Cable 2004). These studies touch on the personal success aspect of height, but the trends also expand to areas of management and leadership (Gawley, Perks, Curtis 2009). Business people assume height is correlative to the fundamental management skill of effective interpersonal communication.

The notion of height has even become embedded in the diction of language (Geissner and Schubert 2007). Descriptors like "large," "up," and "above" connote height with authority, while the antonym set, "small," "down," "below," indicate subordinance. A "Big Man" conveys the simultaneous idea of muscular build and elevated social status – indeed, men in leadership roles on average tend to be physically big men (Ellis 1992). In this way, linguistic cues reveal more of the role of height in society.

Why does height have such a strong correlate to occupational success? Researchers identify definitive patterns in nature that classify height as one of the most primordial advantages in the life cycle. Taller animals win more fights (Archer 1988) and generally obtain higher social status (Anderson 1994; Ellis 1994) than smaller animals. The evolutionary predilections persistent throughout all creatures illuminate the basic advantage of size, and human beings promote that quality accordingly.

Thus, height matters. A bevy of literature shows that the general population associates height with authority and status. Though developed nations in globalized society mitigate situations for their citizens that require physical strength to survive, developed societies still put a premium on physical stature. The research so far demonstrates society's inherent predisposition for taller men.

2.2 Height in Politics

This social, biological, and cognitive concept extends into the American political arena. United States citizens actively associate height with leadership. In fact, the bond is so strong that many researchers have discovered a reverse corollary: leaders are often perceived to be taller than their height. Supporting research arises from the Kennedy-Nixon race, a landmark paradigm shift in public opinion of American politics. Surveys from before the election found that 52.7% of Nixon voters believed him taller than Kennedy, while 68.1% of Kennedy voters thought him the taller of the two (Kassarjian 1963). Though Kennedy was taller in reality, the information shows that the majority of each candidates' supporters perceived him to be the taller candidate. Similarly, the American public perceived Jimmy Carter as taller than Nixon at the time of Nixon's fall from grace (Singleton 1978). These studies concur with the general trend that voters perceive candidates they oppose as shorter than those they favor (Sorokowski 2010). Again, the correlation strengthens – people assume that the candidate they perceive as the best leader is also taller than the opposition.

The quintessential research concerning the embeddedness of leadership preconceptions into the human psyche comes from Murray and Schmitz (2011). The researchers tested average

citizens from various age and education groups, across multiple cultures, asking each individual

to draw simple figures portraying an interaction between a leader and a citizen. In America

(though it held true in other nations as well), the test subjects portrayed the leader as taller in

76% of cases. Preference for height does not appear to have changed much over time, as

Americans in the early 1980s responded to surveys saying they considered height of paramount

importance for a presidential candidate (Werner 1982).

This research lays the precedent for the role of height in American politics. The vast

amount of evidence points to influence of height in the minds of people. Synthesizing the data,

it is exceedingly plausible that candidate height influences voter activity, and that voters falsely

perceive candidate height according to their personal biases. Fundamentally, subscription to

this idea lends more credence to certain data, like the popular vote of presidential elections.

2.3 Presidential Election Data

Exploration of the height of United States Presidents has been a long-standing academic

endeavor. Efforts to deduce what percentage of taller candidates had won presidential election

yielded wildly different results at various times. Gillis (1982) and Higham (1992) pioneered the

venture, and using the available data found that the taller presidential candidate won election

over 85% of the time. Both of these researchers unfortunately suffered from data limitations

and could not access more than 100 years' worth of numbers. Murray and Schmitz (2011) used

more expansive data sets to determine that 58% of presidential victors were the taller

candidate, McCann (2001) was among the first to examine positive correlation between height

and the popular vote winner, along the way discovering that the effect was amplified in times of economic or military crisis.

Stulp et. all (2012) provide the most comprehensive, statistical analysis-driven synthesis of presidential election data. The group accounts for unattainable data, election years with more than two candidates, and years in which the candidate effectively ran unopposed. The threefold study concludes with first significant statistical correlation between candidate height and electoral success, especially with the popular vote. A bifurcated win-loss scenario minimized the effectiveness of the numerical simulations that the researchers conducted, so they also ran numbers for popular votes. Using all available presidential election data, they found (in 10,000 simulations) that the taller candidate won 67% of the time. The popular vote is a far bigger statistical correlate to candidate height than electoral victory. The researchers go on to test presidential height against the height of an average male from the same birth cohort, concluding that the majority of presidents stood well taller than men of their day. Finally, the study offers polling data, in which respondents had to choose qualities that they would prefer in a leader. Unsurprisingly, height was amongst the top.

Modern political science literature overwhelmingly points to the benefit that taller presidential candidates have over their shorter adversaries. Interpretation of social psychology in a political context concludes that natural predisposition towards height enables taller candidates to succeed more, at least at the national level.

To build upon the research in this literature review, the essay will analyze whether that pattern trickles down to the state level. By conducting statistical analysis in the manner of Stulp et all, this essay will identify the extent of "heightism" as it exists in the state of Washington.

3. Objectives and Methodology

3.1 General Statement

This project will employ statistical regression analysis to determine what trend, if any, exists between candidate height and electoral success in the state of Washington. Positive linear trends exist between these variables at the national level, as demonstrated by current research. Emulating the models of researchers past, this project will use regression analysis to see if that same trend applies to elections in the State of Washington from the years 1994-2014.

The study will evaluate gubernatorial and national senate races over this period. Including both primary and general election results for each race, there are 17 unique races to examine. Many elections feature incumbent candidates who successfully run for office multiple cycles in a row; however, such cases are not pertinent in answering the research question. Diverse opponents, in regards to both height and gender, provide valuable contrast for successfully re-elected politicians.

As a disclaimer, all conclusions from this study are necessarily conditional. American elections are complicated and nuanced affairs, involving countless political maneuvers and numerous external factors. It is not possible to extract a singular causal relationship out of such

a convoluted phenomenon. The variables to account for, gender and party affiliation, are

relevant to candidate height and electoral success, respectively. Hopefully, the relationships

between the variables will speak to Washington's preference for taller candidates, or lack

thereof. However, the complex nature of political elections render all findings provisional.

3.2 Research Parameters

3.2.1 Types of Elections

Because this study analyzes voting trends as they specifically pertain to Washington

State, it will include data from U.S. senate and gubernatorial elections. These selections provide

legitimate ground for study, for the following reasons:

1) Breadth of Influence:

Since these three offices maintain the highest level political influence of all

Washington politicians, they generate proportional voter turnout. In 2010, Senator

Patty Murray's most recent election victory, the race drew 2,5,11,094 votes

(Ballotpedia) – which constituted 48.3% of all potential voters (US Census Bureau). In

2012, current governor Jay Inslee and incumbent senator Maria Cantwell won elections

that saw 3,071,047 and 3,069,417 voters participate, respectively. This turnout

represented approximately 44.5% of the state's total population, including those under

the legal voting age. Under-18 splits for Washington's 2016 election were not available,

but the 2010 census figure of 22.7% serves as a reasonable replacement. Elections on

the national scale in Washington bring about sizeable turnouts. This principle similarly

extends to presidential elections, with Washington contributing 65.6% of its voting

population to the 2012 general election (Current Population Survey). That figure was 16th in the nation that year, particularly impressive for a state with relative lack of political competition (Brookings Institute).

These numbers affirm the Washington electorate's activeness in exercising their votes. Washington voters participate in their democratic processes, meaning that successful politicians must maintain favor in the public eye. Therefore, public image of a politician carries weight.

2) Inclusion of Relevant Variables

Many factors influence the outcome of elections, most of which have considerably more to do with the results than a superficial measurement like height. It is certainly impossible to completely isolate height's influence on elections. Furthermore, height itself is a result of myriad other factors. On average, women are shorter than men (Ellis 2001). Indeed, Washington's incumbent Senators have been shorter than the majority of their general election opponents. Thus, Washington fits the topic perfectly, for a wide range of possible conclusions surround the data. Patty Murray and Maria Cantwell's continued success seem to imply that the importance of height is a past reality more fit for pre-enlightenment patriarchal cultures. On the other hand, Jay Inslee beat his 2012 opponent, Rob Mckenna, by 3 inches in height but only 1.5% at the voting booth. Could Inslee's stature have had even the slightest effect on voters who did not align with either political party? The implications are various, showing there is merit to studying the topic.

Including primary results for gubernatorial elections also controls for party bias. Washington gubernatorial primaries are open blanket primaries, meaning that the top two vote getters from the whole candidate pool advance to the general regardless of party. Though partisan dualism generally ensures a Republican will face a Democrat in the general election, Washington's system nevertheless leaves the possibility open for intra-party division.

3.2.2 Timeframe

The two decades spanning 1994-2014 provide an adequate sample size to analyze and diverse applications of the variables at hand. Women have held all three spots in consideration during this time period, and there are comparable same sex candidates as well. The period yields 17 applicable elections between gubernatorial primary, gubernatorial general, and senatorial general. These 17 elections turn into 34 data points that offer gender diversity but relative consistency in party dominance.

This timeframe also provides a look into height's relationship to re-election. Repeat victors come up at least once in each category, thereby adding another layer of complexity to the mix. Finally, both years ending the selection were election years, meaning that each end of the timeline provides useful data for study.

3.3 Hypothesis

The project hypothesizes that the regression will reveal a positive correlation between height and electoral success – generally, that the taller candidate in a two-person, same-sex race is more likely to receive a more of the popular vote than the shorter. Between competing candidates of opposite gender, it postulates that the same trend does not apply.

4. Data

4.1 Presentation and Description of Data

During the years 1994-2014, the State of Washington's gubernatorial primary,

gubernatorial general, and senatorial general elections resulted in the following way:

Candidate Name	Year	Binary Win/Loss	Gubernatorial / Senate	Primary / General
Slade Gorton	1994	1	S	G
Ron Sims	1994	0	S	G
Gary Locke	1996	1	G	G
Gary Locke	1996	1	G	P
Ellen Craswell	1996	0	G	G
Ellen Craswell	1996	0	G	P
Patty Murray	1998	1	S	G
Linda Smith	1998	0	S	G
Slade Gorton	2000	0	S	G
John Carlson	2000	0	G	G
John Carlson	2000	0	G	P
Maria Cantwell	2000	1	S	G
Gary Locke	2000	1	G	G
Gary Locke	2000	1	G	P
George R. Nethercutt Jr	2004	0	S	G
Dino Rossi	2004	0	G	G

Dino Rossi	2004	0	G	P
Patty Murray	2004	1	S	G
Chris Gregoire	2004	1	G	G
Chris Gregoire	2004	1	G	P
Mike McGavick	2006	0	S	G
Maria Cantwell	2006	1	S	G
Dino Rossi	2008	0	G	G
Dino Rossi	2008	0	G	P
Chirs Gregoire	2008	1	G	G
Chirs Gregoire	2008	1	G	P
Dino Rossi	2010	0	S	G
Patty Murray	2010	1	S	G
Jay Inslee	2012	1	G	G
Jay Inslee	2012	1	G	P
Michael Baumgartner	2012	0	S	G
Maria Cantwell	2012	1	S	G
Robert Mckenna	2012	0	G	G
Robert Mckenna	2012	0	G	P

Table 4.1 -- Outright result of each considered election, 1994-2014

This study also accounted all numbers for percentage of the popular vote received, and metrics

on candidate height, as shown below:

Candidate Name	Height (1/0)	% of Popular Vote	Gender	Political Affiliation
Slade Gorton	1	55.75%	M	R
Ron Sims	0	44.25%	M	D
Gary Locke	1	57.96%	M	D
Gary Locke	1	23.65%	M	D
Ellen Craswell	0	52.04%	F	R
Ellen Craswell	0	15.26%	F	R
Patty Murray	0	58.40%	F	D
Linda Smith	0	41.60%	F	R
Slade Gorton	1	48.60%	M	R
John Carlson	1	39.70%	M	R
John Carlson	1	39.68%	M	R
Maria Cantwell	0	48.70%	F	D
Gary Locke	0	58.40%	M	D
Gary Locke	0	58.38%	M	D
George R. Nethercutt Jr	1	42.80%	M	R
Dino Rossi	1	48.90%	M	R
Dino Rossi	1	34.10%	M	R
Patty Murray	0	54.90%	F	D
Chris Gregoire	0	48.90%	F	D
Chris Gregoire	0	38.68%	F	D

Mike McGavick	1	39.90%	M	R
Maria Cantwell	0	56.90%	F	D
Dino Rossi	1	46.80%	M	R
Dino Rossi	1	46.35%	M	R
Chirs Gregoire	0	53.20%	F	D
Chirs Gregoire	0	48.27%	F	D
Dino Rossi	1	47.60%	M	R
Patty Murray	0	52.40%	F	D
Jay Inslee	1	51.50%	M	D
Jay Inslee	1	47.13%	M	D
Michael Baumgartner	1	39.89%	M	R
Maria Cantwell	0	60.45%	F	D
Robert Mckenna	0	48.50%	M	R
Robert Mckenna	0	42.90%	M	R

Table 4.2 – Additional Statistics

<u>Independent Variables:</u>

1) <u>Height</u>

Independent variables for this research are relatively straightforward borrow from the studies in the literature review. The primary independent variable, of course, is the height of each candidate. The first wave of analysis will evaluate this data exclusively. In other words, regardless of gender, did the taller candidate perform better? This is controlled as a fixed number (where specific candidate height can be obtained), or a binary comparison between

two individuals (where specific height cannot be obtained). Height data is surprisingly hard to come by for lower-profile politicians, including a few in the data set. Side-by-side stills of each corresponding set of candidates reveal the comparative heights, determining whom was the taller of the two. After combing through images from old debates and political events, the "taller" and "shorter" labels for each contest were clear.

Lacking specific height differentials for each election is certainly limiting – all the data must be coded in binary fashion in order to produce a cogent function. This precludes knowledge of a proportional relationship between height differential and electoral success since all candidate height is grouped into ones and zeroes.

2) Gender

Gender is the secondary independent variable to analyze. In the majority of situations where a female candidate defeats a male candidate, the female is the shorter of the two. This follows the genetic trend that women are shorter, on average, than men (Ellis, Harrapp, Stebbing 2001). A cursory interpretation of this phenomena would discredit the existence of heightism in elections; however, alternative explanations, like the assumption of constituents that a male candidate is taller than a female candidate, could compensate for such a discrepancy. In any case, looking at gender as a secondary variable aids explanation of the narrative. Thus, in the analysis of this study's results, gender will be an explanatory function. Still, the regression model will solve for the evident problem of multidimensionality in the study.

Gender is also a pertinent factor to the Washington, which is the only state to have a female governor and two female senators serving concurrently (Gill 2016). Currently, those two female senators represent 1/8 of all women in the senate (Gill). Simply put, Washington is significantly more likely to elect female senators and governors than the average state. It is a norm, rather than an exception, for a female, regardless of party, to hold the state's highest elected office over the past 20 years.

3) <u>Political Party</u>

One must control for party affiliation in this category of research, as one's party is the most universally determinant factor in political elections (Kernell 2014). Including gubernatorial primaries, which nominate the two winningest candidates regardless of party, assuages some of the issue. Washington is a traditionally blue state, currently holding the longest Democratic governorship streak of any state (uspolitics.com). As mentioned above, Washington provides 12.5% of all female United States Senators, and the state has famously pioneered marriage equality and marijuana legalization policy. Despite the progressivism of Washington, many high-level elections are close contests between Republican and Democrat. The most recent, notable example of this was Jay Inslee's 1.5% margin of victory over Republican Rob Mckenna. These close contests imply both the existence of a strong Republican base within Washington and the general open-mindedness of Washington constituencies. Determining what extent party affiliation plays a role in Washington voting patterns is key to further isolating height through data analysis.

<u>Dependent Variable:</u>

1) <u>Electoral Success</u>

The dependent variable in this study, as has been briefly mentioned, is electoral success. The project will measure electoral success in binary terms (through a win/loss analysis lens) and proportional terms (through analysis of percentage of popular vote won). Including both of these metrics in the data set allows for more points of comparison, thereby increasing the potential for statistically correlative outcomes.

There is precedent for using both metrics as evaluative tools. Studies on presidential height and electoral success, as noted in the literature review, have employed win/loss and popular vote percentage in their data sets. Aside from providing more opportunities to demonstrate statistical correlation, codifying the data through these two metrics also specifies the questions that the data seeks to address. Examination of win/loss results presumes the question "is a taller candidate more likely to outright win an election?" Inclusion of popular vote percentage expands on this question, asking "to what extent does a taller candidate influence voting patterns?"

To aid the actual regression function, it is useful to include the threshold for victory in any given election. This contextualizes the data and serves as an explanatory factor for error results. Additionally, since Washington's primary and general elections operate under different electoral guidelines with contrasting requirements for victory, inclusion of victory threshold normalizes the electoral success numbers. For reference, all of Washington's general elections require a simple majority (greater than 50%) of the popular vote to win. The same holds true for national senators, who are similarly voted in by direct election. In the gubernatorial

primaries, however, the top two candidates (party notwithstanding) by percentage of popular vote move on to the general election. Technically, this produces two "winners" from each primary. Given that this study only evaluates the top two vote getters in the given primaries regardless, this would seem to pose a problem for the data set. To solve this, each winner by plurality (i.e. the candidate who received the biggest chunk of the popular vote, even if it was not a majority) is the binary "winner" in the data. Thus, for all 17 elections under consideration, there is a determined winner and loser.

Still, one may question the impetus behind including primary gubernatorial elections in the data set entirely. After all, the same top two candidates from each primary are the candidates in the general, so why evaluate the same people twice? Primary elections merit inclusion because the numbers they provide with regards to popular vote differ starkly from those in the corresponding general elections. A plethora of candidates will naturally draw votes away from any one candidate, leading to wider arrays of electoral results. These broader variances offer another look into the behaviors of Washington voters. In essence, votes received in a blanket primary, where any citizen can vote for a candidate regardless party, allow rationales for voting that go beyond party lines. In this lays the possibility of learning even more about Washington State voting behavior. Thus, primary elections are worthy vestibules for analysis in this study.

4.2 Model

A Ridge Regression model will process the data set. Multiple independent variables that are closely related, like height and gender, necessitate a more complex model to remove the inherent statistical bias. Collinearity in a linear model would seemingly predict deviations that

differed from the true value. Adding an additional rule to the equation better regularizes the

numbers.

Ridge regression is ideal for this data, as the model accounts for collinearity. It is "one of

the most popular … estimation procedures for combating multicollinearity" (Myers 1990). The

first step in employing the model is to ensure that the data set in question indeed has a

multivariable problem. One can tell this by identifying "near-perfect relationships" (NCSS

Statistical Manual) amongst the data sets. Figures 4.2, 4.3, and 4.4 in the following section

illustrate examples of perfect corollaries in this study's data set. For Washington State, every

female candidate was shorter than her male opponent (no two women ran against each other

in the relevant timeframe), and democratic candidates emerged victorious over their

republican opponents 16 out of 17 times. Both of these relationships, which dramatically affect

the key figures used in this study, fit the "near-perfect" mold called for when performing Ridge

Regression.

The standard formula for performing Ridge Regression resembles the basic graphing

formula common to many other types of regression: $\mathbf{Y= XB + e}$. Y is the dependent variable,

X is the cumulative effect of the independent variables, B is the regression coefficient, and e is

the residual error. Before any regression can occur, however, it is imperative to standardize

one's variables. The trace of the ridge graph "is on a standardized scale" (NCSS), necessitating

uniformity in every variable category. It is for this reason that the data at hand codes into a 1/0

pattern for candidate height discrepancy. Lack of specific height data for every candidate in the

study rendered it impossible to perform Ridge Regression on a per-inch basis.

To determine B, which represents the matrix of all independent variables, the following equation is used: $B=(R+kI)^{-1} \times X^{\wedge}Y$. Using this equation means one must additionally calculate and settle on a value for *k*, which represents the numerical bias inherent to the overall data set. As a final note, no confidence limits are placed on the model due to the uncertain nature of the multicollinearity itself.

To evaluate the regression results, analysis will focus primarily on the P-value of the function, which ultimately reveals the statistical significance of each independent variable on the dependent variable. This "F-Statistic," or the significance of the function, is "a value resulting from regression analysis" that determines "if the variances between the means of two populations are significantly different." (Hennekens 1987). Lower P-values correlate to higher rates of statistical significance. The P value represents the probability of the null hypothesis of an equation occurring (Penn State University 2016). For reference, a P value of 0.00 would indicate a 99.9% chance of statistical correlation. The threshold for statistical significance in regards to P is .05, which equates to a 5% that the proposed data correlation could occur at random.

Another statistic to consider is the standard deviation, represented by the letter R. The square of R reveals what percentage of variation in the dependent variable can be attributed the independent variables. A high value of R squared indicates greater statistical correlation (Duke 2016). Thus, R squared speaks to the general relatedness of all variables, while the P-value determines the statistical significance of that correlation.

4.2.1 Tables

Illustrating the data through graphics sets the general tone for the relationships between specific data categories. If one were to evaluate the simple relationship between height and electoral success, the result graphs thusly:
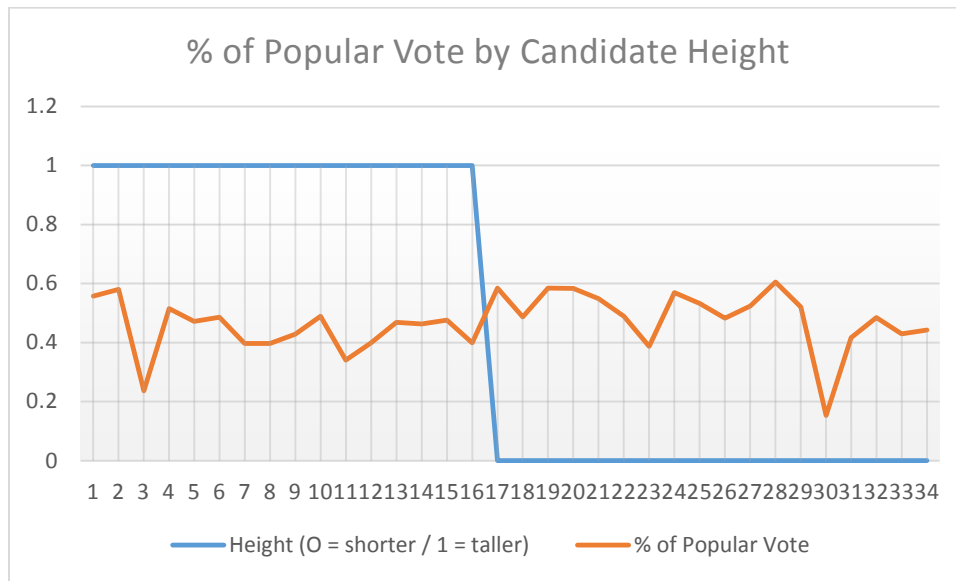

Figure 4.1 – Percentage of Popular Vote Won by Candidate Height

Since height comparisons in this study are only represented through binary taller/shorter comparisons, the graphed data in turn is dualistic. The graph encapsulates a healthy diversity of results, while still identifying the general trend that shorter candidates tend to receive, on average, a higher percentage of the popular vote than their taller counterparts in Washington State. Other variables notwithstanding, this graphic introduces the idea that Washington may not be a realm of heightist elections, but rather a state that does not ascribe value to political candidates' physical appearance. Though this initial comparison offers a base layer of analysis to work with, it hardly tells the full story. To truly understand the link between

candidate height and electoral success in Washington state, one must look to other independent variables.

To further establish a framework for interpreting the data, visualizing where each additional independent variable impacts specifically is especially helpful. In this analysis, the independent variable of political party impacts the dependent variable of electoral success. Democrats in the State of Washington have claimed 16 out of 17 applicable seats, meaning the Washington voters have elected Democrats to their most preeminent offices 94.11% of the time over the past two decades. The following graphs portray the Democratic Party's dominance in the relevant elections:
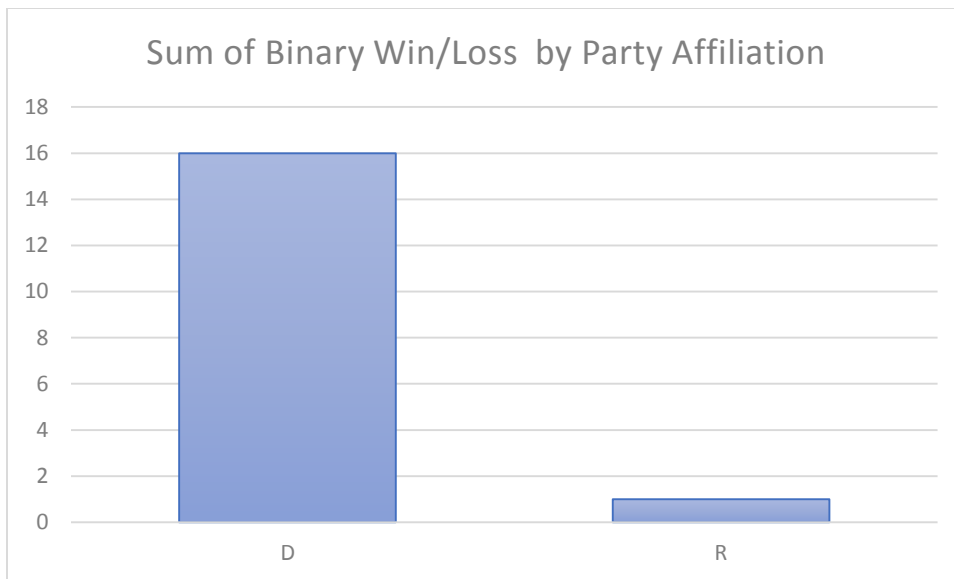

Figure 4.2 -- Sum of Binary Win/Loss by Party Affiliation

Clearly, political party's impact as an independent variable cannot be ignored. The almost automatic correlation between Democratic candidates and victory in Washington determines an impact that is unmatchable by any of the other variables. This is befitting of Washington's reputation. Solving for this impact requires multiple steps. One way of doing so is

to also evaluate primary elections, where candidates from the same party must compete with each other in order to advance to the general. Beyond that, one must rely on the strength of the regression model to obtain a figure that still eschews some correlative result. Still, this does not answer the question of how much these candidates are winning by. The strength of this trend, however, extends to the popular vote.
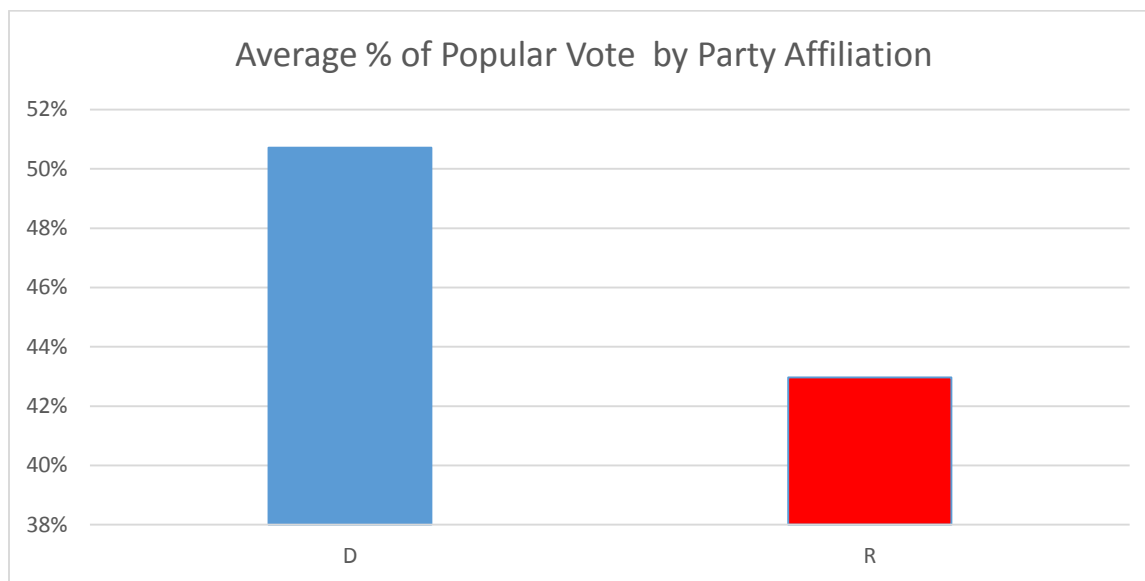

Figure 4.3 – Average % of Popular Vote by Party Affiliation

Once more, Democratic affiliation significantly affects the result in this data set. In general, Democrats win by clear majorities. Within this data, however, it is important to note that the gubernatorial elections tend to be closer, relatively speaking, than the senatorial. That is to say that the elections are close enough, on average, to still evaluate the data.

In any event, this specific data allows for a number of reasonable conclusions about the lack of heightism in politics. Recognizing that political affiliation indeed presupposes all other considerations for constituencies enforces the notion that such constituencies focus predominantly on moral, political, and philosophical premises. At first glance, this correlation

imbues Washington voters with an "enlightened" quality, as they appeal to their moral

sensibilities first and foremost when considering heads of state.

Nevertheless, this data is hardly substantive enough to draw any real conclusions. The

above graphs allow for the possibility of all 17 victors being the taller of the candidate. The

essay so far has shown the falsehood of such a statement, but the point is that even a trend as

strong Democratic success in Washington State is not an all-determinant factor.

The other most pertinent variable relationship is between height and gender. In this

study, all applicable female candidates were the shorter of the two candidates each time they

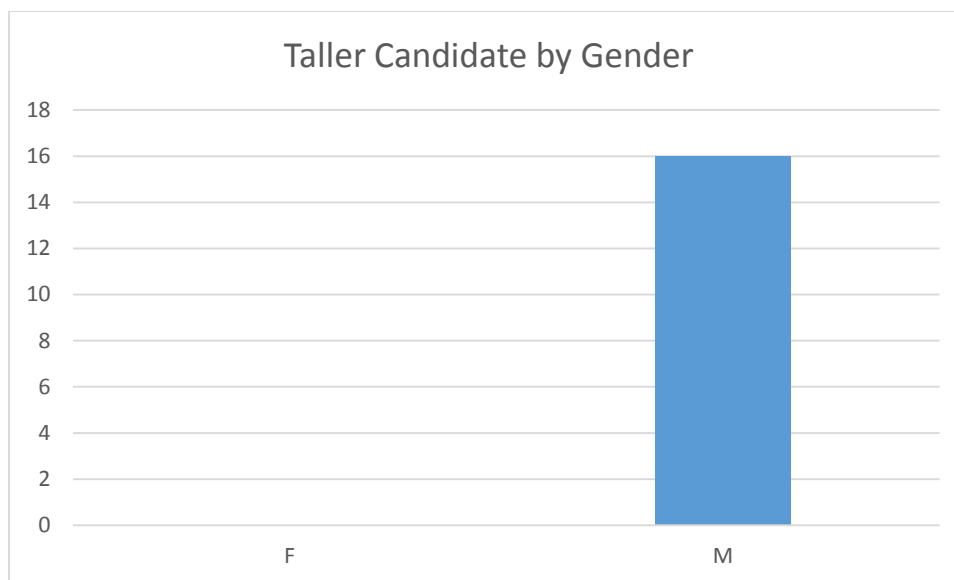ran. This is shown in the figure below:

Figure 4.4 – Sum of Height (Binary) by Gender

Per the chart, no single female candidate was the taller of the two in any pertinent

election. The chart reflects that every male candidate has been taller, with the exception of

male candidates who run against taller males. Once more, we see the necessity to employ a

complex regression model. The height statistic is inherently biased on the upper end towards

male candidates, therefore, the ridge model is necessary to neutralize the data. The innate link

between candidate gender and height is too prevalent in this data set to be ignored.

4.2.2 Descriptive Statistics

Descriptive statistics inform the results of the function, particularly in regards to

standard deviation. First off, a side by side comparison of the performance of taller candidates

versus shorter candidates ought to inform the basis for statistical analysis.

Taller Candidates	% of Popular Vote
Mean	0.44394375
Standard Error	0.02094061
Median	0.46575
Mode	#N/A
Standard Deviation	0.083762442
Sample Variance	0.007016147

Shorter Candidates	% of Popular Vote
Mean	0.492871
Standard Error	0.026205
Median	0.5204
Mode	0.584
Standard Deviation	0.108045
Sample Variance	0.011674

Table 4.5 – Descriptive Statistics between taller and shorter candidates by % of popular vote

The descriptives confirm the trend that the eye test identifies: shorter candidates have,

on the whole, performed significantly better in Washington state than taller candidates over

the last 20 years.

4.3 Results

Multi-variable regression analysis reaffirms the present trends. Running an Excel-based

regression function that solves for electoral success (by popular vote) while factoring in

candidate height, gender, and political party yields the following:

R Squared:	**0.178936**

	P-value
Y-Intercept (electoral success):	**2.65E-12**
Gender:	**0.504595**
Height:	**0.484092**
Party Affiliation:	**0.04793**

Significance F:	**0.111113133**

Table 4.6 -- Regression values with respect to popular vote, factoring in gender, height, and

party affiliation

The value of R Squared in this instance indicates an extremely low correlation between

the combined independent variables and the dependent variable. The regression line does not

fit the function, as the independent variables combine to affect only 17.8% of the dependent variable. At first glance, this data set appears to affirm the null hypothesis that height has no effect on percentage of popular vote won.

Examining the P-values of each individual variable in this instance better informs the situation, as the set is not statistically significant. As previously mentioned, any variable with a P-value greater than .05 is not statistically significant. Of gender, height, and party affiliation, only party affiliation meets that standard. Gender and height exhibit extremely high P-values, resulting roughly in a meager 50% certainty rate. This is the cause of the high number for the F statistic, which also maintains a .05 or lower threshold for significance. Thus, this data set is inconclusive. The only applicable conclusion is the clear effect of party affiliation on the dependent variable of electoral success.

Running more regression functions while removing particular variables produces more values to cross-analyze with the all-inclusive function. This project includes 3 more functions – each of which subtracted one variable. The resultant data is as follows:

1. F(x) as a correlate of height and gender (political affiliation excluded)

R Squared:	**0.062533**
	P-value
Y-intercept:	**6.05E-18**
Gender:	**0.691692**
Height:	**0.230484**
Significance F:	**0.367552765**

This function vividly shows the importance of political affiliation on electoral success. Both gender and height are well over the threshold for statistical significance, leading in turn to the insignificance of the function. The extremely low rate of correlation, a measly 6%, casts legitimate doubt on the importance of height and gender to electoral success. This argument ties into the earlier analysis on the direct relationship between height and gender in the state of Washington, since a 1 to 1 taller – shorter / male – female ratio in the data set generates a parallel effect of height and gender on percentage of popular vote won. In other words, both data points are equally trivial in this analysis. Individually removing height and gender from the function produces similar results, seen below:

2. F(x) as a correlate of gender and political affiliation (height excluded)

R Squared:	**0.165197**
	P-value
Y Intercept:	
	1.19E-12
Gender:	**0.791155**
	0.025688
Political Affiliation:	
Significance F:	**0.060891019**

3. F(x) as a correlate of political affiliation and height (gender excluded)

R Squared:	**0.166451**

	P-value
Y Intercept:	**3.99E-14**
Political Affiliation:	**0.053067**
Height:	**0.733415**
Significance F:	**0.059488**

Both functions 2 and 3 reinforce the significance of party affiliation while mitigating the importance of height and gender. The P values of height and gender do not come close to the .05 threshold needed to qualify for statistical significance – whereas political affiliation nears or hits that mark in every applicable function. The inclusion of the political party variable provides legitimacy to the data whenever present – exclusion causes F Significance to rise well into statistical insignificance. Political affiliation also raises the R Squared value over 10% when it is concluded in the function. It is the only statistically significant data point that consistently and directly affects the overall functions.

In conclusion, calculating the ridge trace of this data set determines that height as an isolated variable has a negligible impact on electoral success. Even when controlling for the multicollinearity presented by the factors of gender and party affiliation, height as a variable exhibits no direct influence over outright win / loss ratio, or percentage of the popular vote won.

5. Implications

At present, the data shows that no significant correlation exists between a Washington candidate's height and his or her chance at electoral victory. Admittedly, Washington State is a curious study. Washington's propensity for electing shorter female heads of state and national representatives, compounded especially by the longterm success of Patty Murray and Maria Cantwell, render difficult the prospect of evaluating the true impact of height on elections. Such is the inherent limitation to studying Washington in the late 20th and early 21st centuries. Shorter female candidates who experience repeated success are innately going to serve as contradictory data points to this study's hypothesis. If anything, the preliminary linear trends reverse the pattern seen in United States Presidents – one is more likely to win as a shorter candidate in Washington State than a taller one. Moreover, the state's Democratic dominance makes it difficult to control for the variable of political affiliation – less political balance means an increase in statistical bias towards that factor. Even so, lack of a direct correlation does not mean lack of findings.

The significance in the variable relationships leads one to conclude that "heightism" is a non-factor, a myth, in Washington State. Were Washington voters to weight candidate height heavily in their considerations, it is highly unlikely that Chris Gregoire, Maria Cantwell, and Patty Murray could have enjoyed the tremendous success they have had. Indeed, heightism in this sense appears to be an offshoot of sexism – female candidates are going to trend shorter than male candidates. Preferring height, especially across gender boundaries, is an inherently sexist notion. Thus, the data argues that male and female candidates have equal opportunity to win election.

Still, one wonders if Washington's exceptional election of women to seats of power is an exception to a national norm. As previously mentioned, Washington is the only state in which three women have held both senate seats and the governorship simultaneously. Furthermore, those women triumphed over men in each of their electoral victories. Thus, Washington is perhaps the case study for bucking the heightism trend that is prevalent elsewhere across the country. Other states, whose recent history features more male v. male and female v. female contests, may be more suited to provide conclusive evidence as to the existence of heightism in American politics.

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