AN EXAMINATION OF THE IMPACT OF

EDUCATION ON VOTER TURNOUT

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AN EXAMINATION OF THE IMPACT OF EDUCATION ON VOTER TURNOUT

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Benjamin Joseph Turpen, son of John Joseph and Tammy Ann (Stone) Turpen, was born October 2, 1982, in Louisville, Kentucky. He graduated from Holy Cross High School in Louisville, Kentucky in 2001. From 2001-2006, he attended Auburn University and received the degree of Bachelor of Arts in Economics with a minor in Business Administration. In 2006 he was accepted into the graduate program at Auburn University. In the fall of 2007 he began work towards his Juris Doctor at Tulane University in New Orleans, La.

THESIS ABSTRACT

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EDUCATION ON VOTER TURNOUT

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This paper explores the relationship between educational attainment and voter turnout. The relevant theory is addressed and a model is formulated to account for demographic factors thought to affect turnout. Data from the 2004 United States Presidential election cycle is used to establish the impact of education. Once the model is constructed and the relevant tests are performed it is determined that there is, in fact, a positive relationship between education level and voter turnout. Other relevant factors are addressed and evaluated in relationship to the education variable.

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Style manual or journal used American Economic Review Style Guide

Computer software used Microsoft Word 2007

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I. INTRODUCTION AND HISTORY

The purpose of this paper is to investigate the impact educational attainment has on voter turnout in United States elections. It is often considered a "given" that educated people vote with higher frequency, but is it necessarily true? And if so, to what extent is this difference attributable to education alone as opposed to other factors? In order to investigate the relationship, it is important to first understand some history behind the electoral process.

The United States of America was founded on the principle that the government that represents the people should be chosen by the people. In such a government the citizens have a say, thus giving them the power to decide the general direction of the country. Representatives are chosen to make decisions which match their constituencies and to vote according to the will of the people. Not surprisingly, with the political and economic weight held by the federal government, many people have a vested interest in the outcome of both state and federal elections. Those people running for office will shape policy and economic conditions affecting individuals and businesses alike.

The high profile nature of politics has led to an intense fascination and focus on all things dealing with elections. Much attention is focused on the candidates, the parties, and the campaign process. An important factor for those running and those analyzing the process is determining the "face" of the electorate. One of the most common topics of

conversation during any election cycle is voter turnout. For the candidates it is important to tailor their message to those who are most likely to cast their ballot; and for those covering and studying the elections, it is important to understand who is likely to vote.

To fully understand the current political context, it is important to understand the historical evolution of voting rights in the United States. While the Constitution of the United States of America has always stated "all men are created equal," the franchise was only fully extended to every adult American in 1924, and its final extension included the 18 year old to 21 year old age group in 1971. Even with the extension to the franchise to Native Americans in 1924, full rights were not guaranteed to minorities until the National Voting Rights Act of 1965, which outlawed practices that prevented or diverted people from casting a ballot.[1] The act outlawed practices and procedures intended to minimize minority turnout and it prevented discrimination based on color or race. Prior to that there were many instances of discrimatory practices on the basis of color.

From the onset there was a large degree of discrimination in deciding who was allowed to vote, with the initial franchise consisted of land owning white males. Through political uprisings and constitutional movements, the franchise was extended piecemeal to its current configuration which is still criticized. It is often suggested that socioeconomic and electoral constraints limit the effectiveness of the amendments to some degree. Those factors will be explored further, but they are not central to this paper.

The goal of this paper is to utilize demographic information to discern what factors would characterize the "common" voter. More specifically, the goal is to determine the impact education has on the electorate. Does education induce increased

[1] http://www.usdoj.gov/crt/voting/overview.htm

turnout? This question becomes important for many reasons. For politicians and political minds, it helps to define a target audience and to understand what compels people to cast their ballot. For observers, it helps to predict possible turnout. It is also helpful for policy makers concerned with increasing voter turnout; if a "typical voter" can be targeted his characteristics can be used to develop policy geared towards increasing poll numbers.

Utilizing the idea of the "typical voter", it is important to understand the challenges of determining who votes and why they do so. Understanding the factors which motivate a voter is imperative for policy changes and voter turnout drives. Such factors range from complex and highly charged issues like race and socioeconomic status to fairly common and mundane reasons like indifference or lack of interest in the process.

One explanation for the indifference factor is known as rational ignorance. Commonly discussed in the field of public choice economics, rational ignorance is one explanation for why some people do not make it to the polls. It is not that they are uninformed or that they do not have a stake in the election. They simply feel the costs involved with voting outweigh the benefits. In a complex political system, with as many voters as the United States has, the likelihood of any one potential voter being decisive is minimal. Thus, many feel that their vote will not be the deciding factor in an election and, their time and energy are better spent elsewhere. They simply choose not to participate. Accounting for such behavior is difficult, yet not impossible. However, for the purpose of this paper, we will assume it is assumed within the error term. It is important to address this issue because it may explain the low voter turnout in the United States. Many people point to higher turnout in other countries; however, their political systems are likely arranged differently than the American system. Also many countries have more pressing

economic, socioeconomic and political issues people deem worthy of their time and efforts.

Along with the rational ignorance factor, is the idea that by not voting people are effectively endorsing the popular candidate. If there is little question in the outcome, or if the candidates are similar enough in policy and ideology it may simply be a sign the voters or satisfied that the results will be agreeable. Or perhaps the opposite is true and the voter feels that neither candidate will represent their perspective thus rendering them effectively disenfranchised. In either scenario there is a strong likelihood some people who abstain from voting are doing so because of the choice (or lack thereof) of candidates on the ballot. It is likely the cost of going to vote for those candidates simply outweighs the anticipated benefits. While these are viable explanations and important to address they will not be accounted for in the models presented.

II. LITERATURE REVIEW

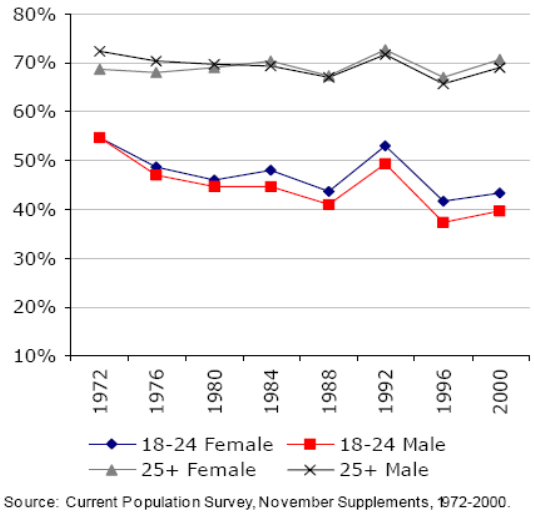
In order to devise a logical model of voter participation it is important to review prior research on the topic. For as long as there have been elections there have been people interested in understanding their outcomes and why the eventual nominee was successful. With over three hundred million citizens, it would be difficult to pinpoint every possible reason someone voted or did not vote in any given election cycle. Thus, most studies have opted to utilize demographic information in order to form a general voter profile with the realization that the error term is likely to account for the variables not measured in the actual model.

Many of the most highly cited articles and books examine the role of gender in the voting process. While the common perception is men are more likely to vote, Wolfinger and Rosenstone illustrate compelling arguments for why the opposite may be true. "Women live longer than men—their life expectancy was nearly eight years higher in 1972—and therefore compromise a larger share of the elderly population." (Wolfinger 37) A more recent report by the Women's Campaign Forum cites increased voter registration and turnout by women beginning in the mid 1980s. "Women have registered to vote in higher numbers than men since the 1980 presidential election, and have voted at a higher rate than men in every federal election since 1984." (Women's Campaign Foundation 2) These arguments highlight the misconception that the typical voter is male.

They also begin to paint a portrait of a changing electorate. With longer life expectancies and a more prominent role in both business and political circles, the influence of the female voters has become substantially greater.

Another impact is the number of women with a college education. It would be little coincidence that the proportion of female college graduates began to rise in the 1970s and in short order those more educated women began impacting elections. A 2007 article in The Chronicle of Higher Education indicated that "Nationwide, women make up about 58 percent of undergraduates, according to the U.S. Education Department's most recent statistics." (Chronicle 1) They continue by citing "Nationally, women's enrollment began to overtake men's in the early 1980s," which also happens to be consistent with the time frame where female voter registration and turnout overtook males. (Chronicle 1) It is far from coincidence that the numbers rose in tandem and further solidifies the idea that higher education has an impact on voter participation.

Figure 1: Gender and Age Distribution



This graph illustrates two points, first the higher female turnout, and also the age disparity in voter turnout.

Clearly there is some connection between gender and voter participation which does not follow conventional wisdom. These facts give further validity to the education and participation scenario. It is also interesting to consider the number of older women voters outweigh male voters because of life expectancy. Another factor for females is the particular issues of each election. For instance, in the election cycle in question, there was a large push to win the vote of the "Security Moms" or those mothers who were also concerned with issues of national security. A 2003 Time Magazine article highlights the phenomenon: "When I was out campaigning last fall, this was all women wanted to talk about," says Senator Joe Biden of Delaware. "Not schools, not prescription drugs. It was 'What are you doing to protect my kids against terrorists?' Soccer moms are security moms now." (Time) Both candidates tailored particular campaign messages for those women, casting a large spotlight on the importance of the female vote.

Along with gender, race is often a talking point for politicians. The initial franchise was only extended to white land-owning males. The franchise was formally extended to non-whites in 1970, women in 1920 and Native Americans in 1924; however, as previously noted, those rights were often compromised until the 1965 law enforcing those rights. Still, to this day, many people question how much discrimination exists via both voter registration laws and polling scenarios. As recently as 1993 "Motor Voter" legislation was passed in an attempt to give people, especially minorities, more options for registering to vote.

In their 1980 analysis, Wolfinger and Rosenstone found a large disparity between the number of black voters and white voters. "In the aggregate, blacks are less likely to vote than whites. One historical reason was widespread disenfranchisement in the South,

where blacks are a much larger proportion of the population than in the rest of the country" (Wolfinger 90). They go further stating one probable factor is the fact that "Blacks are considerably younger and less educated than whites" which would be an indication they are less likely to participate (W&R p. 90). Regarding Hispanics, Wolfinger and Rosenstone found "little research" to indicate participation among citizens of Hispanic origins (Wolfinger 91).

A report from the United States Census Bureau on the 2004 election indicated that "Non-Hispanic Whites had the highest registration rate at 75 percent. Sixty-nine percent of Blacks, 52 percent of Asians, and 58 percent of Hispanics were registered to vote in 2004" (Census 7). The report went further indicating the lower registration numbers were likely to result from "citizenship issues" (Census 8). Due to lower registration numbers, turnout numbers were lower for both Asians and Hispanics. One key issue for many is difficulty in registration for minorities. The 1993 Motor Voter law was intended to relieve some of the pressures on minority population and to encourage their participation. However, some factors which could contribute to the lower registration and turnout are the relative youth and financial burden on minority groups. A large majority of both the Asian and Hispanic population are first or second generation Americans who are not economically established. They tend to be working class citizens who have little time for involving themselves in politics and turning out to the polls. It is also possible they suffer from a language barrier or they may simply be misinformed about the voting process.

It is important to note that between the time of the Wolfinger and Rosenstone article and the 2004 Census report there were steps taken to encourage registration and turnout, which did increase the number of minorities who participated. In the 2000 and

2004 election the Black and Hispanic votes were highly coveted “swing voters” because they have few historic ties with either major party.

Along with gender and race, socioeconomic factors are considered important to determining who will vote. Many people base their activities around their financial situation because most Americans are motivated in one way or another by money. Thus it is important to find an accurate measure which indicates economic conditions. There are several likely demographic measures that could be appropriate. A few of those factors are the unemployment rate, the percentage of the population below the poverty level, and the median income for individuals. In the big picture they measure similar factors, so including all three variables in the model would be unrealistic.

One point of view is economic duress increases participation. The argument suggests that people under economic strain blame the government for their situation; in turn, they vote, organize, lobby, protest, and so on (Schlozman 12). So those in adverse financial situations may be more likely to participate. However, one also must take into account certain resources are required to participate and if those resources are in short supply people may not be able to participate. They may also be more concerned with addressing their financial situation or taking care of family and household concerns to invest time and energy into voting. (Brody 344)

Income may not be the most effective measure of socioeconomic status because income is closely tied to the variable we are interested in studying, education. There is likely to be a high correlation between the two variables. Some college graduates make much less than what the average salary for someone with only a high school diploma. Conversely, some people with limited education may have been successful businessmen

or deemed fortunate to move into a high paying career path. On the whole, they are more likely to be comparable than not. (Wolfinger 12) The same is likely for poverty conditions. When measured, it is probable that the proportion of impoverished potential voters lacking higher levels of education would be high.

Because those two factors could be more closely tied to education, another consideration is the unemployment rate. People of all levels of educational attainment are likely to be unemployed at one time or another. Thus it is less likely these numbers would be skewed in one direction. While it is likely not a perfect indicator of economic conditions, the unemployment rate will be a helpful indicator and useful variable for the model.

Age is another factor commonly associated with voter turnout. There are many explanations for why age is considered which range from opportunity costs to interest and education level. The 2004 Census election report noted young adults had the lowest turnout rates yet they had the largest increase in voter registration (Census 2). There are many explanations for this including the fact that the younger age group includes college age individuals who either do not have the time to vote or who may be out of their voting jurisdiction. Also, the younger age groups tend to have less time to focus on political implications and candidates. Further, they often feel somewhat disconnected from representatives who are often significantly older. In contrast the census data indicates that citizens 55 and older had a 72 percent turnout. A report by the Population Resource Center indicates for the 2000 presidential election “Voter turnout increased with age, from a low of 25% of those aged 18-24 to a high of 66% of those aged 65-74. Voter

registration numbers showed similar trends of registration rates increasing with age." (Population Resource Center)

Simply put, turnout increases with age (Wolfinger 14). Another plausible explanation is retirees have more time and there is less economic burden placed on that particular age group. For whatever reason, it is clear that the conventional wisdom in this case is accurate. Age is a factor in voter turnout and subsequently should be included in a model attempting to determine turnout rates.

The final area of interest for this particular paper is the capability to measure education levels. Over the past several decades the numbers of people with a college degree have increased due to the accessibility by the middle class to higher education and federal funding of colleges and student loan programs. A college education is no longer only for the wealthy. The number of adults with post graduate education has also grown substantially. A 2003 United State Census report indicates over 85 percent of all adults who were 25 years or older reported at least finishing high school and over 27 percent had at least a Bachelors degree. The same report indicates the older age group, 75 and older, contained only 15 percent with a Bachelors degree or higher. Thus a younger more educated population is replacing an older less educated population.

The 2004 Census voting report indicated for each successive level of educational attainment both registration and mobilization increased. Those who had a Bachelors degree were twice as likely to vote as those who had not completed high school. For younger voters with a Bachelors degree they were also more likely to vote. The Bachelors degree group had a 67 percent turnout rate while those with lower levels of educational attainment were in the 25 to 57 percent turnout range. It is also important to

recall that this age group was less likely to vote than their older peers for various reasons. What is clear is the larger numbers of educated youth voters are likely to have a significant political impact and turnout impact as they age. Conventional wisdom would both suggest that people with higher education would be more likely to cast a ballot. The reasoning is often multifaceted. People who have obtained higher degrees may have a more substantial financial risk, they may be more aware of policies, and they may also simply have a more directed understanding of the political system.

A major piece of research "Who Votes" by Wolfinger and Rosenstone states clearly the importance of education in voter turnout. "The core finding is the transcendent importance of education. From this we have developed our fundamental proposition: the personal qualities that raise the probability of voting are the skills that make learning about politics easier and more gratifying and reduce the difficulties of voting. Education increases one's capacity for understanding complex and intangible subjects such as politics, as well as encouraging the ethic of civic responsibility. Moreover, schools provide experience with a variety of bureaucratic problems, such as coping with requirements, filling out forms, and meeting deadlines." (Wolfinger 102) There is no doubt that education impacts mobilization, the question is to what extent? Previous research lays the groundwork for further investigating the relationship between education and voter turnout. These studies establish precedent for moving forward to determine just how large the impact is, and how the other variables affect voter turnout as well.

In order to understand the relationship between voter participation and education it is important to develop a model that would include the factors which influence voter turnout. Thus, utilizing the previously discussed theory a model is developed. In this case

the dependant variable would be a measure of voter participation in a specific election. Because the question is how education impacts turnout, the model will determine how those various factors which influence individuals to voter impact turnout as a whole. Further, theory indicates several variables which are indeed likely to affect voter involvement in a given election. Those variables are considered to be the independent variables. Alone they give small pieces of information about a potential participant; combined they create a model used to explain those factors contributed to the overall turnout.

III. MODEL SPECIFICATION

For this particular model, the independent variables are likely to be demographic indicators of the probability of a vote. In this model, demographic measures for gender, race, socioeconomic status, age and most importantly education levels will be included. These independent factors are analyzed to determine their contribution to the overall outcome. Thus using this information, a conceptual model is established. In this case the conceptual model is as follows:

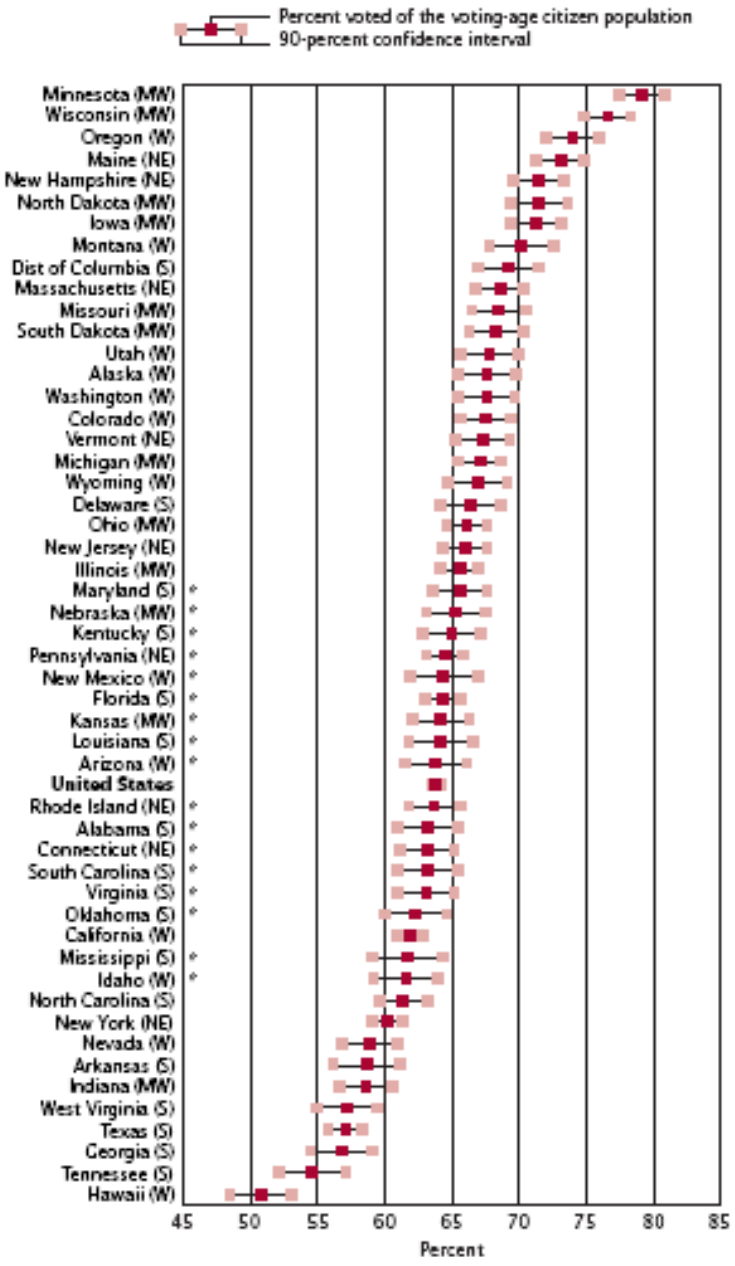
Voter Turnout= f (Gender, Race, Socioeconomic Status, Age, and Education Level)

Utilizing this model will be helpful to determine the impact of education on voter turnout.

Next it is important to determine what data is used to measure these conceptual ideas. For the dependent variable it is important to utilize a measure of participation that adequately reflects the scope of voter participation. The most commonly used measure among media analyst and political scientist is the Voting Age Population or VAP. The United States Election Assistance Commission (EAC) defines the VAP by stating "The term Voting Age Population (VAP), refers to the total number of persons in the United States who are 18 years of age or older regardless of citizenship, military status, felony conviction, or mental state. The standard source of VAP figures is the Bureau of Census" (Elections Assistance Commission). Simply stated, the VAP indicates those eligible to

cast a ballot. As stated, VAP information is readily available through the United States Census Bureau.

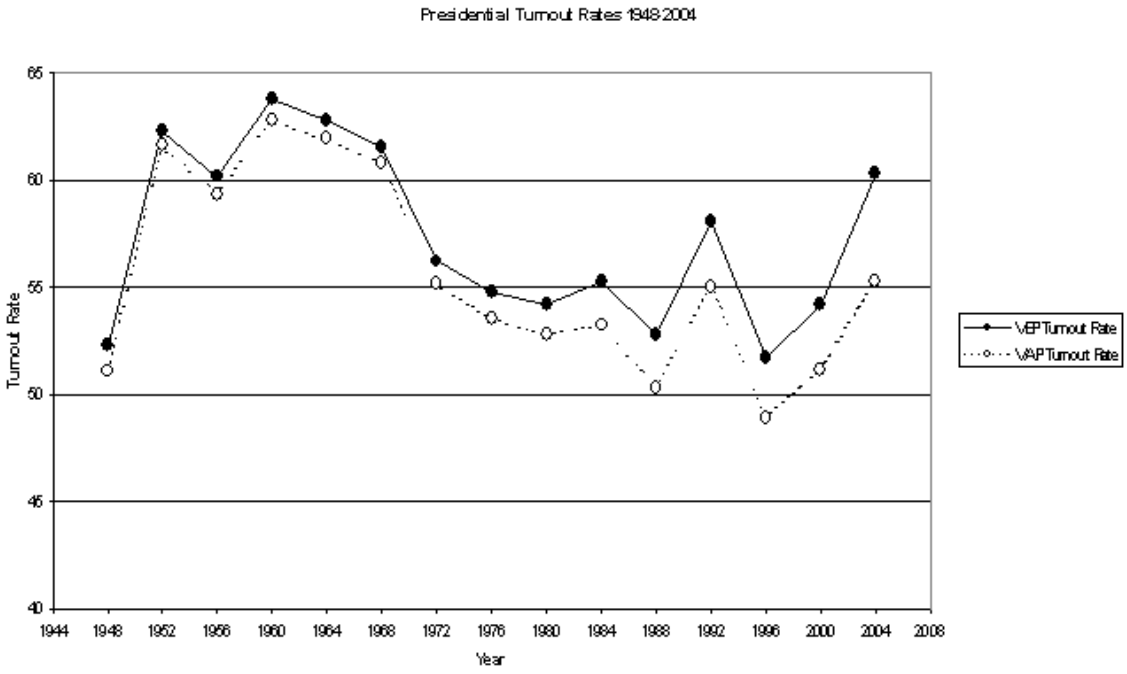
Figure 2: Turnout Numbers by State



Graph two illustrates the voter turnout for each individual state in the 2004 presidential election, this information was obtained from the United States Census Bureau report on Voting and Registration in the November 2004 Election.

There is another measure of turnout that may paint a slightly different picture of the electorate, and it is worth taking a look at this measure. Economists at George Mason University have adjusted the VAP for some factors which they feel may skew turnout numbers. The original numbers, which are most commonly used, included people ineligible to vote either because they were non-citizens or felons. The VAP also excludes eligible voters who are overseas for business, education, or military participation. Because non-citizens and felons cannot vote, their inclusion may skew slightly the results of the econometric testing. Also, because military participation is routinely high in elections, the inclusion of those numbers is helpful. Thus the adjusted numbers are titled the Voting Eligible Population or VEP. Because these two variables measure different populations they will both be utilized to determine if there is a change in the impact of education depending on the dependent variable used. Thus there will be two specific models, one measuring VAP and one measuring VEP.

Figure 3: VAP and VEP comparison



This table, courtesy of the George Mason University United States Election Project, illustrates the differences between the VAP and VEP several election cycles dating back to 1944.

The independent variables offer the opportunity to determine how these demographic variables impact participation. The fist variable mentioned is gender. As discussed previously the impact of gender is one in which there may be some misconceptions. Many would expect males are more likely to participate. However, emerging evidence is suggesting that women are out-voting men. This could be because of the increased role of women in higher education and in career roles. It may also be due to an increase in campaign focus on stay at home moms.

Whatever the reason may be, theory indicates in modern elections a higher percentage of women in a given state will lead to a higher number of participants at the

polls. However, because conventional wisdom says men vote more often, the variable used in this model, MALE, is the demographic measure of the percentage of a states male population. If recent theory holds, there will be a negative coefficient for this variable indicating women are the voting majority regarding gender. It may also indicate the increased role educated women play in politics.

Another extremely important factor in voter turnout is race. As previously discussed, the franchise was initially limited and subsequently expanded over a period of decades. However years of laws and discriminatory practices prevented citizens from effectively exercising their rights. Furthermore, those people who most often lack the resources considered necessary to vote are more often than not a member of a minority group. Many political candidates and pundits often consider minorities the last real undecided or dedicated group of voters. Often minority groups lack traditional alliances with either party and instead vote on individual issues if they vote.

In order to find a variable to measure racial distribution per state the best approach is to utilize United States Census data. However, there are many minority groups represented in the United States. Many of these groups consider themselves to be multi-racial. Including all of those races as variables could become quite complicated and create a cumbersome model to evaluate. Thus, in order to include those who may be a member of a smaller racial group the solution was to take white only numbers and to subtract them from 100 percent. This variable, labeled as NONWHI, represents those groups and individuals who may relate to a small sector to multiple groups. This measure will indicate the number of non-white voters who are likely to turn out. The expected magnitude would be a negative number because most theory indicates white voters tend

to be registered and thus vote. Also, it is important to note there were an increased number of illegal aliens who were not allowed to vote. Many of those illegals are non-whites.

Determining the appropriate explanatory variable for socioeconomic status becomes slightly more difficult. As previously mentioned there are multiple variables that could be used to represent similar issues. Unemployment rate, poverty level, and median income all represent economic conditions for individuals. Unemployed individuals are more likely to live below the poverty level and likely to have lower income levels. The same logic can be applied to poverty measures, those living in poverty are likely not choosing to live in impoverished conditions and thus are either unemployed or under very low income conditions. This measure is none the less important because economic status and situations play heavily in the decision to cast a ballot. Many people vote simply because either they are adversely impacted by economic conditions or they are the beneficiaries of economic conditions.

Determining which of these variables is most effective in representing socioeconomic status is slightly more difficult. They are closely related however each has strengths and weaknesses. While poverty levels are a solid measure because poverty conditions are an impetus for motivating people to attempt to change their situation, there are complications. Poverty conditions in some parts of the country are far more extreme than in other parts of the country. Furthermore a small number of individuals may be comfortable in their conditions such that changing their status is not a motivating factor for them.

The median income for each state is another strong indicator of socioeconomic status; however, it to suffers. The median income is not transferable to another state with the same results. For instance, the median income in West Virginia may provide sufficient living conditions in West Virginia, but the same income level in California may be substandard. Cost of living adjustments may pose difficult in the analysis. Though it is a strong indicator of status, median income may not paint a complete picture of the socioeconomic impact on participation.

The unemployment rate is a nearly universal measure of economic conditions. Because each state measures unemployment the same way, and the rate for each state is adjusted for population it is a stronger indicator of status. The Bureau of Labor statistics regularly reports national, state, and local unemployment figures and a 5 percent unemployment rate in New York means the same as a 5 percent unemployment rate in Alabama. The unemployment rate measures the number of people actively seeking employment. It does not include those who are no longer actively seeking employment; however, those numbers are significantly smaller than the numbers of active seekers. This variable will be known as UNEMP. It would be expected that UNEMP would have a positive coefficient. The reason being that if capable to work and concerned for their well being, these individuals are likely to vote, possibly to improve their own economic status.

Yet another explanatory variable considered is MA, or median age. The median age of the residents in each state are considered because convention says older Americans are more likely to cast a ballot. There are also many sources that indicate younger voters, in the 18 to 25 year old range, are far less likely to even register to vote. States with a higher median age overall would be expected to have a higher turnout rate. There are

many explanations for the theory that older people are more likely to vote, experience is often mentioned. Some may say older people may feel more connected to the process; also those retired voters may have easier access to the polls on voting day. Their lower opportunity cost due to retirement is beneficial; taking the time to go to the polls simply costs less. These individuals are also more likely to have established a permanent or long term residence which often detours younger voters due to lack of interest or lack of eligibility. As previously mentioned, the number of females in the older age range may also have an impact. Thus, a positive coefficient is expected for median age.

The main focus of this investigation is on education and its impact on voter turnout. Thus it is important to find an adequate measure for education levels. The United States Census reports on education numbers for each state, giving a breakdown for high school and college graduates. Theory would suggest the higher level of education attained the higher the participation in the electoral process. If theory is correct, the turnout impact on VAP and VEP would be higher for individuals with a Bachelors degree or higher for those with only a high school education. In order to investigate this, there are two explanatory variables used for education.

The first explanatory variable used is a measure of the percentage of high school graduates in each state, HSO. This number has been adjusted in order to provide an accurate measure in the overall model. In order to ensure those with higher degrees were not counted twice, the number of Bachelors degree holders was subtracted from the number of high school graduates. This was done because a high school diploma or equivalent is required to progress on to college. The coefficient for HSO is expected to be positive. It is also expected to have a smaller magnitude than the measure for higher

education levels. This operates under the theory that during the education process, the inclination of an individual to participate in the electoral process increase, this could be through civics and government education, or simply preparing people for the activities associated with voting. Further reason for this assumption is that while a high school diploma should provide adequate levels of education to participate in the political process, those with higher degrees are more likely to have an increased personal interest.

Along the same lines of the HSO variable, another independent variable was created to measure the number of citizens with a college diploma or higher. The coefficient for the variable, BACHO is expected to be positive and to have a greater magnitude than that of HSO. This variable was created in the same manner HSO was created by subtracting the number of high school diplomas from the Bachelor's degrees. Again this was done to ensure that the same individuals were not counted twice. Theory would suggest increasing the number of college graduates would have a positive impact on the number of voters participating in the electoral process. This measure should give sufficient evidence to indicate the increase in turnout. Consideration was given to adding a third variable to measure post graduate and professional degrees, however the numbers were less clear in terms of the percentage in each state and what constituted a professional degree. Thus, the two education variables should be sufficient to indicate whether or not the theory is indeed correct.

As indicated earlier, because of the two dependent variables there will be two final working models to evaluate. The first model, using VAP as the dependent variable is:

$$VAP=\beta_1+ \beta_2 MALE+ \beta_3 NONWHI+ \beta_4 UNEMP+ \beta_5 MA+ \beta_6 HSO+ \beta_7 BACHO +\varepsilon$$

Again, utilizing the VEP as the dependent variable the second model for consideration is:

$$VEP=\beta_1+\beta_2 MALE+\beta_3 NONWHI+\beta_4 UNEMP+\beta_5 MA+\beta_6 HSO+\beta_7 BACHO+\varepsilon$$

Utilizing these two models should give an indication to the validity of the theory that education impacts voter turnout.

IV. DATA

The data represents demographic measures for the 2004 presidential election cycle. The data is cross-sectional and was collected on a State by State basis. The majority of data used came from the United States Census Bureau. The demographic data measuring the percentage of males for each state, the race distribution, the median age and both the high school and college graduate rates were all accessed through the Census Bureau web site, www.census.gov. Further information was gathered from the Bureau of

Figure 4: Demographic Information

State	Male	Nonwhi	Unemp	MA	HSO	BachO	VAP	VEP
AL	48.20%	29.00%	5.60%	37	60.10%	15.40%	54.98%	57.10%
AZ	49.80%	25.30%	5.00%	34.1	56.40%	19.89%	47.98%	57.36%
AR	48.70%	21.00%	5.70%	36.6	60.40%	13.27%	50.97%	53.85%
CA	49.60%	39.10%	6.20%	34.2	49.60%	22.41%	46.61%	59.21%
CO	50%	16.50%	5.55%	34.5	52.80%	24.70%	61.62%	67.83%
CT	48.50%	18.80%	4.90%	38.9	54.30%	21.08%	58.81%	64.03%
DE	48.50%	26.40%	4.10%	37.5	59.60%	17.06%	59.65%	64.77%
FL	48.70%	23.20%	4.80%	39.3	63.50%	18.19%	56.61%	65.90%
GA	49.00%	37.50%	4.60%	34	57.60%	19.31%	50.53%	57.11%
ID	48.80%	8.20%	4.70%	34.3	64.10%	17.47%	58.35%	63.17%
IL	49.00%	27.80%	6.20%	35.4	59.40%	17.82%	55.41%	59.86%
IN	49.10%	13.90%	5.20%	35.7	66.10%	14.29%	53.24%	54.71%
IA	49.20%	6.50%	4.80%	38	65.50%	17.85%	66.26%	69.29%
KS	49.40%	14.80%	5.50%	36.1	59.60%	21.68%	57.95%	62.83%
KY	48.90%	10.10%	5.30%	37.3	60.80%	14.14%	56.88%	59.02%
LA	48.20%	36.30%	5.70%	35.2	56.30%	16.27%	57.86%	60.36%
ME	48.80%	3.10%	4.60%	40.7	62.90%	16.50%	71.31%	72.35%
MD	48.20%	38.50%	4.20%	36.8	52.20%	21.76%	56.81%	63.48%
MA	48.50%	16.60%	5.10%	38.1	50.20%	22.58%	58.76%	63.27%
MI	48.90%	20.00%	7.10%	36.6	63.50%	16.05%	63.54%	66.36%
MN	49.60%	12.00%	4.70%	36.6	59.80%	23.99%	73.04%	76.82%
MS	48.10%	39.20%	6.20%	34.9	62.90%	14.47%	53.85%	55.56%
MO	48.80%	15.50%	5.70%	37.3	59.80%	20.55%	62.87%	66.08%
MT	49.70%	9.40%	4.40%	39.6	66.40%	18.45%	62.95%	63.56%
NE	49.50%	10.40%	3.80%	36	66.50%	17.45%	59.11%	63.60%
NV	50.60%	23.90%	4.30%	35.1	61.80%	18.68%	47.74%	55.47%
NH	49.40%	4.50%	3.80%	39.2	55.40%	24.93%	67.73%	70.34%
NJ	48.60%	30.10%	4.80%	37.8	53.00%	23.48%	54.95%	64.07%
NM	48.80%	30.50%	5.70%	35.8	57.80%	15.71%	53.91%	57.72%
NY	48.20%	32.90%	5.80%	37.3	54.80%	18.71%	49.97%	57.04%
NC	48.90%	28.60%	5.50%	36	57.50%	16.26%	54.58%	58.40%
ND	49.80%	8.50%	3.40%	38.8	64.30%	19.31%	63.82%	64.56%
OH	48.60%	15.70%	6.10%	37.5	63.50%	17.09%	64.83%	66.44%
OK	49.00%	24.60%	4.80%	36.5	62.30%	16.66%	54.93%	58.66%
OR	49.40%	13.20%	7.40%	37	61.50%	17.13%	66.38%	69.93%
PA	48.40%	15.40%	5.50%	39.3	61.20%	16.59%	60.00%	62.22%
RI	48.20%	17.10%	5.20%	38.1	53.90%	16.93%	51.86%	58.68%
SC	48.30%	32.60%	6.80%	36.9	58.70%	17.93%	50.96%	52.70%
SD	49.40%	12.00%	3.50%	37	62.00%	19.39%	67.37%	68.93%
TN	48.80%	20.40%	5.40%	37	58.60%	17.56%	53.96%	56.59%
TX	49.40%	28.10%	6.10%	32.9	53.80%	17.45%	45.57%	53.35%
UT	50.10%	10.20%	5.20%	28	60.20%	23.66%	56.39%	61.12%
VT	49.10%	3.40%	3.70%	40.4	56.60%	23.19%	63.97%	65.79%
VA	48.70%	28.30%	3.70%	36.9	55.30%	21.31%	56.16%	61.03%
WA	49.70%	18.80%	6.20%	36.4	59.80%	20.77%	60.42%	66.85%
WV	48.90%	5.00%	5.30%	40.3	65.60%	9.28%	52.85%	53.25%
WI	49.40%	11.90%	4.90%	37.5	63.20%	18.49%	71.48%	76.24%
WY	49.90%	7.60%	3.90%	38.4	69.40%	15.84%	63.04%	64.38%

Labor Statistics regarding the unemployment rates for the 2004 election year. The Bureaus web site is www.bls.gov. The data for the VAP is available through the Federal Elections Commission, their website is www.fec.gov. The VAP and VEP information are also available through the George Mason University's United States Election Project. Their online address is http://elections.gmu.edu. Again, it is important to note the education numbers were adjusted to fit the context of this study.

V. REGRESSIONS AND RESULTS

After researching theory and determining the variables used to test the theory regressions can be run to determine if the hypothesis stands. Utilizing the aforementioned models and data the regressions will give empirical support of what would otherwise only be theory. The first table contains the descriptive statistics for the explanatory variables.

Table 1: Descriptive Statistics

Variable	Mean	SD	Minimum	Maximum
MALE	.4903	.5877	.4810	.5060
NONWHI	.1963	.1039	.3100E-01	.3920
UNEMP	.05139	.09273	.3400E-01	.7400E-01
MA	36.7667	2.1982	28.0000	40.7000
HSO	.5959	.4572	.4960	.6940
BACHO	.1852	.3244	.9280E-01	.2493

Using a standard Ordinary Least Squares (OLS) regression to analyze the results begins the process of testing the validity of the hypothesis that education has an impact on voter participation. A regression will be run for each model, using both VAP and VEP as the dependent variable but maintaining the same explanatory variables. These regressions will be compared to analyze measures for turnout in addition to the essential question. They may also yield some interesting results regarding actual turnout measures. It is possible that utilizing a more accurate measure of participation may indeed contribute to the explanation of low turnout.

Table 2: Regression 1 VAP

Variable	Coefficient	Standard Error	T-Ratio	P[|T|] > t
CONSTANT	1.0064	.7779	1.294	.2030
MALE	-3.0655	1.4733	-2.081	.0437
NONWHI	-.2556	.0858	-2.979	.0048
UNEMP	1.1250	.7573	1.486	.1450
MA	.0076	.0036	2.091	.0428
HSO	.8638	.2198	3.929	.0003
BACHO	1.4886	.2941	5.062	.0000

The first regression analyzes the relationship between the explanatory variables and the VAP measure of voter turnout. The regression yields an R^2 of .67 and adjusted R^2 of .62 with all of the variables being significant at the 5 percent level with the exception of unemployment. Analyzing the coefficients yields results that would be in line with the theoretical basis of the model. The indication is that in a state with a higher male population you are likely to see a lower turnout. Specifically, for every 1 percentage point increase in the number of males the VAP declines by 3.1 percent. As theory suggests, males are less likely to vote even though that would be contrary to conventional wisdom. As expected a state with a larger nonwhite population is more likely to see a lower turnout. For every 1 percentage point increase in nonwhite population there is a .25 percent decrease in VAP. Again, this is what theory would suggest.

The unemployment measure yields an interesting result. For every 1 percent increase in unemployment there is a 1.12 percent increase in VAP. This variable does not reach the desired significance level, but for the purpose of a point estimate evaluation it is

acceptable. The results are not quite as expected but yet there are possible explanations. Because the general election falls on a workday it is possible that unemployed individuals may have an easier time getting to the voting booth. It is also possible they may be more highly motivated to participate and change the political environment they feel is causing their employment issue. It is also possible the VAP may be including people who have chosen not to work due to material wealth or career success. The comparison to the VEP will be important here.

Looking at the median age, the results are as expected, the higher the median age voter the higher the likelihood of increased turnout. In this scenario, a one year increase in the median age will yield a .01 percent increase in the VAP. This coefficient is not as high as expect but still follows the theory that an older population is more likely to participate in the electoral process. Again, a comparison with the VEP will be interesting. It is possible the VEP results will be higher.

The focus of this model would be the education variables. Thus it is important to focus on the HSO and BACHO results. In this case, a one percent increase in the HSO yields a .86 percent increase in the VAP. This may not seem like a high number but considering the fact that the high school graduation rate nationally is just above 86 percent a 10 percent increase in the high school graduation rate could increase the VAP by 8.6 percent. It is not unthinkable to have a 96 percent high school graduation or equivalent rate, especially in a country with such vast economic resources as the United States. This clearly suggests a connection between a high school education and voter participation. It is likely that as the percentage of graduates increased there would likely be less impact on the VAP, but there is still likely to be an increase. As indicated, it is

unlikely there will ever be 100 percent participation, mainly attributed to rational ignorance and lack of registration and mobilization.

The high school graduate coefficients are likely to be lower because there is assumed universal access to a high school education. In the United States everyone is offered at least a twelfth grade education at the expense of taxpayers. Thus, graduation rates for that range tend to be higher. However, access to a college education is not guaranteed. There are high costs for those trying to obtain a college degree and there are also many jobs still available which do not require higher education. However, it should still hold that those with a college education are more likely to vote. It is also likely this number is higher than those with only a high school education. These participants are thought to be more likely to understand the voting process and are likely to have a more vested interest in the outcome of the election.

Looking at the numbers for the BACHO variable the results are again as expected. For every one percent increase in Bachelors degrees there is a 1.5 percent increase in the VAP. Nationally only roughly 27 percent of the population has a college degree or beyond. A ten percent increase in college graduates could increase VAP by 15 percent. It is clear a college education is beneficial to those participating in the voting process. There is no guarantee this trend will continue, and it is likely that, as the BACHO increases the impact on the VAP will decrease. However it is also clear there is an impact. Increasing the number of college graduates is beneficial for many reasons beyond political participation.

Table 3: Regression 2 VEP

Variable	Coefficient	Standard Error	T-Ratio	P[|T|] > t
CONSTANT	.3018	.7412	.407	.6859
MALE	-1.3071	1.4036	-.931	.3572
NONWHI	-.1402	.0817	-1.716	.0938
UNEMP	1.0790	.7215	1.496	.1424
MA	.0074	.0035	2.141	.0383
HSO	.6266	.2064	2.992	.0047
BACHO	1.5559	.2802	5.554	.0000

Because the VEP adjusts the measure of turnout to give what is considered to be a more accurate measure, it is important to compare the results for the two regressions. It is expected that the coefficients sign would be the same and it would also be expected the magnitudes are similar. Comparing these two regressions will help to determine which, if either, is a better measure of turnout and how they each are impacted by the education variables.

Consistent with the VAP regression there is a negative coefficient associated with the MALE variable. In the case of the VEP however, the magnitude is smaller. A one percent increase in the male population yields only a 1.3 percent decrease in the VEP. This is not quite as high as the 3.1 percent increase experienced with the VAP. A partial explanation is this measure adjusts for the number of felons and illegal aliens the VAP includes. Conventional wisdom would suggest the number of felons who are male would be higher than the number of female felons. There is a question as the significance level associated with this model, which indicates a potential weakness in the evaluation.

The coefficient associated with the nonwhite variable again is consistent with what theory would suggest, there is a lower percentage of turnout reported in states with a higher percentage of nonwhites. For a 1 percent increase in nonwhites in a state there is a .14 percent decrease in VEP. This magnitude is also smaller than that of its VAP counterpart. This difference is likely attributed to the exclusion of illegal aliens in the VEP. These individuals are likely included in the VAP measure and thus skew the results.

The unemployment measure for the VEP is also consistent with the VAP model. There is a 1.1 percent increase in VEP with each percentage increase in the unemployment rate. This is only slightly lower than the coefficient in the VAP measure. It could be assumed that the adjustments made with the VEP excluded some potential voters who were not actually eligible to participate and thus decreases the magnitude of this particular coefficient.

As expected the coefficient for median age is consistent with the VAP measure. Only slightly smaller, the MA results increase a one year increase in median age would cause a .01 percent increase in turnout when rounded. This is the same as the VAP and is somewhat expected. The adjustments made in the VEP do not exclude or include many different age groups. Thus there is a consistent impact by age in both VAP and VEP models.

In this model attention is focused on the variables measuring education statistics. In the case of high school-only graduates, there is a positive coefficient as there was in the VAP model however its magnitude is less than the previous model. In this case there is a .63 percent increase in VEP with each percentage increase in the number of high school graduates. This is less than the .86 percent increase noted in the VAP model.

Obviously the adjustments made in the VEP model impact the education number for high school education. There are several possible explanations for this finding; however, they are not vital to the discussion at hand. What is clear is there is still a positive coefficient as expected.

The BACHO coefficient is also consistent with the results from the first regression. While sharing the same positive coefficient, the VEP regression yields a slightly larger magnitude. The impact of a one percent increase in BACHO on the VEP is 1.55 percent. While not a huge difference there is still a slightly larger impact from a college degree when using the VEP as the dependent variable. Again, this is likely attributed to the adjustments made in calculating the VEP.

In order to ensure the doubly truncated dependent variable does not skew the regressions results, a Logit transformation can be applied to both VAP and VEP. Thus using this technique transforms the "probability of voting" to the "log odds of voting" and thereby creates a variable that ranges from negative infinity to positive infinity instead of a probability that ranges only from zero to one. The technique amounts to converting the probability of voting to a log odds ratio through logistic the transformation[2]. (Troutman 199) Thus we have the following models to illustrate the adjustment

$$VAPT=\beta_1+ \beta_2 MALE+ \beta_3 NONWHI+ \beta_4 UNEMP+ \beta_5 MA+ \beta_6 HSO+ \beta_7 BACHO +\varepsilon$$

and

$$VEPT=\beta_1+ \beta_2 MALE+ \beta_3 NONWHI+ \beta_4 UNEMP+ \beta_5 MA+ \beta_6 HSO+ \beta_7 BACHO +\varepsilon$$

where VAPT and VEPT are defined in footnote 2.

[2] In this case the logistic transformation is as follows VAPT=ln[VAP/(1-VAP)] and VEPT=ln[VEP/(1-VEP)]

Table 4: Regression 3 VAPT

Variable	Coefficient	Standard Error	T-Ratio	P[|T|] > t
CONSTANT	1.8337	3.3222	.552	.5904
MALE	-12.2482	6.2918	-1.947	.0584
NONWHI	-1.0652	.3663	-2.908	.0059
UNEMP	4.7559	3.2339	1.471	.1490
MA	.0324	.0155	2.085	.0433
HSO	3.5758	.9387	3.809	.0005
BACHO	6.2001	1.2558	4.937	.0000

Upon reviewing the transformation there are no sign changes, however the magnitudes do change. The significance levels are similar with unemployment and median age being slightly less significant. This transformation decreases both the R^2 .66 and adjusted R^2 to .61. Further, it does little to adjust the significance of the coefficients to the extent it makes them more significant. In order to ensure the logit transformation is unnecessary it will also be performed on the VEP model.

Table 5: Regression 4 VEPT

Variable	Coefficient	Standard Error	T-Ratio	P[|T|] > t
CONSTANT	-1.1029	3.3199	-.332	.7414
MALE	-5.2665	6.2873	-.838	.4071
NONWHI	-.6142	.3661	-1.678	.1010
UNEMP	4.8792	3.2316	1.510	.1388
MA	.0326	.0156	2.102	.0417
HSO	2.7217	.9381	2.901	.0060
BACHO	6.7249	1.2549	5.359	.0000

The VEP logistical transformation indicates a similar result to the VAP transformation. The R^2 is .60 and the adjusted R^2 is.54. In this transformation the magnitudes remain similar in size the significance are also comparable. The changes in the significance levels combined with the decrease in the R^2 and the adjusted R^2 make these models comparable, but do not make the adjusted model more desirable than the original. The original VAP and VEP models are appropriate to continue the investigation.

Now it is clear the original model is appropriate, it is important to test for constant variance in the error term. If the variance is not constant, then it can be assumed heteroscedasticity exists. Because there are two independent variables being tested both will be checked for heteroscedasticity.

Table 6: VAP Heteroscedasticty test

Variable	Coefficient	Standard Error	T-Ratio	P[|T|] > t
CONSTANT	1.0064	.6403	1.572	.1237
MALE	-3.0655	1.1971	-2.561	.0142
NONWHI	-.2556	.0687	-3.720	.0006
UNEMP	1.1250	.7462	1.508	.1393
MA	.0076	.0029	2.646	.0115
HSO	.8638	.1724	5.011	.0000
BACHO	1.4886	.2695	5.524	.0000

Using the heteroscedasticity command in LIMDEP to determine the presence of heteroscedasticity yielded an expected result. There is no heteroscedasticity present in the model which is surprising considering the small sample size. The Breuch-Pagan Chi-square statistic was 1.24 with a p-value of .9705. This model is unbiased, consistent and has a constant variance. But to ensure the variance of coefficient estimates are consistently estimated, we will continue to use the White Standard Errors employed in the LIMDEP heteroscedasticity command.

Since there are two models being evaluated, it is important to run the same test for the VEP model. It is likely to have a similar result as the first. Again, the heteroscedasticity command will be used to determine if constant variance is present.

Table 7: VEP Heteroscedasticty test

Variable	Coefficient	Standard Error	T-Ratio	P[|T|] > t
CONSTANT	.3018	.5555	.543	.5898
MALE	-1.3071	1.0240	-1.276	.2090
NONWHI	-.1402	.0608	-2.308	.0261
UNEMP	1.0709	.7803	1.383	.1742
MA	.0074	.0027	2.700	.0100
HSO	.6266	.1505	4.163	.0002
BACHO	1.5559	.2419	6.431	.0000

For this regression the Breuch-Pagan statistic is 5.18 with a p-value of .5211. As with the first regression it appears that there is no heteroscedasticity present.

Another consideration is model specification. It is important to ensure the model is properly specified. In order to ensure any omitted variables do not result in statistically significant biases in the coefficient estimates it is important to run a Ramsey Reset test. The RESET test will be performed on both models to ensure both are properly specified and our model is correct. The results of the VAP reset test are included.

Table 8: VAP Ramsey Reset Test

Variable	Coefficient	Standard Error	T-Ratio	P[|T|] > t
CONSTANT	736.6817	419.6143	1.756	.0872
MALE	-2605.7364	1486.0232	--1.753	.0876
NONWHI	-217.2434	123.9113	-1.753	.0876
UNEMP	956.1094	545.3648	1.753	.0876
MA	6.4589	3.6844	1.753	.0877
HSO	733.9548	418.6198	1.753	.0876
BACHO	1265.0249	721.5539	1.753	.0876
YHAT2	-2257.5130	1283.7534	-1.759	.0867
YHAT3	2652.5686	1504.4192	1.763	.0859
YHAT4	-1162.0246	658.2925	-1.765	.0876

Table 9: VEP Ramsey Reset Test

Variable	Coefficient	Standard Error	T-Ratio	P[|T|] > t
CONSTANT	30.3710	182.5733	.166	.8688
MALE	-231.1788	1625.2426	-.142	.8876
NONWHI	-24.7800	174.3412	-.142	.8877
UNEMP	190.5159	9.2179	.142	.8878
MA	1.3109	779.0232	.142	.8877
HSO	110.7499	1934.4594	.142	.8877
BACHO	275.0511	2996.1360	.142	.8877
YHAT2	-488.0617	174.1387	-.163	.8715
YHAT3	588.9936	3200.1167	.184	.8549
YHAT4	-261.7572	1278.1376	-.205	.8388

The RESET test was run on both models to determine specification and to ensure there is no statistically significant bias. Both models fell below the critical F value, thus the null cannot be rejected[3]. This indicates there is no specification error. It is important that the model is properly specified, and these results indicate that the models have met this requirement.

[3] The resultant F values were as follows. The VAP F value was .0024 with (3,43) degrees of freedom. The F value for the VEP was calculated as .014. The Critical Value for P =.001 is 2.84

VI. CONCLUSIONS

The first point to address is a final determination of which dependant variable is a better indicator of turnout. For this particular analysis the obvious difference is in the significance levels for the VEP model. There are differences between the coefficients in the VEP and the VAP. However, the VEP variables are not as significant as the VAP coefficient significance levels. The VEP is thought to illustrate a realistic picture, however, including it as the final model poses some obstacles that are beyond the scope of this analysis. More work would be required to determine the issues with significance for the MALE, NONWHI, and UNEMP variables before it could be considered accurate.

The increase in influence of women as voters is an interesting point to illustrate the impact of education. It appears the increase in educated women and the increase of female voter turnout are closely connected. This further strengthens the argument in a unique way. It illustrates that an increase in educational levels can have a long term and wide reaching impact on the electoral process.

The decrease in voting rates by recent college graduates is only a short run phenomenon. It is clear the average voter is well beyond college age. It is likely the typical college student chooses to allocate his time towards other things. It could be social or academic pursuits or perhaps a feeling of apathy or disconnection with the politicians who tend to be older and less in touch with that segment of the population.

Another consideration is many students attend a university away from home. They may not be registered to vote or may not have enough knowledge of the political climate in the particular area to contribute.

The question of minority participation in voter turnout can also be tied to education questions. It is not surprising there is a negative coefficient associated with minority voting habits. There are likely multiple contributing factors including a lack of voting history, and a lack of minority representation in the political arena. The question this analysis is more concerned with is the relatively low educational attainment level among minority groups. While it is acknowledged this is likely not the only explanation, it is clearly a factor. Though the numbers of educated minorities are increasing, it is likely the impact of those increases will not be recognized in the political arena in the immediate future. Further, to the extent there is an impact, the minority number of educated individuals and individuals seeking higher education are still low in relation to the majority. This is another area where an increase in minority education levels is likely to increase the voter turnout and benefit society as a whole.

The main focus is the evaluation to what extent education impacts turnout overall. Both models presented show a positive coefficient associated with both measures of education, HSO and BACHO. The coefficients for HSO in both the VAP and VEP model were lower than the BACHO which is to be expected as explained in the literature review. This is consistent with the idea that higher educational attainment levels correlate to higher turnout. As a policy matter, this would indicate that broadening the reach of the education system would have a multifaceted impact on the political and socioeconomic environment. Along with the personal benefits of each individual citizen, there are social

benefits to be gained. Society is better off with educated voters. Their contribution to society as a whole would be broadened outside the voting booth and in.

It is unclear to what degree increased voter turnout influences the political climate or government effectiveness. Some would argue that a higher turnout is not as advantageous as it may seem. Higher turnouts could indicate that the government is failing to represent adequately the desires of the citizens. It may also include citizens who have little knowledge of the candidates they are voting.

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APPENDICES

APPENDIX A

OLS NO HET CORRECTION

1. VAP

--> REGRESS; Lhs = VaP; Rhs = ONE, MALE, NONWHI, UNEMP, MA, HSO, BACHO$

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+----------------------------------------------------+
| Ordinary least squares regression |
| Model was estimated Aug 31, 2007 at 02:17:19PM |
| LHS=VAP Mean = .5810042 |
| Standard deviation = .6616273E-01 |
| WTS=none Number of observs. = 48 |
| Model size Parameters = 7 |
| Degrees of freedom = 41 |
| Residuals Sum of squares = .6812672E-01 |
| Standard error of e = .4076306E-01 |
| Fit R-squared = .6688744 |
| Adjusted R-squared = .6204170 |
| Model test F[ 6, 41] (prob) = 13.80 (.0000) |
| Diagnostic Log likelihood = 89.27303 |
| Restricted(b=0) = 62.74685 |
| Chi-sq [ 6] (prob) = 53.05 (.0000) |
| Info criter. LogAmemiya Prd. Crt. = -6.263826 |
| Akaike Info. Criter. = -6.265920 |
| Autocorrel Durbin-Watson Stat. = 2.1602735 |
| Rho = cor[e,e(-1)] = -.0801367 |
+----------------------------------------------------+
+---------+-------------+----------------+--------+---------+----------+
|Variable | Coefficient | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+---------+-------------+----------------+--------+---------+----------+
 Constant 1.00635772 .77792064 1.294 .2030
 MALE -3.06551829 1.47326196 -2.081 .0437 .49027083
 NONWHI -.25555303 .08577425 -2.979 .0048 .19633333
 UNEMP 1.12501311 .75725181 1.486 .1450 .05138542
 MA .00760159 .00363513 2.091 .0428 36.7666667
 HSO .86378787 .21982432 3.929 .0003 .59593750
 BACHO 1.48860769 .29406300 5.062 .0000 .18520417
```

APPENDIX B

2.VEP

--> REGRESS; Lhs = VeP; Rhs = ONE, MALE, NONWHI, UNEMP, MA, HSO, BACHO$

```
+----------------------------------------------------+
| Ordinary least squares regression |
| Model was estimated Aug 31, 2007 at 02:18:07PM |
| LHS=VEP Mean = .6231750 |
| Standard deviation = .5805245E-01 |
| WTS=none Number of observs. = 48 |
| Model size Parameters = 7 |
| Degrees of freedom = 41 |
| Residuals Sum of squares = .6183965E-01 |
| Standard error of e = .3883664E-01 |
| Fit R-squared = .6095836 |
| Adjusted R-squared = .5524495 |
| Model test F[ 6, 41] (prob) = 10.67 (.0000) |
| Diagnostic Log likelihood = 91.59683 |
| Restricted(b=0) = 69.02383 |
| Chi-sq [ 6] (prob) = 45.15 (.0000) |
| Info criter. LogAmemiya Prd. Crt. = -6.360650 |
| Akaike Info. Criter. = -6.362745 |
| Autocorrel Durbin-Watson Stat. = 2.2422645 |
| Rho = cor[e,e(-1)] = -.1211322 |
+----------------------------------------------------+
+---------+-------------+----------------+--------+---------+----------+
|Variable | Coefficient | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+---------+-------------+----------------+--------+---------+----------+
 Constant .30184639 .74115676 .407 .6859
 MALE -1.30708573 1.40363684 -.931 .3572 .49027083
 NONWHI -.14021488 .08172063 -1.716 .0938 .19633333
 UNEMP 1.07901653 .72146473 1.496 .1424 .05138542
 MA .00741519 .00346333 2.141 .0383 36.7666667
 HSO .62663132 .20943561 2.992 .0047 .59593750
 BACHO 1.55597400 .28016583 5.554 .0000 .1852041
```

APPENDIX C

OLS WITH HETERO CORRECTION

3.VAP

--> REGRESS; Lhs = VAP; Rhs = ONE, MALE, NONWHI, UNEMP, MA, HSO, BACHO; Het$

```
+-----------------------------------------------------+
| Ordinary least squares regression |
| Model was estimated Aug 31, 2007 at 02:10:42PM |
| LHS=VAP Mean = .5810042 |
| Standard deviation = .6616273E-01 |
| WTS=none Number of observs. = 48 |
| Model size Parameters = 7 |
| Degrees of freedom = 41 |
| Residuals Sum of squares = .6812672E-01 |
| Standard error of e = .4076306E-01 |
| Fit R-squared = .6688744 |
| Adjusted R-squared = .6204170 |
| Model test F[ 6, 41] (prob) = 13.80 (.0000) |
| Autocorrel Durbin-Watson Stat. = 2.1602735 |
| Rho = cor[e,e(-1)] = -.0801367 |
| White heteroscedasticity robust covariance matrix |
| Br./Pagan LM Chi-sq [ 6] (prob) = 1.24 (.9750) |
+-----------------------------------------------------+
+---------+-------------+----------------+--------+---------+----------+
|Variable | Coefficient | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+---------+-------------+----------------+--------+---------+----------+
 Constant 1.00635772 .64029944 1.572 .1237
 MALE -3.06551829 1.19712784 -2.561 .0142 .49027083
 NONWHI -.25555303 .06869750 -3.720 .0006 .19633333
 UNEMP 1.12501311 .74615603 1.508 .1393 .05138542
 MA .00760159 .00287332 2.646 .0115 36.7666667
 HSO .86378787 .17237636 5.011 .0000 .59593750
 BACHO 1.48860769 .26949413 5.524 .0000 .18520417
```

APPENDIX D

4.VEP

--> REGRESS; Lhs = VEP; Rhs = ONE, MALE, NONWHI, UNEMP, MA, HSO, BACHO; Het$

```
+----------------------------------------------------+
| Ordinary least squares regression |
| Model was estimated Aug 31, 2007 at 02:12:11PM |
| LHS=VEP Mean = .6231750 |
| Standard deviation = .5805245E-01 |
| WTS=none Number of observs. = 48 |
| Model size Parameters = 7 |
| Degrees of freedom = 41 |
| Residuals Sum of squares = .6183965E-01 |
| Standard error of e = .3883664E-01 |
| Fit R-squared = .6095836 |
| Adjusted R-squared = .5524495 |
| Model test F[ 6, 41] (prob) = 10.67 (.0000) |
| Autocorrel Durbin-Watson Stat. = 2.2422645 |
| Rho = cor[e,e(-1)] = -.1211322 |
| White heteroscedasticity robust covariance matrix |
| Br./Pagan LM Chi-sq [ 6] (prob) = 5.18 (.5211) |
+----------------------------------------------------+
+---------+-------------+----------------+--------+---------+----------+
|Variable | Coefficient | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+---------+-------------+----------------+--------+---------+----------+
 Constant .30184639 .55552234 .543 .5898
 MALE -1.30708573 1.02401874 -1.276 .2090 .49027083
 NONWHI -.14021488 .06075103 -2.308 .0261 .19633333
 UNEMP 1.07901653 .78032231 1.383 .1742 .05138542
 MA .00741519 .00274604 2.700 .0100 36.7666667
 HSO .62663132 .15053628 4.163 .0002 .59593750
 BACHO 1.55597400 .24193140 6.431 .0000 .18520417
```

APPENDIX E

RESET MODELS

5. VAP

--> REGRESS; Lhs = VaP; Rhs = ONE, MALE, NONWHI, UNEMP, MA, HSO, BACHO, yh2, yh3, yh4$

WARNING: Badly conditioned X. Condition value = .1031199D+07

```
+----------------------------------------------------+
| Ordinary least squares regression |
| Model was estimated Aug 31, 2007 at 02:30:30PM |
| LHS=VAP Mean = .5810042 |
| Standard deviation = .6616273E-01 |
| WTS=none Number of observs. = 48 |
| Model size Parameters = 10 |
| Degrees of freedom = 38 |
| Residuals Sum of squares = .6138838E-01 |
| Standard error of e = .4019308E-01 |
| Fit R-squared = .7016257 |
| Adjusted R-squared = .6309581 |
| Model test F[ 9, 38] (prob) = 9.93 (.0000) |
| Diagnostic Log likelihood = 91.77261 |
| Restricted(b=0) = 62.74685 |
| Chi-sq [ 9] (prob) = 58.05 (.0000) |
| Info criter. LogAmemiya Prd. Crt. = -6.238879 |
| Akaike Info. Criter. = -6.245069 |
| Autocorrel Durbin-Watson Stat. = 2.1071081 |
| Rho = cor[e,e(-1)] = -.0535541 |
+----------------------------------------------------+
+---------+-------------+----------------+--------+---------+----------+
|Variable | Coefficient | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+---------+-------------+----------------+--------+---------+----------+
 Constant 736.681696 419.614399 1.756 .0872
 MALE -2605.73638 1486.02320 -1.753 .0876 .49027083
 NONWHI -217.243380 123.911330 -1.753 .0876 .19633333
 UNEMP 956.109421 545.364798 1.753 .0876 .05138542
 MA 6.45896224 3.68442500 1.753 .0877 36.7666667
 HSO 733.954813 418.619835 1.753 .0876 .59593750
 BACHO 1265.02489 721.553851 1.753 .0876 .18520417
 YH2 -2257.51304 1283.75339 -1.759 .0867 .34043284
 YH3 2652.56863 1504.41918 1.763 .0859 .20109289
 YH4 -1162.02460 658.292473 -1.765 .0856 .11970212
```

6.VEP

--> REGRESS; Lhs = VeP; Rhs = ONE, MALE, NONWHI, UNEMP, MA, HSO, BACHO, yh2, yh3, yh4$

WARNING: Badly conditioned X. Condition value = .2080593D+07

```
+----------------------------------------------------+
| Ordinary least squares regression |
| Model was estimated Aug 31, 2007 at 02:24:17PM |
| LHS=VEP Mean = .6231750 |
| Standard deviation = .5805245E-01 |
| WTS=none Number of observs. = 48 |
| Model size Parameters = 10 |
| Degrees of freedom = 38 |
| Residuals Sum of squares = .5917775E-01 |
| Standard error of e = .3946276E-01 |
| Fit R-squared = .6263892 |
| Adjusted R-squared = .5379025 |
| Model test F[ 9, 38] (prob) = 7.08 (.0000) |
| Diagnostic Log likelihood = 92.65281 |
| Restricted(b=0) = 69.02383 |
| Chi-sq [ 9] (prob) = 47.26 (.0000) |
| Info criter. LogAmemiya Prd. Crt. = -6.275554 |
| Akaike Info. Criter. = -6.281744 |
| Autocorrel Durbin-Watson Stat. = 2.2552415 |
| Rho = cor[e,e(-1)] = -.1276208 |
+----------------------------------------------------+
+---------+-------------+----------------+--------+---------+----------+
|Variable | Coefficient | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+---------+-------------+----------------+--------+---------+----------+
 Constant 30.3710039 182.573280 .166 .8688
 MALE -231.178843 1625.24256 -.142 .8876 .49027083
 NONWHI -24.7800109 174.341158 -.142 .8877 .19633333
 UNEMP 190.515901 1341.44862 .142 .8878 .05138542
 MA 1.31085958 9.21795139 .142 .8877 36.7666667
 HSO 110.749851 779.023202 .142 .8877 .59593750
 BACHO 275.051081 1934.45943 .142 .8877 .18520417
 YH2 -488.061681 2996.13600 -.163 .8715 .39035863
 YH3 588.993552 3200.11674 .184 .8549 .24577188
 YH4 -261.757169 1278.13757 -.205 .8388 .15551695
```