*Filip KOKOTOVIC, Petar KURECIC**

AN EMPIRICAL ANALYSIS OF VOTING PATTERNS IN FOUR BATTLEGROUND STATES OF THE 2016 US PRESIDENTIAL ELECTION

Abstract. *The results of the 2016 US Presidential Election showed the inaccuracy of the polls and the unexpected victories of the Republican candidate in Michigan, Florida and Pennsylvania, thereby allowing Donald Trump to carry the electoral vote. By using a standard Ordinary Least Squares regression, we designed predictive models for four battleground states and assessed their accuracy. The model proposed by Lewis-Beck and Tien is used as the foundation for proposing secondary models that consider macroeconomic variables. While most of these models fail to provide accurate results, the models which use macroeconomic variables correctly identify the results for Pennsylvania and Ohio.*
Keywords: *US Presidential Election, battleground states, blue-collar states, voting models, OLS regression*

Introduction

The year 2016 has largely left voters, pollsters, various social science experts and members of the media establishment deeply confused. The confusion and sense of misdirection started with the Brexit phenomenon. Even though many surveys correctly predicted the country would opt to leave, the reasoning and underlying causes have been difficult to identify. The vote has created divisions, dividing the country by generation, race and making many confused about the exact cause of the vote itself. A pattern whereby voters choose self-destructive and radical options, in the hope such options will force a Copernican turn on the path taken by policy is on the rise. Nowhere is this case more evident than in the 2016 US Presidential Election. Many predicted the 2016 election would bring an easy victory for the Democratic candidate, Hillary Clinton, given that her Republican counterpart, Donald Trump, had been plagued by so many scandals that appeared to make the Clinton e-mail intrigue irrelevant.

* *Filip Kokotovic, MA, Teaching assistant at the University College of International Relations and Diplomacy Dag Hammarskjöld, Zagreb, Croatia; Petar Kurecic, PhD, Assistant professor at the University North, Department of Business and Economics, Varaždin, Croatia.*

There are several ways to react to what may be perceived as a radical change to what appeared to be a politically correct and globalised society. Many who have been feeling disenfranchised hit the emergency brakes, in the process establishing a new pattern of possibly damaging politics. This often repeated hypothesis has not been completely verified. The key theoretical argument in support of it is the shift in the traditionally Democratic states which accepted the potentially dangerous rhetoric and ideas of the Republican nominee.

One could consume much time and energy in naming the many threats made by Mr Trump, from his questionable attitude to the press to his even more questionable understanding of statements that fail to comply with both the US Constitution and numerous relevant international agreements. In a world of uncertainty and risk, where 'post-truth' and 'alternative facts' are often mentioned concepts, it is safest to conduct a thorough qualitative and quantitative analysis in an attempt to understand this phenomenon.

The fact remains that, like the Brexiteers, Trump correctly identified the grievance of the White, mostly blue-collar majority in the battleground states of the US Great Lakes Region (Ohio, Michigan, Wisconsin, Minnesota and Pennsylvania) and Florida, where the anti(Latino)-immigrant views he constantly expressed during the campaign obviously found fertile ground to flourish and give him victory. Although Trump did not win in Minnesota, the victories in all the other battleground states brought him the victory. The Great Lakes Region, which overwhelmingly supported Obama in 2012 (except for traditionally Republican Indiana), changed its orientation in 2016.

The above-mentioned grievance was oriented to neoliberal, transnational capitalism, and the elites that have created and are supporting it, exporting manufacturing jobs from the USA (and ignoring the problems of what was once pejoratively called the 'Rust Belt' and bringing in low-skilled, mostly Latin-American immigrants prepared to work for less. These elites were personified in H. Clinton and 'the Washington swamp'[1].

Ever since the 1980s, usually seen as the starting point for predictive models taking previous voter behaviour patterns into account, both elections and parties have become more prone to plutocracy and financial capital(ism) and triggered resistance from movements such as "Occupy Wall Street". Even though many blue-collar, middle-class voters cared very little about

[1] *"The cowardice of the liberal class meant it lost all credibility, much as Bernie Sanders did when he sold his soul to the Clinton campaign. The liberal class proved it would stand and fight for nothing. It mouthed words and ideas it did not truly believe. It bears significant responsibility for the phenomena that created Trump. It should have had the foresight to abandon the Democratic Party after President Bill Clinton passed the 1994 North American Free Trade Agreement, to build parties and institutions that defended the interests of the working class." Accessible at https://faktensucher.wordpress.com/2016/11/14/its-worse-than-you-think-information-clearing-house-ich/.*

such causes, the message of the Republican candidate Mr Trump and his anti-trade stance was one they could understand. It should also be noted that this is a highly mixed demographic that is difficult to define (Walley, 2017).

Therefore, the demos' reaction should represent some kind of backfire. Nevertheless, it is difficult to imagine any improvements in workers' rights, especially for blue-collar, middle- and low-paid workers, who are exactly those who elected Mr Trump to the White House. Manza and Crowley (2017) also investigate this claim and believe that this demographic was crucial to his electoral success.

It seems preposterous that lower middle-class workers would vote for a billionaire who has profited from the tax-exemption system and capitalism as such. However, one fact that is striking tells a lot about why this happened. In 2007, when 'the neoliberal miracle' was at its peak, the real wages of non-supervised workers were lower than in the previous years, and the real wages of male workers were at the same level as they were in the 1960s: "The only time in the last four decades in which workers at the middle and bottom of the wage distribution saw consistent gains in real wages was the period of low unemployment in the 1990s boom" (Baker, 2016: 28).

Predicting the outcome

Many attempts to predict the results of the election were published. Several were actually correct, predicting a slight popular vote victory for Secretary Hillary Clinton. The problem is that this simple model only accounts for the result of the popular vote. For the fifth time in history and the second time in recent history, the winner of the popular vote did not win the electoral vote. Unlike the 2000 presidential election when the results were contested and a recount effort ultimately stopped by the Supreme Court, this time the Clinton campaign conceded within a day of knowing the results. The US electoral system distributes votes amongst states based on their respective population size. The system means the most populous states also have the largest number of electoral votes.

The outcome is, in general, the crucial votes are those of the so-called swing states or battleground states which frequently alternate between voting for either Democratic or Republican candidates. Some of these swing states carry quite a big number of electoral votes and an overwhelming share of campaign funds and the candidates' time are spent campaigning in them. One of the most crucial states in recent elections has been Florida. With its 29 electoral votes, it is third behind California, which is allocated 55 electoral votes, and Texas holding 38 electoral votes. Since 1980, Florida has voted for the winning candidate in each election, except for the 1992 election when Bill Clinton defeated George H.W. Bush. In its long history,

Florida has mostly favoured Republican candidates. However, this state was central to the Democratic coalition constructed by the 44th President of the United States, Barack Obama. Usually, when pollsters or anyone discussing potential models for how to obtain an electoral victory, the discussion is centred on mathematical paths to victory.

When it comes to Congressional elections, the paper by Tonkes and Lesmono (2009) is worth mentioning. They state (2009: 46): "Election timing as an endogenous policy variable in relation with other factors such as growth rate, electoral support and other subsequent economic performance has also been investigated, mathematically modelled and applied in several countries".[2]

The changing demographic in many states due to the increase in the number of African American and Latino-American voters has largely favoured the Democratic Party. It also has caused a changing dynamic whereby traditionally strongly Republican states, such as Texas, in a few years could become battleground states as well. Johnson, Scala and Smith (2016) emphasise the significance of such demographic trends in New Hampshire, with more young voters and immigrants identifying themselves as Democrats.

One of the Democratic campaign's key mistakes was its focus on traditionally Republican states, starting with the assumption of winning in 'assured' Democratic states. Attempts made to overturn decades of traditionally Republican voting in Arizona and Texas ultimately proved fruitless, all the while consuming desperately needed campaign funds, time and energy, which should have been allocated to ensuring its message was heard by working-class, white voters.[3] The Clinton campaign's last-minute rush of celebrities and the political elite to Michigan was insufficient to overturn the electoral trend in favour of the Republican candidate. Schmidt (2013: 1699) indicated that, in the aftermath of the September 11 attacks, there was a rise in middle-aged white voters identifying themselves as Republican, thus already signifying this general trend several years ago. This demographic

[2] *"Our quantitative model for the electoral state considers the voting intentions of the public as a single state variable governed by a stochastic differential equation. Actual election outcomes are distorted by both deterministic and stochastic outcomes" (Tonkes and Lesmono, 2009: 46).*

[3] *Simple surveys that ask people who they expect to win are among the most accurate methods for forecasting US presidential elections. The majority of respondents correctly predicted the election winner in 193 (89 percent) of 217 surveys conducted from 1932 to 2012. Across the last 100 days prior to the seven elections from 1988 to 2012, vote expectation surveys provided more accurate forecasts of election winners and vote shares than four established methods (vote intention polls, prediction markets, quantitative models, and expert judgment) (Graefe, 2014: 204).*

Vote expectation surveys were most accurate in predicting election winners and vote shares. If one had simply relied on the most recent vote expectation survey available on a particular day, one would have achieved an average hit rate of 92 percent. (...) In comparison, if one had relied on the most recent single poll on the same day, one would have predicted the correct winner only 79 percent of the time (Graefe, 2014: 219).

shift was crucial to the Republican candidate's success, especially in the blue-collar states. Thus, it is interesting to note the research of Elinder (2011: 236) who finds that political attitudes are not significantly influenced by prior voting behaviour. This assertion will be further explored in the discussion, while it is relevant to note the level of debate during the 2016 election.

One of the most accurate predictive methods for the US presidential elections is "Keys to the White House", a forecasting model that has retrospectively predicted the popular-vote winner of every American presidential election from 1860 to 1980, and forecast well ahead of time the popular-vote winner of every presidential election from 1984 to 2008 (Lichtman, 2010: 33). For example, in 2010 Lichtman predicted that out of 13 keys, 9 were true (therefore favouring the incumbent), and 4 were false. Consequently, the prediction was that the Democratic candidate and the incumbent President would win the 2012 Presidential Election, which proved correct. However, the problem with the US presidential elections is that they are not decided by the popular vote, even though the popular and electoral votes have coincided in the great majority of these elections. Therefore, the prognosis for 2016 was correct, in terms of the popular vote. There were 5 negative keys out of 13 (the fatal number to defeat the incumbent party holding the White House is 6)[4], and Hillary Clinton did win the popular vote by a huge margin. Nevertheless, in the USA the electoral system decides who will be President, not voters at the national level.

For the 2012 election, the Continuous 2012 Presidential Election Poll (CPEP) introduced an innovative way to forecast the results of the 6 November 2012, US presidential election. The CPEP's main innovations were that respondents were asked to express their percentage chance of voting in the election as well as their percentage chance of voting for each candidate, and that the study was conducted within a panel. The use of percentage chance questions to elicit voting intentions was pioneered by Delavande and Manski (2010), who showed this to be a successful method for eliciting respondents' likely voting behaviour (Gutsche et al., 2014: 234)[5].

The 2016 election was deeply impacted by political uncertainty, conflict and scandals, resulting in both candidates reaching historic levels of unpopularity. Since the Republican primaries, there were rising concerns about media coverage of the election. Those concerns focused on two main

[4] *Accessible at https://pollyvote.com/en/components/index-models/keys-to-the-white-house/.*

[5] *The sample for the study consists of members of the RAND American Life Panel (ALP). The ALP is a panel of US households that regularly take surveys over the Internet in either English or Spanish (Gutsche et al., 2014: 237).*

The result received by using the model implies a 93 percent probability of Obama winning the popular vote. This corresponds well with the New York Times FiveThirtyEight final prediction, which gave Obama a 90.9 percent chance of winning (Silver, 2012) (in: Gutsche et al., 2014: 247).

problems: 1) covering of news which was sensationalistic and attracted more viewers; and 2) the problem of 'fake news', which was constantly emerging during the campaign, that was a frequent method of attack by Mr Trump in both his primary campaign and the general election. Many believed the questionable attacks by the Republican candidate would prevent him from being a serious candidate in the general election, a view largely conforming to the thesis of Snyder and Ting (2011). The question of media ethics, i.e. how to cover a candidate, which perceives the truth as undervalued or at times even unnecessary was a constant source of debate. McCann and Jones-Correa (2016: 1) note the increased level of negative rhetoric, especially the negative focus on immigration during the Republican primaries. Britt (2003) studied self-engagement in the 2000 US presidential election and its motivational and emotional consequences. Using the Triangle Model of Responsibility, he found that "engagement in voting was highest when the guidelines for voting were perceived as clear, when the individual perceived personal control over voting, when the individual perceived voting as relevant to his or her role as a citizen, and when who won the election was important to the individual". Klofstad (2016) discusses the relevance of voice pitch for election outcomes.

Ever more factors outside the sphere of traditional politics are influencing election results. Somewhere during the time of the numerous scandals and pseudo scandals, the American public completely lost its appetite for a divisive election. Many questions bearing a very strong influence on the United States' near future were not addressed at all. Relevant examples include America's rising public debt, as well as its current inability to lift its economic growth above 3%. During the entire campaign, everyone was asking questions about the candidates' characters, rather than implementable policy plans and strategies. Many ideas suggested by the Republican candidate came without any details concerning their application and he has yet to provide any details of how his signature policy plans will be carried out. This is especially interesting considering the research by Debacker (2015) suggesting that in re-elections US senators encounter difficulties if they often switch positions or 'flip-flop' on relevant issues. Therefore, it is difficult to understand how the Republican candidate managed to be elected without taking clear stances on any relevant issue. Even without even referring to abstract plans such as building a wall along the Mexican border, to be financed by Mexico, there are numerous policy concerns which should deeply trouble the American public. Wu (2016) emphasises the absence of a strong economic message from the Democrats and Mr Trump's appeal regarding his calls to limit free trade.

The Republicans constantly argued it was necessary to replace the Affordable Health Care Act, popularly known as 'Obamacare', but have

since been unable to come up with a plausible replacement for it. Following the election, in 2017 the Republican Party has control over the Senate, the Congress, and the White House. It has a clear mandate to govern and, unlike the economic legacy left to Barack Obama by George W. Bush, it has relatively favourable economic conditions to start a new era. For the past eight years, the Republican Party has mostly been satisfied being an often unconstructive opposition to President Barack Obama. They took unprecedented steps by refusing to even consider Obama's candidate for the Supreme Court, Merrick Brian Garland, and therefore made unusual steps to limit the power of the executive branch and to find excuse after excuse to delegitimise the sitting President of the United States. In 2017, the post-election failure to pass an alternative healthcare plan, due to opposition from within, seems to fuel the Republican Party's position as if it is still today the party in opposition, which is unrealistic

While all of these elements might appear irrelevant or slightly unconnected, they were all necessary to pave the path for an unconventional candidate like Mr Trump. The immigrant crisis, the failure of US foreign policy in the Middle East, mostly connected with the Obama Presidency (albeit he inherited Bush's failures), and the terrorist attacks all contributed to make Trump a relevant candidate, and cannot be properly evaluated by models that only measure macroeconomic trends.

The gridlock in the Congress during President Obama's period of office caused an intense public backlash to the slow pace of politics. The divisiveness and constant challenging of the President's authority set the scene for one of the most scandal-plagued elections in modern American history. Many pollsters detected trends of falling support for Hillary Clinton in the aftermath of the potential new FBI investigation. Comey, the former director of the FBI, sent two days prior to the election, may even have had a negative impact on Clinton by reinforcing the image of a system working for the 'Washington elite'. This also conforms to Celuba's (2005) thesis that decreased voter turnout follows when the public feels a lack of respect for the government and the process. The constant scandals and low level of political discourse depressed the voter turnout, while the FBI scandals energised voters for the Republican candidate. Some of the general concerns noted in this section are highly relevant for developing the theses presented in the methodology section.

Methodology

Concerning the general model for projecting election results, Lewis-Beck and Tien (2016) conducted their prediction using the following equation:

Presidential vote = Political popularity + Economic Growth (1)

Using these two very simple variables and an Ordinary Least Squares (OLS) regression, one is likely to obtain a rough assessment of the winner of the popular vote. The problem is, as mentioned, that the winner of the popular vote is not necessarily the winner of the electoral vote. George W. Bush and Donald J. Trump both lost the popular vote, yet won the electoral vote. This paper considers use of the same equation but, on the country level, it analyses specific battleground states. For the first model, the dependent variable is the percentage of the vote received by the Republican presidential candidate during 1988–2016. The data for that variable is extracted from the official website of the National Archive and Records Administration (2017). The independent variables are the four-year average of the state's economic growth measured by Gross Domestic Product (GDP), and the political popularity of the candidate (RPA), measured by his popularity in the Gallup poll surveying likely voters (Gallup, 2017). The data on a state's economic growth were extracted from the Bureau of Economic Analysis (2017). The second model follows the general explorations of different models by Lewis-Beck and Tien (2016), using macroeconomic data as independent variables. The general model can be described as follows:

$$\textit{Presidential vote} = \textit{Economic Growth} + \log(\textit{Stock Index}) + \textit{Unemployment Rate} \quad (2)$$

Similar to the first model, the dependent variable is the percentage of votes received by the Republican presidential candidate in the observed time period. The only significant difference included is that, rather than depending upon polling, this model depends on the predictive value of relevant macroeconomic indicators. Economic growth is measured through the GDP percentage growth of the state observed, with the data coming from the Bureau of Economic Analysis (2017). The data for the Dow Jones Index measure the value of the stock index on Election Day, prior to polls opening in the majority of the United States (Dow Jones Stock Indices, 2017). This presents a relevant short-term indicator, although this index often decreases in value prior to the election due to the relatively high level of political uncertainty. The value of this Dow Jones Index is transferred into the form of its natural logarithm to avoid potential errors regarding statistical inaccuracy. The data concerning the unemployment rate also measures unemployment levels at state level for the quarter the elections took place, with the data extracted from the Bureau of Labor Statistics (2017).

There are several reasons this paper focuses on individual (battleground) states rather than on the country as a whole. The key one is that the electoral map and the way the electoral college functions make it more likely for the popular vote winner to still be unable to win the electoral college. This approach also has its shortcomings since we are unable to predict the winner of the overall elections, but only observe a sample of several

battleground states. This paper seeks to observe trends and patterns within these battleground states in the hope of providing a more significant overall conclusion. There is an obvious downside to such an approach, namely the availability and suitability of the data is far lower at the level of the battleground states. It should be noted, as evidenced by the work of several authors such as Lewis-Beck and Tien (2016), that many scholars have generally produced valid and correct results. Hillary Clinton did win the popular vote, yet these predictions are irrelevant because what is important is that the candidate hat receives a majority of votes of the Electoral College rather than of the electorate itself. Several aspects that impacted the 2016 election, such as the influence of alleged Russian hacking, or the letter sent by James Comey, simply cannot be quantified.

The analysis was conducted in the Gnu Regression, Econometrics and Time-series Library (GRETLE). Prior to conducting the empirical analysis, the theoretical discussion and analysis of existing literature enabled the construction of the following theoretical hypotheses.

Hypothesis 1: Due to the inaccuracy of polling on Election Day, the first set of models will have limited success in predicting the outcome of the 2016 election.

Null hypothesis: The effects of polling data will have no impact on predicting the results of the 2016 election.

Hypothesis 2: There is a significant structural break in the voting patterns in the 2016 election in Michigan and Pennsylvania.

Null hypothesis: There is no noticeable difference in the voting patterns before and after the 2016 election in Michigan and Pennsylvania.

Hypothesis 3: The models which include political popularity will have greater success in predicting the election outcome than those that predict the election outcome based only on macroeconomic variables.

Null hypothesis: There is no statistically significant difference between the two models utilised to predict the election outcome.

Results and discussion

By inputting the values into the standard OLS regression, we are provided with the following equations. For Michigan, the equation is as follows:

$$\textit{Votes} = 3.576(0.595) - 0.026(9525) * \textit{GDP} + 0.887\,(0.0013) * \textit{RPA} \qquad (3)$$

It is important to note that the model is statistically significant at the 5% significance level, yet the coefficient determining the relevance of economic growth is statistically insignificant, as is the constant. The values in the parentheses are the respected P-values of the coefficients. With an R-squared of 0.89, the predictive value of the model is satisfactory. An alternative to increasing the model's predictive value would be to include other

elements, possibly the Dow Jones Index, to allow us to better understand the short-run relationship. It is clear that the four-year moving averages, at least in the case of Michigan, fail to predict any statistically significant trend. When viewing the model dependency, the following is observed in Table 1.

Table 1: ACTUAL AND FITTED VALUES FOR MICHIGAN

Year	Actual value	Fit value	Prediction
2016	47.50	44.33	False
2012	44.70	47.91	Correct
2008	40.96	40.87	Correct
2004	47.81	47.02	Correct
2000	46.15	46.06	Correct
1996	38.48	39.82	Correct
1992	36.38	36.37	Correct
1988	53.57	53.17	Correct

Source: Authors' calculations and GRETLE output.

Similarly to its R-squared value, the model predicts the correct result 87.5% of the time for the elections. The only election it failed to predict was the shocking win of Donald J. Trump, which is probably due to a structural break appearing in voting patterns within Michigan. The equation for Pennsylvania is as follows:

$$\textit{Votes} = 11.243(0.179) - 0.177(0.843) * \textit{GDP} + 0.743(0.0054) * \textit{RPA} \quad (4)$$

The factor of concern is that, once again, the coefficients for both the constant and economic growth are not relevant at any level of statistical relevance. While the model has a tolerable predictive value, most of the model's potency seems to derive from the consistency of polling. As in Michigan, this will likely mean that the fitted values failed to, and cannot predict, the outcome of the 2016 election.

Table 2: ACTUAL AND FITTED VALUES FOR PENNSYLVANIA

Year	Actual value	Fit value	Prediction
2016	48.6	45.06	False
2012	46.6	48.29	Correct
2008	44.17	42.17	Correct
2004	48.42	47.35	Correct
2000	46.43	46.20	Correct
1996	39.97	41.17	Correct
1992	36.13	38.47	Correct
1988	50.7	52.30	Correct

Source: Authors' calculations and GRETLE output.

The model has an accuracy of 87.5% in predicting the actual outcome, with its obvious weakness being its failure to predict the 2016 election result. The equation for Florida is as follows:

$$\textit{Votes} = 5.067(0.5418) - 0.216(0.662) * \textit{GDP} + 0.936(0.0026) * \textit{RPA} \quad (5)$$

The result reflects the same patterns as the results for Pennsylvania and Michigan. While the candidate's political popularity is a significant variable, none of the other selected variables seems to be statistically significant. Yet this does not detract from the moderately high R-squared of the model, with the value being 0.87 and the model itself being relevant even at the 1% significance level. The results for the elections themselves are presented in Table 3.

Table 3: ACTUAL AND FITTED VALUES FOR FLORIDA

Year	Actual value	Fit value	Prediction
2016	49	45.06	False
2012	49.1	48.29	Correct
2008	48.22	42.17	Correct
2004	52.1	47.35	False
2000	48.85	46.20	False
1996	42.32	41.17	Correct
1992	40.89	38.47	Correct
1988	60.87	52.30	Correct

Source: Authors' calculations and GRETLE output.

Despite having a higher R-squared value, the model predicts the correct winner in 62.5% of actual elections. However, it failed to predict both victories by George W. Bush and the results of the 2016 election. There are several probable causes. The first is the considerable discrepancy between the candidate's popularity and ultimate election result. As the model largely depends on the polls, the outcome seems difficult to distinguish and future research should include other variables, perhaps capturing short-term economic trends, as well as variables for understanding the political stability at the time. A significant problem is the lacking number of long-term variables to account for the political stability of the United States. The equation for Ohio is as follows:

$$\textit{Votes} = 9.749(0.299) - 0.432(0.5303) * \textit{GDP} + 0.842(0.0058) * \textit{RPA} \quad (6)$$

The model equation is consistent with the results for the other observed states. The model's R-squared is a moderate 0.81. While significant at the 5% confidence level, the model's predictive value once again depends almost exclusively on the candidate's respective polling. Table 4 shows the difference between the fit values and the actual incomes of presidential elections.

Table 4: ACTUAL AND FITTED VALUES FOR OHIO

Year	Actual value	Fit value	Prediction
2016	51.7	47.71	Correct
2012	47.7	51.47	False
2008	46.91	45.27	Correct
2004	50.81	50.48	Correct
2000	49.97	48.35	Correct
1996	41.02	41.17	Correct
1992	38.35	38.47	Correct
1988	55	52.30	Correct

Source: Authors' calculations and GRETLE output.

Despite having the lowest R-squared value of the first four models, the results are correctly predicted for 87.5% of the observed elections. The model only incorrectly gives Governor Mitt Romney an electoral victory in Ohio in 2012. The result for 2016 does not fully provide the correct results, as it would only hand the Republican candidate victory because Hillary Clinton won just 43% of the vote. Future efforts should rely on not only short-term indexes, but also other variables that are central to modern-day elections to determine whether they have any statistical significance. Including elements such as the Gini coefficient as a measure of inequality may help to boost the predictive value of the observed models. This largely conforms to the conclusions of Autor et al. (2017) who stated that the increase in Chinese imports to the USA added to the Republican Party's growing popularity. Since it seems that traditional political models fail to indicate the correct electoral outcome, the second model which includes macroeconomic variables is considered.

The first of these models concerns Michigan, with the following equation:

$$\textit{Votes} = 42.92(0.3856) - 0.241(0.8922) * \textit{Unemployment} + 0.288(0.8163) * \textit{GDP} + 0.31(0.945) * \log(\textit{Dow Jones Index}) \quad (7)$$

The problem with this model is that its R-squared value is around 0.04, meaning that its predictive value is close to being statistically insignificant. None of the three selected independent variables, or the constant, are statistically significant even at the 10% level of statistical significance.

Table 5: ACTUAL AND FITTED VALUES FOR MICHIGAN USING MACROECONOMIC VARIABLES

Year	Actual value	Fit value	Prediction
2016	47.50	45.91	False
2012	44.70	44.18	Correct
2008	40.96	42.05	Correct
2004	47.81	43.9	Correct
2000	46.15	45.13	Correct
1996	38.48	45.24	Correct
1992	36.38	44.45	False
1988	53.57	44.68	False

Source: Authors' calculations and GRETLE output.

Despite its very low predictive value, the model, which depends on macroeconomic values, is more precise in predicting the outcome of the 2016 election. It does not correctly predict the election of George H.W. Bush in 1988 and, because Bill Clinton won the vote with 43.8% of the vote, it is also inaccurate. The equation for Pennsylvania is as follows:

$$\textit{Votes} = 8.359(0.7757) - 1.075(0.4723) * \textit{Unemployment} + 3.057(0.1841) * \textit{GDP} + 3.93(0.1884) * \log(\textit{Dow Jones Index}) \quad (8)$$

None of the selected independent variables are individually significant, but the overall R-squared is not as low as with the model with macroeconomic independent variables concerning Michigan. The predicted values for Pennsylvania are displayed in Table 6 and these are so far the only model to correctly predict the results of the 2016 election, aside from the Ohio model.

Table 6: ACTUAL AND FITTED VALUES FOR PENNSYLVANIA

Year	Actual value	Fit value	Prediction
2016	48.6	51.10	Correct
2012	46.6	44.57	Correct
2008	44.17	40.76	Correct
2004	48.42	46.22	Correct
2000	46.43	46.72	Correct
1996	39.97	44.63	Correct
1992	36.13	39.53	Correct
1988	50.7	47.49	False

Source: Authors' calculations and GRETLE output.

While the margin of the victory is off by more than 2%, this model correctly predicts that Donald J. Trump will be elected as President. The model generally has a very high rate of predicting the correct outcome, with the model's only failure being its failure to predict George H. W. Bush's narrow victory over Michael Dukakis in 1988. The equation for Florida is as follows:

$$\textit{Votes} = 87.06(0.1316) - 2.062(0.4404) * \textit{Unemployment} + 0.719(0.6544) * \textit{GDP} - 2.812(0.5381) * \log(\textit{Dow Jones Index}) \quad (9)$$

The relatively low R-squared value indicates the low predictive value of the model. Controversially, Florida has for several elections been a battleground state where comparatively small margins have decided the outcome. This further inhibits accurate forecasting for this state. Once again, not all three of the coefficients is individually significant at the 10% significance level. The fitted and actual values are presented in Table 7.

Table 7: ACTUAL AND FITTED VALUES FOR FLORIDA

Year	Actual value	Fit value	Prediction
2016	49	46.79	False
2012	49.1	44.39	Correct
2008	48.22	48.37	Correct
2004	52.1	50.78	Correct
2000	48.85	51.48	Correct
1996	42.32	50.19	False
1992	40.89	47.08	Correct
1988	60.87	52.28	Correct

Source: Authors' calculations and GRETLE output.

Like in many of the previous models, the results for the 2016 election are not correctly identified. There is a second error concerning previous elections, where the 1996 election is awarded to Bob Dole rather than Bill Clinton. Aside from these two elections, the results are relatively satisfactory for a model with such a low R-squared value. The discrepancies between the actual and fitted results are far greater than in the model which depended on the political popularity of the Republican candidate. The final equation for Ohio is as follows:

$$\textit{Votes} = 52.51(0.2859) - 1.491(0.5203) * \textit{Unemployment} - 0.4927755 * \textit{GDP} + 0.5865(0.8884) * \log(\textit{Dow Jones Index}) \quad (10)$$

The results for Ohio are as discouraging as those for Michigan, with a highly low R-squared value and all three variables, as well as the constant, being statistically insignificant at the 10% significance level. Table 8 displays the model's accuracy and allows us to understand some of its shortcomings.

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Table 8: ACTUAL AND FITTED VALUES FOR OHIO

Year	Actual value	Fit value	Prediction
2016	51.7	48.94	Correct
2012	47.7	46.35	Correct
2008	46.91	47.32	Correct
2004	50.81	47.39	False
2000	49.97	51.51	Correct
1996	41.02	48.68	False
1992	38.35	44.45	False
1988	55	46.83	Correct

Source: Authors' calculations and GRETLE output.

The model again correctly predicts the result for 2016, but does not predict the Republican candidate's success will exceed 50%. There are also discrepancies between the fitted values and actual results, as well as the result for 1988 where the model is only correct due to the very low result achieved by Dukakis. Overall, the predictive values of the models based on political popularity provide far more reliable results than those that depend on macroeconomic indicators. Based on the results of the predictive models, it is possible to discuss the previously established theoretical hypotheses. It is largely possible to confirm the first hypothesis, which established that the models based on political popularity would have limited success in predicting the outcome of the 2016 election.

Despite the fact the model provided the correct result for Ohio for the 2016 election, the hypothesis is correct for the remaining three models. The second hypothesis established there might be a structural break in voting patterns in Michigan and Pennsylvania. The results of the models seem to principally conform to this hypothesis and the Democratic Party's failure to appeal to white working-class workers seems to have led to the acceptance of the Republican candidate's anti-establishment rhetoric. The results of the models seem to strongly support the acceptance of the third hypothesis because the models that depend on macroeconomic variables seem to have large discrepancies with the actual results in predicting the elections in the period 1988–1996, although they are slightly more accurate in predicting the 2016 election outcome.

While these empirical results somewhat conform to the findings of Lewis-Beck and Tien (2016), it is interesting to once again consider the findings of Elinder (2011). There is clearly no substantive evidence that cognitive dissonance theory, as defined by Elinder (2011), provides a consistent base for any political party in the United States. While many states have consistently voted for either the Republican or the Democratic Party, the very existence of 'battleground states' to some extent reduces the value of the

cognitive dissonance theory arguments. The key theoretical argument that can be made is that there has been a clear shift in the development of US presidential elections. As stressed by Snyder and Ting (2011), there used to be a negative outcome of statements made during the primaries that would have an adverse impact on the general election. This hypothesis clearly did not apply to Mr Trump who managed to be elected despite holding highly radical stances during the primaries.

It is interesting to take note of this fact with regard to Public Choice Theory. Ciraki (1996: 201) emphasises that the goal of democracy and the political process is for individuals to make decisions based on the wishes of the majority of the electorate. In a highly unconventional way, this is how the Republican candidate approached the 2016 election. He repeated messages that won applause at rallies, encouraging the "Drain the swamp" and "Lock her up" chants that energised his base.[6] He articulated these stances because he believed they would encourage the turnout of his target demographic, while the tone and conduct of the election discouraged the Democratic base from even participating. Donald Trump's electoral success is understandable from the viewpoint of Public Choice Theory, as Ciraki (1996) stresses that every individual has both political and economic interests. The Republican candidate managed to appeal to the economic interests of the corporate elite and wealthy white voters, together with the disenfranchised middle-class and their forgotten political views – such as a regulation that would allow more coal-mining jobs. This unlikely coalition ultimately carried the day with many far-reaching consequences. As emphasised by Fukuyama (2016), this demonstrates that inequality may be the strongest motive for voters. Regardless of the Trump Administration's results, this provides a clear message to both parties that they need to make greater efforts to create more inclusive social policies.

Conclusion

The paper discusses the results of the 2016 US election and finds that the equation proposed by Lewis-Beck and Tien (2016) provides results that are not entirely successful in determining the outcomes of the election in Michigan, Pennsylvania, Ohio and Florida. While most equations based on political popularity considered in this paper have more than acceptable predictive values, further research should be conducted to establish which factors have influenced the current state of US politics. Possibly, the most significant variable which should be replaced by one or more other variables

[6] *Some of his approaches to the political discourse have even drawn comparison with Hitler, for further discussion see Connolly (2017).*

is the problematic variable of measuring a candidate's political probability. As many pollsters clearly failed to use a representative sample, the incorrect polling values strongly affect all of the observed models.

The second set of equations correctly predicts the results of the 2016 election in two of the four observed states, but their general predictive value is far lower and the results for Ohio and Michigan are highly unfavourable. It seems difficult to achieve a higher predictive value of the model without incorporating the political popularity of candidates, although this creates a causal link in which the inaccuracy of polling makes any short-term predictions inaccurate. The 2016 election provided an unexpected overturn in Democratic-leaning states, such as Michigan and Pennsylvania, and it remains to be seen whether the Democratic Party can reshape its message so that it more strongly appeals to working, white, middle-class voters. Despite the changing electoral landscape in some Republican-leaning states such as Arizona and Texas, the Democratic Party cannot hope to alter the outcome of future elections significantly without maintaining a key grasp over the demographic groups that were central to the victories of President Obama in 2008 and 2012.

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