Spending in Vain? The Effect of Spending in the 2016 and 2020 US Presidential Elections

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December 16, 2024

Abstract

Every two to four years, voters across the United States are inundated with fundraising or vote solicitations. Are campaigns actually doing anything with the money they raise? Is that money actually causally changing the results of the election? To estimate the effect of spending on election outcomes, I use cardinality and coarsened exact matching at the state and county levels. I find no definitive effect of spending on election results. Further, I find no evidence of spending decaying when investments are made further from the election.

Introduction

In the 2018 and 2020 US election cycles, political consulting firms collected $1.4 billion [46] from candidates and parties looking to craft perfect messages or contact the right voters to gain an edge over their opponent. Those investments do lead to innovations, from Dwight D. Eisenhower using television advertisements for the first time in a presidential campaign in 1952 with his now famous slogan "I like Ike" [16] to George W. Bush's 2004 campaign pioneering "microtargeting" to flip likely John Kerry voters based on specific messaging [31]. With campaigns pouring hundreds of millions of dollars into elections biannually to develop novel ways to contact voters, political scientists wonder if campaigns really matter [75, 31, 33]. Do campaigns actually affect voting patterns? Does spending impact US presidential election outcomes?

This paper seeks to answer the latter question by examining state and county level spending data from presidential campaigns in the 2016 and 2020 elections. While previous research has examined the influence of television ads [9, 36], canvassing [8], or candidate appearances [69], there is no consensus [68, 45].

I hypothesize that spending has no measurable effect on election outcomes; the effect of spending from one party cancels out the other party's spending. Election outcomes would obviously change if one party spent no money while the other spent hundreds of millions of dollars. However, presidential races are always highly contested, so I hypothesize that spending has no effect.

History of Money in US Politics

"In our elections, which are the foundation of our whole governmental structure, we treat offices as things to be paid for" [26, p. 206]. That quote could come from any political pundit today without surprise, yet those words were written in 1883. Concerned about the increasing cost barrier to run for office, political economist Henry George urged one hundred and forty years ago to "[lessen] the cost of elections" [26, p. 207]. George's concerns were not unfounded.

The Tillman Act, enacted in 1907, barred corporations from directly donating to candidates [18, 65] after then-Republican nominee William McKinley received several six-figure donations from corporations during the 1896 presidential election. Subsequent allegations of improper fundraising by Theodore Roosevelt in the 1904 election [65] created an environment to enact legislation to limit such donations, so the Tillman Act was born. Then, as the US exited the Great Depression, the Political Action Committee (PAC) was born in 1944. Instead of acting on behalf of a national party, the Congress of Industrial Organizations, a union, sought to elect pro-labor politicians [15, 47]. This is one of the first instances of a group of citizens organizing around a specific policy position to elect like-minded politicians, rather than by their party membership.

These two instances set the stage for the Federal Election Campaign Act (FECA) of 1971. FECA not only required campaigns to disclose contributions and expenditures [38], but also authorized corporations to "establish, operate and solicit voluntary contributions for PACs" [4]. Just three years later, however, Watergate necessitated amendments to FECA, creating the Federal Election Commission (FEC) [22] to enforce campaign finance violations. While these laws attempted to rein in campaign spending, loopholes still existed.

To close some loopholes, in 2002, Senator John McCain, a Republican, and Senator Russ Feingold, a Democrat, advanced a bill to ban so-called soft money, unlimited contributions from large individual donors, like corporations [63]. Provisions in the McCain-Feingold Act were slowly stripped away by the Supreme Court [4], until in 2010 when the Supreme Court ruled in *Citizens United v. FEC* that money could act as speech, allowing corporations to pool together resources to finance Political Action Committees [2]. The ruling still barred corporations from contributing directly to campaigns, but effectively undercut the core tenets of the 2002 bill [34] by creating "super PACs", groups that could advocate on behalf of candidates so long as the super PAC and campaign do not communicate [50].

Democrats condemned the *Citizens United* ruling, yet quickly realized they needed to level the playing field. "It is a terrible decision. But we can't disarm unilaterally, so we're going to do whatever we can to be competitive," [49] then Senate Majority Leader Harry Reid said, likening super PAC spending to a war. And a war it became with the Supreme Court in 2014 eliminating individual contribution limits in *McCutcheon v. FEC* [3]. Now, wealthy donors can currently influence campaigns by spending as much as they wish, rendering previous campaign finance reforms moot. The most recent example is Elon Musk contributing $277 million to elect Donald Trump and other Republicans in the 2024 election [30]. Despite the concern of progressives that Musk was attempting to buy the election [37], the question still remains: does spending matter?

Hypothesis and Game Theory

My hypothesis that spending does not have an effect on election outcomes can be extended to the field of game theory. Game theory models "situations of interactive decision making. These

are situations involving several decision makers (called *players*) with different goals, in which the decision of each affects the outcome for all decision makers. ... Game theory tries to predict the behavior of the players and sometimes also provides decision makers with suggestions regarding ways in which they can achieve their goals" [56]. In the context of presidential spending, there are two main decision makers, the Democratic campaign and the Republican campaign, each vying for the goal of winning the presidency. According to game theory, the spending of one party impacts the effectiveness of not only their own spending, but also their opponent's. Figure 1 below demonstrates a simplified version of how this interaction works.


Figure 1: Simplified Spending Equilibrium Model

For the sake of simplicity, when campaigns spend the same amount of money, they receive the same amount of votes. When campaigns spend differing amounts, the campaign with more spending receives more votes. While both campaigns could spend a little money and earn the same number of votes, neither campaign is incentivized to do so. By spending more than their opponent, a campaign can secure more votes than their opponent. Then the opponent would respond by spending more. This cycle continues until an equilibrium is reached. In Figure 1, the equilibrium is in the top left, where both campaigns are spending a lot of money.

This is a popular equilibrium known as a Nash Equilibrium: a "situation where no participant

gains by a change in his strategy as long as the other participant's also remain unchanged" [48]. More importantly, this is also a dominant strategy. "In the dominant strategy, each player's best strategy is unaffected by the actions of other players" [48]. Looking at Figure 1, we see that the best strategy is for either campaign to spend as much money as possible. If a campaign outspends their opponent, they receive more votes, but if spending levels are equal, they do not receive fewer votes than their opponent. If a campaign spends less than their opponent, they will collect fewer votes, but as long as that campaign is spending as much as they can, they are minimizing their losses. Therefore, the dominant strategy is for campaigns to spend the maximum they can [59], regardless of their opponent's actions. Perhaps this is why the cost of elections is on an upward trend, from $2.6 billion in 2024 dollars spent on the 2000 presidential election to $7.7 billion of spending in 2020 [62].

Methods of Spending

However, just spending more does not result in a campaign receiving more votes than their opponent. Consultants are paid enormous sums of money to design the best marketing campaign, personalized to the candidate [67]. But as soon as one party adopts a new method to contact and persuade voters, the other follows suit. "The best way to get anyone to do anything on the Democratic side – and I'm sure it's the reverse on the Republican side – is to tell people that the Republicans are doing it," [31, p. 160] former Democratic political consultant Harold Malchow concluded, further adding credence to my hypothesis that each party's efforts are canceled out.

With advances in technology and more data than ever before about every US citizen available, campaigns can allocate resources to "microtarget" undecided voters [31]. Microtargeting is the process of identifying voters' "propensity to vote, likelihood of supporting a candidate, and position on specific issues" [71, p.32] and tailoring specific messages to individual voters [31]. In the 2012 presidential election, President Obama's campaign pioneered a version of microtargeting to identify - with confidence - all 69.5 million citizens who voted for Obama in the 2008 election [32]. Using that data, which of course costs money to produce, the campaign could then identify how best to persuade those voters during their reelection bid.

Persuasion methods have also improved. In 1927, Harold Gosnell [27] estimated several ways to increase voter turnout, most notably by mail. Gerber and Green [8] expanded by finding in 2000 that a face-to-face interaction with a voter, known as canvassing, is the most effective form of "getting-out-the-vote," followed by sending mail, and finally, phone calls.

Digital marketing is another form of advertising, one that has the capability of "no other conventional media" [66]. In a study of almost two million voters in the 2020 presidential election, Aggarawal et al. [58] found that digital advertising can affect voter turnout by as much as 0.7 percent, a number on par with a voter receiving one piece of mail [8].

However, one of the most recognizable forms of advertising is the television ad. Since Dwight D. Eisenhower in 1952, and over the next seventeen election cycles, strategies have ranged from perfecting the thirty second ad spot in the 1960s [31] to precisely identifying which media markets to spend in [41]. Television advertising is now a staple of presidential campaigns.

Nevertheless, current literature is divided on the actual impact of advertising. Quantifying the impact of a campaign paying for a message to be broadcast in a commercial (known hereafter as 'TV ads') is difficult. Looking at advertising expenditures or Gross Rating Points (or GRPs) are two different methods to attempt to gauge the reach of TV ads [39]. GRPs aim to reduce the impact of

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an advertisement into one number. For example, an ad buy with 1,000 GRPs is equivalent to the average TV viewer seeing the same ad ten times in one week [31]. But how effective are TV ads?

In 1992, political scientist and former George McGovern campaign advisor Samuel Popkin wondered the same thing. "[I]f you only have money to spend on ads, do you give one person fifty ads or two people twenty-five? Nobody knows" [31, p.35]. In the thirty years since, a clear answer continues to elude political scientists.

Some research says that 1,000 GRPs of TV ads can amount to a five percent increase in vote share but that those gains are only effective for one week [9]. Any length of time past one week will have an insignificant effect on voters' preferences. Other research insists that every TV ad matters, but the distribution of the ads is what counts. Daron Shaw [69] found that a voter seeing twenty ads will be less effective than twenty voters seeing one ad. Five hundred GRPs can boost a candidate's vote share by about two point two percentage points [69].

Yet, still other research questions whether advertising even matters to begin with. "Moreover, these high levels of advertising rarely translate into an advertising advantage for either candidate because the two sides typically match each other's advertising" [36, p. 710]. At the same time, the same paper argues that if a candidate has a one hundred TV ad advantage, as in, if a campaign airs one hundred more thirty second ads than their opponent in a media market, that would result in a 0.158 percent advantage. That may seem minuscule, but when expanded to an eleven million person electorate, about the population of Georgia, one hundred more ads can amount to 17,000 more votes. In the 2020 presidential election, Joe Biden received just 12,000 more votes than Donald Trump in Georgia. That finding implies that solely advertising output could change a state's election results. Yet Shaw disagrees. "No elections would have been reversed without implausible changes in the distribution of campaigning in several key states" [69, p.357].

Likewise, separate research has estimated the cost of persuading a voter to be different. Spenkuch and Toniatti [41] and Sides, Vavreck, and Warshaw [36] use a method of breaking down media markets into counties and testing bordering counties in different media markets to determine if a difference in TV ads impacts vote share. Spenkuch and Toniatti estimate the cost of a vote to be $170 [41], while Sides, Vavreck, and Warshaw claim persuading one voter costs $365 [36].

Much of the literature centers analysis on those aforementioned individual methods. The end goal of a presidential campaign is clearly to win the election, though, regardless of the method used to persuade voters. Shaw [69] is correct that television ads and candidate appearances can positively impact vote share, but there is more to a campaign than ads and appearances. Digital advertising [58] can change turnout levels, and thus results. But again, there is more to a campaign than digital advertising. Simply put, the medium of communication is irrelevant to determining if spending impacts election results. It is extremely difficult to accurately quantify and isolate the effects of specific types of spending when voters are exposed to several types of communication. One voter could read a mailer, see a TV ad, and a digital ad, all in a single day.

Gerber and Green [8] and Gerber et al. [9] tried to isolate specific types of spending by conducting randomized field experiments, in the 1998 election in New Haven, Connecticut and during Rick Perry's 2006 Texas gubernatorial campaign, respectively. Needless to say, randomized field experiments during a presidential campaign will never happen. Overall spending levels have been analyzed during congressional elections [45, 68, 72], but not during presidential elections at the state and county levels.

As Malchow put it, both campaigns will essentially use the same methods for fear of their opponent getting an edge. Albeit, Democrats and Republicans are forced to canvas and conduct get out the vote operations differently. Democrats can go door-to-door in urban areas, while Republicans

rely on satellite groups, such as churches or social clubs, to reach their rural base [31]. Nonetheless, assuming that Democrats and Republicans use optimal, or close to optimal, strategies, it is possible to examine the effect of spending in presidential elections.

Independent Variable

My independent variable is the spending differential between presidential candidates in all 50 states plus DC and in all 3,100 counties during the 2016 and 2020 US general presidential election. The Federal Election Commission requires candidates and Political Action Committees to report disbursements, defined as "any purchase or payment made by a political committee or any other person that is subject to the [Federal Election Campaign Act]"[61]. These disbursements, or what I also call spending, are publicly available on the FEC's website, fec.gov, in a delimited text file allowing analysis of spending by committee. Candidates, PACs, and super PACS fall under the FEC's definition of a committee, a term I use to indicate any entity that is spending money on the election. Besides their own campaign, presidential candidates also have a super PAC dedicated to spending money for their candidate, which the FEC also tracks in the same file. For Hillary Clinton in the 2016 election, it was the Hillary Victory Fund. Joe Biden's affiliated super PAC in 2020 was the Biden Victory Fund. In both 2016 and 2020, Donald Trump used the Make America Great Again PAC. These committees were cross-referenced with OpenSecrets' database on election spending to ensure the correct committees were chose.

However, other committees, separate from those affiliated with a candidate, also spend money on presidential elections. That data is also tracked by the FEC, though separately from the other disbursements. These are classified as "independent expenditures," which can be broken down by which candidate the committee is spending money to support or oppose. I exported .csv files of independent expenditures marked as supporting or opposing the major party candidates in the 2016 and 2020 elections.

Even given this amount of data, not all spending is present. Only spending that was absolutely spent by or for a candidate is included. Spenders such as the Republican National Committee (RNC) or the Democratic National Committee (DNC) are excluded from analysis. With publicly available data, it is not possible to separate money the RNC or DNC spent on their respective presidential candidates or on behalf of any congressional or local candidates. Only spending I am confident was by or for a presidential candidate is included.

Then, split by year, I combined disbursements and independent expenditures into a single data frame, with all spending on behalf of or from a presidential candidate, with a column indicating the candidate is on behalf of. Now, the location of disbursements becomes particularly useful. The data contains both the state the money was spent in, as well as the city and zip code. It is easy enough to then generate the amount of money spent in each state, split by candidate. To analyze spending by county however, I had to translate the zip code into county names, in order to match up with county-level election results.

Now that an amount of spending in each state and county for each candidate is determined, a differential can be calculated. The spending differential is translated into a binary variable: a 0 if Democrats spent more than Republicans in a state or county, and a 1 if Republicans spent more than Democrats, meaning that Republicans become the treated group.[1]

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[1]While Republicans are the treated group, I can still analyze spending by Democrats as the control group. The results are the same regardless of which party is treated and which is the control group.

As an example, all committees with the sole purpose of electing Joe Biden spent $185,000 in Wisconsin during the 2020 presidential election, and all committees to elect Donald Trump spent $271,000. This differential is $86,000 and because Donald Trump spent more than Joe Biden, the binary spending variable is 1.

I recognize that a lot of detail is lost in reducing the quantitative spending variable into a binary variable. However, this allows me to use matching later on. Additionally, the total disbursements by state are not always consistent. Above, I said that Biden and Trump only spent $456,000 in Wisconsin in 2020. But as Wisconsin was a key battleground state, it is surprising that total spending was not more. According to NPR, Biden and Trump spent over $100 million in Wisconsin solely on television advertising [60].

Much of that spending is not quantified in Wisconsin in the dataset, but rather in other states, like California, New York, or Washington DC. Under the "purpose" column in the FEC's data, terms related to television advertising or paid media are often categorized as taking place in those states because several political communications firms, such as GMMB Inc. and Buying Time, LLC, are located there. Committees can pay communication firms to contact and persuade voters, through mediums like advertising. The ads could air in other states, yet based on the available data, spending must count in those states. Obviously, this does not provide a perfect picture of the location of spending during presidential elections, because the exact location of spending may be lost. Thus, I reduce spending to a binary variable in an attempt to mitigate some of those potential harms.

General Election Date

I can utilize the fact that every disbursement or expenditure has an associated date to run several types of analysis. First, I run an analysis for the entire general election. In the 2016 election, the last Republican primary election was June 7, while Democrats ended their primary with the District of Columbia primary on June 14 [5]. After delays because of the COVID-19 pandemic, Connecticut held the last presidential primary on August 11, 2020 [1]. Gerber et al. [9] and Shaw [69] contend that the effect of spending decays as time progresses. In other words, spending is more effective closer to election day. To test this hypothesis, I also find the effect of spending filtered to thirty days and seven days before the election.

Table 1: Spending Time Spans

	2016	2020
End of Primaries	June 14	August 11
30 Days Before	October 9	October 4
7 Days Before	November 1	October 27
Election Day	November 8	November 3

Dependent Variable

The dependent variable is election outcomes, or the vote share for each party in a state or county. To measure the impact of spending on the outcome of an election, more than one year of election data is needed. Election results dating back to 2000 for states and counties are collected from the

MIT Election Lab in a .csv file. Perhaps the simplest way to measure the effect of spending is to see how a party's vote share changes from election to election. This is not perfect; outside factors impact the outcome of an election, such as economic conditions [14] or incumbency [20].[2] While another intuitive solution would be to use an existing predictive model, such as FiveThirtyEight's Election Forecast or RealClearPolitics' Poll Averages, both methods have an endogeneity problem. I cannot measure the impact of spending by using a model that incorporates polling data. When polls are conducted, committees already spent money to influence public opinion.

Instead, I created a predictive model without using polling data, but incorporating different confounding variables. Accordingly, the dependent variable is the difference between actual vote share and predicted vote share for each candidate in each state or county in the 2020 election.

As an example, say that a candidate was predicted to receive 51% of the vote in state X, but actually received 54%. The difference is $actualvoteshare - predictedvoteshare$, or in this case three percent. Using a differential allows for the analysis of the impact of spending. If that candidate spent more money than their opponent in that state, was the extra spending the reason for gaining votes?

Constructing the Predictive Model

Creating computer models to predict the outcome of US presidential elections is not new. One of the first instances of a model predicting elections was a division of John F. Kennedy's 1960 campaign. The model split the electorate into 480 distinct voter types based on "race, religion, gender, party, place of residence, and professional and socioeconomic status" [31, p.118]. Using those characteristics, analysts could "simulate the effect that a change in the issue terrain – a shift in a candidate's position, or a reordering of voter priorities – would have on broader public opinion and even electoral-college math" [31, p.118]. As the campaign wrestled with acknowledging or ignoring Kennedy's Catholic faith in the midst of anti-Catholic sentiment, simulations claimed that by leaning into his faith, Kennedy stood to benefit. Ironically, Kennedy later said in the campaign, "I believe in an America where religious intolerance will someday end; ... where there is no Catholic vote, no anti-Catholic vote, no bloc voting of any kind" [7], despite his campaign reducing voters to specific voting blocs. Against his wish, voting blocs still exist and vote consistently election to election [40].

There is no dearth of previous literature regarding election predictions. Yet Rosenstone [74], Lewis-Beck and Stegmaier [57], and Rigdon et al. [73] all cite polls as important predictors of election outcomes. As mentioned previously, polls present a challenge to interpretating results. Instead of using an existing model, I created a Least Absolute Shrinkage and Selection Operator (LASSO) model without polling. It is a machine learning approach where several different variables are plugged into the model, which attempts to predict an outcome based on those variables. The coefficients of each predictor are initially randomized, until the model determines the optimal coefficient for each predictor, by finding the lowest mean squared error [13].

The LASSO model was trained on each party's results in the 2020, 2016, and 2012 elections. The following variables were used to predict the 2020 election: percent of votes in 2016 (one election before the outcome), percent of votes in 2012 (two elections before the outcome), percent of votes in 2008 (three elections before the outcome), the percent change between 2016 and 2012 (trend from two elections before to one), the percent change between 2012 and 2008 (trend from three

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[2]Economic conditions and incumbency could be controlled for in a typical linear regression model. However, I use matching, and as I will explain later, these variables are not accounted for.

Table 2: Coefficients of LASSO Models

	State	County
(Intercept)	-0.103996392	-0.09983727
onebefore	0.802828379	1.05279977
twobefore	0.123353936	.
threebefore	0.082785227	.
trend_3to2	.	-0.01118628
trend_2to1	0.015449709	0.04667745
inflation	.	.
cpi	.	.
incumbent	-0.027050380	-0.05557849
unemployment	0.009014936	0.00509647
unemployment_yearchange	0.029516692	0.02748174

elections before to two), the change in inflation between October 31, 2019 and October 31, 2020, the Consumer Price Index [3] (CPI) at the end of October, incumbency [20, 11] (coded as 1 if the party has the incumbent president, 0 if not), national unemployment at the end of October, and the change in the unemployment rate over the last year [24].

This formula can be generalized to predict other elections, such as using the results from 2012, 2008, and 2004 to predict the 2016 election, along with updating economic indicators and incumbency. Each row is either a state or a county, depending on if I am testing the impact of spending at a state or county level. To avoid an overfit model, the same model and same coefficients are used to predict the 2020, 2016, and 2012 elections. The variables and coefficients for the LASSO model can be seen above in Table 2 and the residual plots for the state and county models are visible in Figure 2.

The residual plots are not perfect. Once clear outlier is at the top of the state residual plot. In 2016, Evan McMullin ran an independent presidential campaign almost exclusively in Utah, and siphoned votes away from Donald Trump [17]. He secured over 20% of the statewide vote, creating an outlier in the residual plot. In both residual plots, there is a slight downward trend from left to right. Ideally, each slice of the x-axis would have points in a normal distribution with a mean at zero. But the goal is not to create a perfect model, it is to set a vote share expectation for each party in each state and county and compare spending levels to the difference between predicted and actual vote share.

Initial Analysis

For preliminary findings, I investigated a possible correlation between spending and election results, without accounting for any confounding variables. Table 3 below shows the mean vote share in states for Democrats and Republicans in 2016 and 2020 against the aforementioned binary spending variable, calculated at the end of the primary election. For example, the third row down "Republican Advantage in 2016, Democratic Advantage in 2020" means spending was 1 in 2016 (Republicans spent more than Democrats), but 0 in 2020 (Democrats spent more than Republicans).

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[3] The U.S. Bureau of Labor Statistics says that the CPI is used "as an economic indicator. As the most widely used measure of inflation, the CPI is an indicator of the effectiveness of government policy. In addition, business
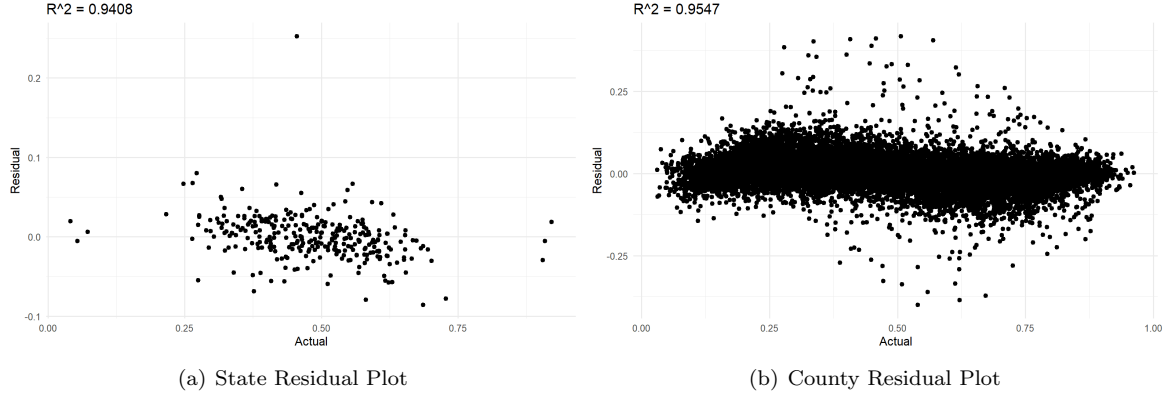
(a) State Residual Plot   (b) County Residual Plot

Figure 2: LASSO Residual Plots

Table 3: State Level

	Vote Share				
	Republican 2016	Republican 2020	Democratic 2016	Democratic 2020	n
Republican Spending Advantage in 2016 and 2020	0.5535	0.5591	0.3811	0.4189	19
Democratic Spending Advantage in 2016 and 2020	0.3950	0.4084	0.5300	0.5695	17
Republican Advantage in 2016, Democratic Advantage in 2020	0.4851	0.4909	0.4321	0.4833	12
Democratic Advantage in 2016, Republican Advantage in 2020	0.5170	0.5376	0.4313	0.4423	3

In states where a party spent more than their opponent in both elections, their vote share stayed relatively constant between 2016 and 2020, and far exceeded their opponent's average vote share. Democrats gained about five percentage points in 2020 after flipping the spending differential. The reverse was less pronounced, with Republicans gaining around two percentage points in 2020. Interestingly, both parties gained vote share in 2020, disregarding spending category, indicating fewer third party votes in 2020.

Table 3 below displays the same concept as Table 2, except state level data is replaced with county level data. Regardless of spending, Republican vote share stayed fairly constant from 2016 to 2020. Meanwhile, Democrats saw three and a half to four point gains across all counties.

Table 4: County Level

	Vote Share				
	Republican 2016	Republican 2020	Democratic 2016	Democratic 2020	n
Republican Spending Advantage in 2016 and 2020	0.5268	0.5251	0.4162	0.4566	125
Democratic Spending Advantage in 2016 and 2020	0.4127	0.4204	0.5249	0.5592	163
Republican Advantage in 2016, Democratic Advantage in 2020	0.4842	0.4844	0.4525	0.4958	111
Democratic Advantage in 2016, Republican Advantage in 2020	0.5038	0.5038	0.4434	0.4792	78

These results seem to suggest spending could or could not matter, depending on party. However, it is not possible to properly interpret the results. Without adding control variables, the picture remains fuzzy.

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executives, labor leaders and other private citizens use the index as a guide in making economic decisions"[77].

Matching and Causal Diagram

I use matching as my causal mechanism to determine whether spending impacts election outcomes. Matching is the "process of closing back doors between a treatment and an outcome by *constructing comparison groups that are similar according to a set of matching variables*"[29]. Here, back doors are also known as alternative explanations or non-causal paths for the outcome. Naturally, there are several backdoors between general election spending and the election outcome. Figure 3 below shows spending as the treatment and election outcome as the outcome. Any other node is a potential backdoor affecting the treatment and outcome. An arrow pointing between nodes means there is a causal relationship between those two variables in the direction of the arrow [29].
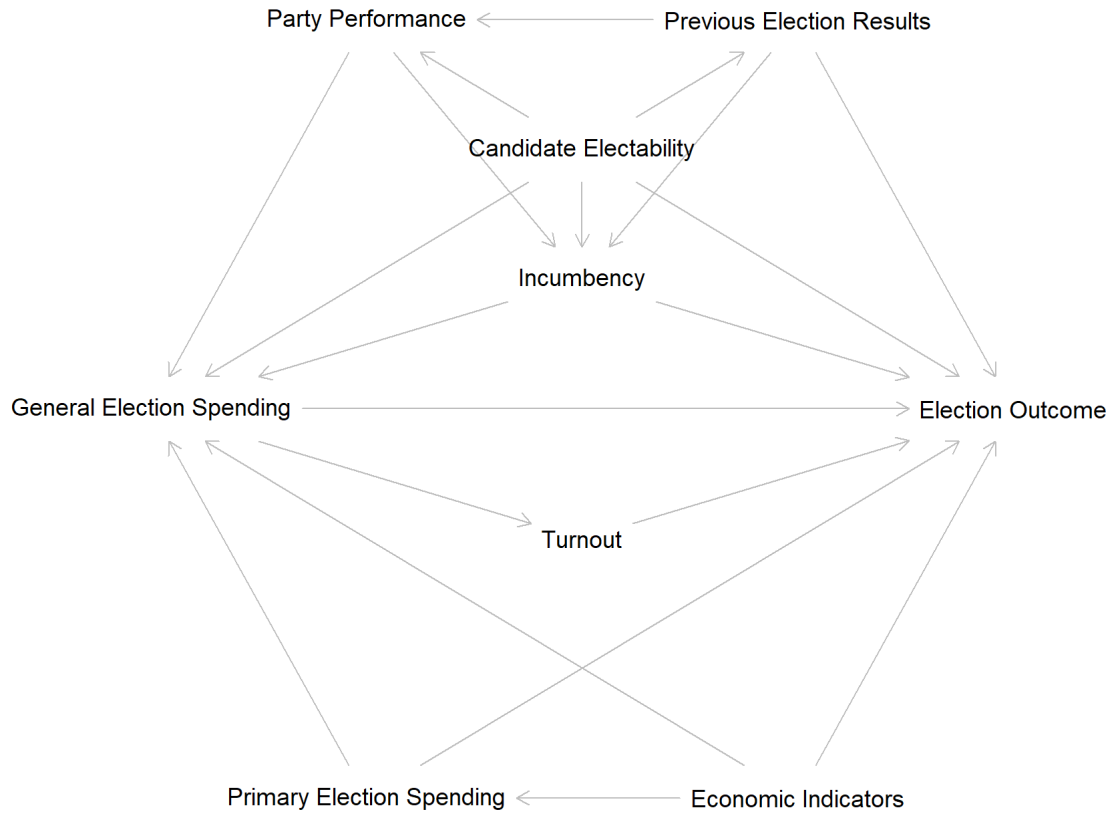
Figure 3: Causal Diagram

In the 2020 Democratic primary, the party establishment viewed Biden as an "electable" candidate, one that was capable of defeating Donald Trump [10, 43]. Despite the media's focus on electability, few voters in the primary indicated it as a motivating factor for who they cast a ballot for [19]. Generally though, candidate electability can take other forms for voters, such as a policy position or personal traits, like charisma and temperament [23, 19]. I group candidate ideology or pertinent traits into one variable, which impacts voters' choices, thus an arrow pointing from candidate electability to election outcome in the diagram. Any variable that could possibly alter

elections is also one that impacts how and where campaigns spend money. If a president is already in office, the electorate already surmised they were "electable", in turn influencing election outcomes and also impacting spending decisions [11, 20].

Perhaps I am oversimplifying the effects of candidate electability and incumbency, however, these two variables do not matter in my research. The units of analysis are states and counties. Because I am using matching to analyze the effect of spending, candidate and electability and incumbency have the same effect in all cases. Presidential candidates run national campaigns, so the impact of these variables remain constant in all states and counties.

Elections do not happen in a vacuum; one election in a state or county is similar to the next, influencing incumbency and election outcomes. I use an unmeasurable party performance variable to cover national party platforms [54] and down-ballot races, like state or congressional candidates and ballot measures [51]. To block non-causal paths between general election spending and election outcome, I need to control for either party performance or previous election results. Previous election results are easier to quantify, so I match on previous vote share for each party by state or county.

At the bottom half of the diagram, general election spending is causally linked with primary election spending, economic indicators, and turnout. Spending to turnout to outcome is a causal path, so is not matched on. The amount of money spent in a primary election can have an effect on general election spending and the outcome [23, 64]. For example, in the 2020 election, Joe Biden ran in a contested primary, but Donald Trump did not [21]. FEC data confirms that Biden spent more than Trump in the primary election, as expected. But because I am interested in looking at the effect of spending in the general election, when only one Democrat is running against one Republican, I match on primary spending.[4]

As previously mentioned when constructing the LASSO model, the state of the US economy at the time of the election plays a significant part in voters' decisions [14, 24]. Inflation levels or Gross Domestic Product (GDP) growth can predict an incumbent party's election success [76], but those are national level variables. Unlike candidate electability or incumbency where there is no viable proxy variable, I can use unemployment rate as a proxy for economic indicators [35, 44]. The U.S. Bureau of Labor Statistics releases unemployment rates at the end of every month. I use the rate from October of the election year, as it is the closest date of available data to the election.

Additions to the causal diagram could include an arrow from candidate electability to primary election spending [23] or from economic indicators and party performance to turnout [24, 51]. Clearly, the amount of money a campaign raises effects spending, in turn effecting election outcomes [70], but fundraising is an intermediary variable throughout the diagram, therefore it is eliminated from the diagram [29]. Regardless, after a review of the literature, the matching variables are the same. To block non-causal paths between general election spending and election outcome, I need to match on primary election spending differential, economic indicators, and previous election results (collectively, matching variables).

For state and county results, the effect of spending by Republicans (the ATT - Average Treatment effect on Treated) and the effect of spending by Democrats (the ATC - Average Treatment effect on Control) are calculated using cardinality matching. Because treatment assignment is not strictly random, cardinality matching is used to create "largest possible matched sample of exposed and unexposed participants representative of the target population" [12].[5]

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[4]I define primary election spending as any spending prior to the start of the given analysis, whether the start date is the first day of the general election or thirty days before election day. This allows me to isolate the effect of spending in the time frame of interest.

[5]In this case, cardinality matching also reduced the absolute standardized mean difference below the threshold of

Economic indicators and primary election spending are constant for both Democrats and Republicans. Regardless of the party, the unemployment rate will remain the same. Spending during the primary is Republican spending minus Democratic spending, so this variable is always inverted around zero. In other words, Republican spending plus Democratic spending will always equal zero. It is not necessary to change either economic indicators or primary spending when calculating the ATT or ATC. However, previous election results will change depending on the party. The presence of third-parties means the sum of Democratic and Republican vote share will not always equal one hundred percent. Consequently, when calculating the ATT, the Republican vote share in the corresponding state or county is matched on, while the Democratic vote share is matched on for the ATC. Finally, the dependent variable, election outcomes, changes for the ATT and ATC. To calculate the ATT, the dependent variable is the predicted result from the LASSO model for Republicans minus the actual outcome in the corresponding state or county. The predicted result for Democrats is substituted along with the actual Democratic vote share to determine the ATC. Here is the model formula:

$$\text{predicted\_difference} \sim \text{treatment} * (\text{unemployment} + \text{previous\_results} + \text{primary\_spend\_difference})$$

Cardinality matching only creates a balanced sample between the treated and control groups, not necessarily a representative sample of the entire population. For this reason, a different matching method, coarsened exact matching, is used to calculate the overall effect of spending (the ATE - Average Treatment Effect). Coarsened exact matching simplifies continuous variables into discrete variables, such that each category is balanced across all matching variables [28]. To calculate the ATE, I combine the data frames used to calculate the ATT and ATC for double the number of cases. Previously, a row included the dependent variable and vote share for both Democrats and Republicans. Now, a row only includes variables for one party. The same formula is used. For accessibility, Table 5 clarifies the variables used while matching.

Table 5: Variables

		ATT	ATC	ATE
Dependent Variable	Republican Prediction Minus Actual	✓		✓
	Democratic Prediction Minus Actual		✓	✓
Matching Variables	Unemployment Rate	✓	✓	✓
	Primary Spending	✓	✓	✓
	Previous Republican Vote Share	✓		✓
	Previous Democratic Vote Share		✓	✓

Results

Primary Election Results

Figure 4 plots the estimated effect of spending[6] on state level election results, with 95% and 99% confidence intervals. The first row is the effect of spending by Donald Trump in the 2016 election,

0.1.

[6]This section only includes the effect of spending from the end of the primaries to election day.

with an estimate of -0.01966 and a p-value of 0.468. The estimate is interpreted as: *In states where Trump spent more than Clinton, Trump received 1.9% less votes than if he spent less than Clinton.* This is a strange interpretation, implying that by spending more than his opponent, Trump hurt himself in the 2016 election, but the p-value is high and the confidence interval overlaps zero. The only statistically significant result is the effect of spending by Hillary Clinton in 2016, at the 90% level. According to this result, Clinton received 2.4% more votes in states where she spent more than Trump than if Trump spent more than Clinton.
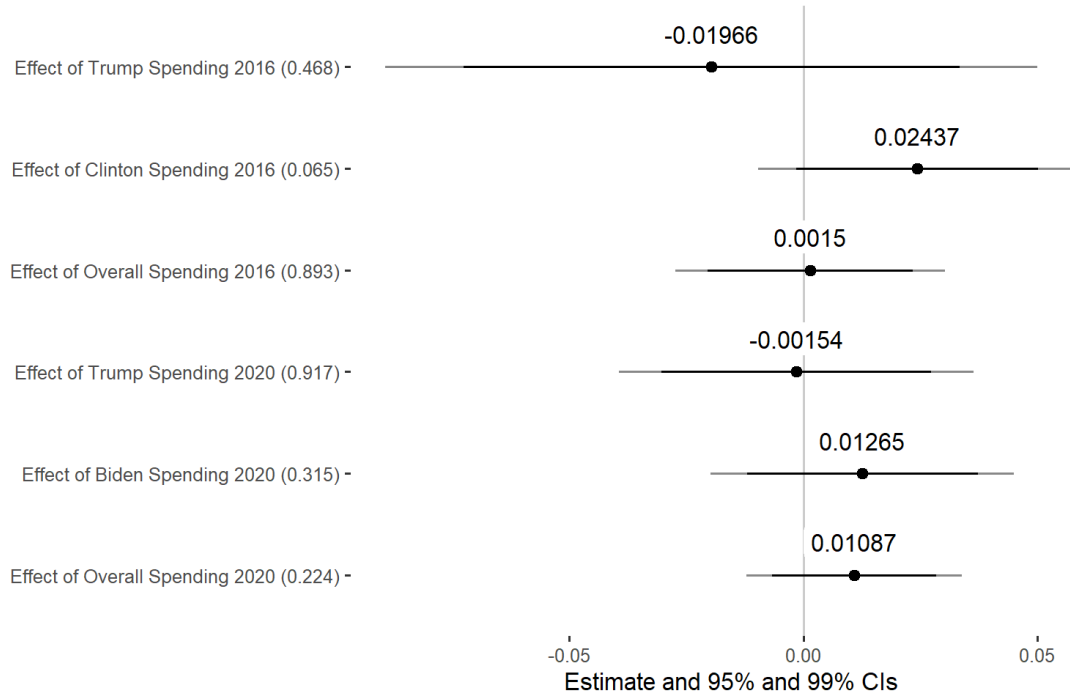

Figure 4: Estimated Effect of Spending at the State Level - End of Primary to Election Day

At the county level, Figure 5, Clinton again has statistically significant results, this time at the 95% level during the 2016 election, but with a negative coefficient. This would not be the only paper to find that contacting voters decreases candidate support. Bailey et al. [55, p. 713] found that "persuasive appeals possibly reduced candidate support and almost certainly did not increase it." A more likely reason for this discrepency, however, is unbalanced treatment and control groups at the state and county levels. At the state level, there 31 treated states and 20 control states, while there are 323 treated counties to 439 control counties. To that end, not all counties are included in the analysis. For the inclusion of a county, one of the two major party candidates had to spend money in that county. In 2016, counties with spending only accounted for 59% of total votes, while in 2020 that number fell to 54%. All 51 states plus DC are present, but I am missing the effect of spending on over a third of the electorate at the county level. But spending is not boxed in by county. It is possible for neighboring counties to receive advertisments, even if they are not the target [36]. Furthermore, as previously mentioned, the expenditure form may list spending as a different place than the actual effect of the spending.
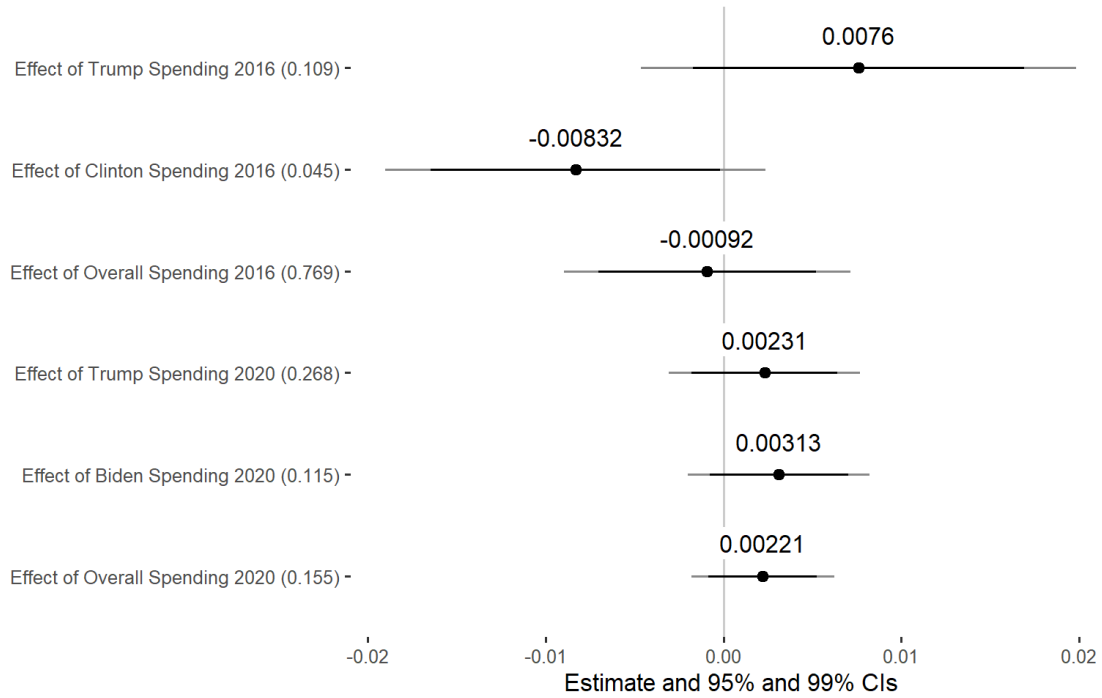
14

Figure 5: Estimated Effect of Spending at the County Level - End of Primary to Election Day

Results from 30 Days and 7 Days Prior to Election Day

Figures 6 and 7 below show the effects of spending on election outcomes either 30 or 7 days from the general election. Unsurprisingly, the confidence intervals expand with fewer cases to analyze. Interestingly, at the county level, the effect of spending by Clinton remains negative at a statistically significant level. The figures show a p-value of 0 due to rounding. The p-value is 0.00005 thirty days from the election, and seven days from the election, the p-value is 0.0003. No other results are statistically significant, with most of the coefficients hovering around zero.

Discussion and Conclusion

The most significant barrier to comprehensively answering "Does spending impact US presidential election outcomes?" is the absence of complete data on the location of the effect of spending. This paper supposes that the state or county where money is spent is the location of its dissemination. That is not strictly true. Further complicating the interpretation is the lack of data regarding dark money contributions. Dark money is a type of contribution to a campaign without donor names attatched, thus concealing who donated. Some dark money is reported to the FEC, but not all [52, 53].

It is possible that reducing spending to a binary variable blunts these limitations, but a binary variable is, by its nature, not well suited for thorough analysis. There are some states or counties with differentials in the millions of dollars and others with only hundreds of dollars separating the
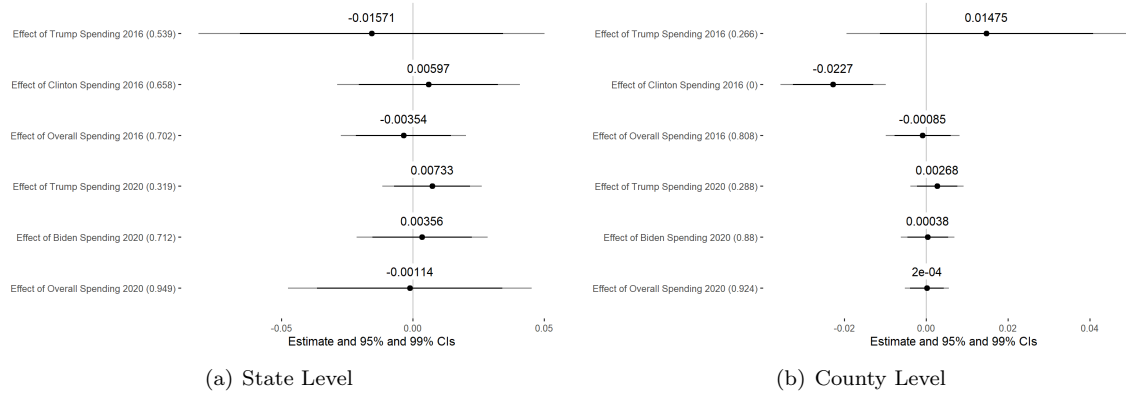
(a) State Level   (b) County Level

Figure 6: Effect of Spending 30 Days from Election
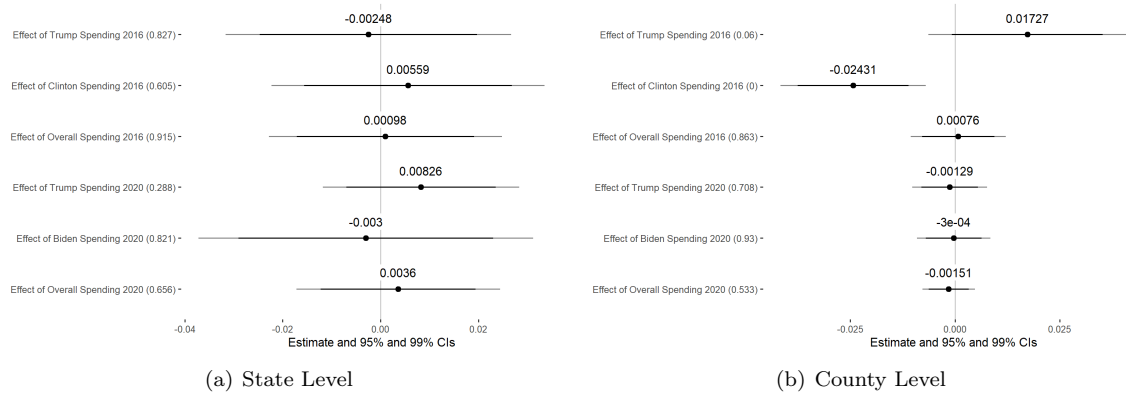

(a) State Level   (b) County Level

Figure 7: Effect of Spending 7 Days from Election

two candidates. Treating the two cases as equal is not fully accurate. Even within a binary variable, there are options for further work. For example, Johnson-Cartee and Copeland [42] claim that positive and negative television advertisements have distinct effects. My analysis could be extened to look at the effect of positive or negative spending.

Moreover, I am using a predictive model to forecast what an election could have looked like without spending. If a perfect predictive model existed, elections would cease to be necessary. I used a predictive model to include confounding variables, like incumbency, nationwide national economic indicators, or party performance by including trends between elections - variables I could not use in matching. My model is also very simple, more than ten variables are certainly used in more robust predictive models [25]. Incorporating other variables such as demographics, voting blocs [40], or more granular economic data into the predictive model or, ideally, matching, is an area for future work.

A different way of categorizing the electorate may be necessary to properly quantify spending. According to recent Gallup polls [6], the electorate is consistently split into three camps: 30% Republicans, 30% Democrats, and 40% Independents. And almost regardless of state, both parties

will get around a third of the vote at a minimum. The winner of the remaining 33-40% will usually win an election [31]. Creating a predictive model that splits the electorate in such a way and only forecasts the independent voters may add a new dimension of analysis.

I can not interpret any of these results to generalize to other elections. I am ignoring candidate electability and incumbency by matching, but those may fluctuate election to election. As an example, the gender of the candidates is a part of electability [43], but I was looking at an election with a female candidate (2016) and an election with two male candidates (2020). When using matching for only the 2016 election, the gender of the candidates does not matter, because it is constant across all cases. To look at an overall effect of spending across the 2016 and 2020 elections, I would have to create a candidate electability metric to later match on.

With statistically significant results suggesting spending does and does not have an impact on election results, I could say that my hypothesis is confirmed; because both candidates spend as much as they can, the effect of their spending cancels out, resulting in no measurable effect. However, on account of the limitations and generally inconclusive results, I cannot confidently come to that conclusion. This does not suggest campaigns matter, or that they do not, simply that the question remains open. I also found no indication that the effect of spending decays as time progresses. The confidence intervals were wider when limiting the scope of the general election spending, as I removed more cases, adding uncertainty. However, the estimates remained fairly steady when changing time spans.

Is it possible that in 2016 and 2020 both Democrats and Republicans found a dominant equilibrium and canceled out their opponent's spending? Yes. But it is also possible due to limited publicly available data, I do not have the capability to properly answer my research question. There is not enough data to either reject or fail to reject the null hypothesis. Therefore, I have null results.

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