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A simple model explaining the interaction between special interest spending and voter choices

By Austin MURPHY †

Abstract. This research develops a model of eligible voters rationally maximizing their stochastic utility functions in their decisions with respect to casting ballots in elections that result in voting decision being largely determined by social and psychological factors heterogeneously maleable by political expenditures. The wealthiest agents utilize their overwhelming financial resources to promote only candidates cooperating with their special interests to attract public attention, which exerts social pressure on voters to cast ballots only for those politicians who represent those agents. The model, which enables exacting computation of the benefits to politicians, special interest groups, and voters from their political actions, is shown to supply insightful explanations for the 2016 U.S. Presidential polling results for the four leading candidates. Voters were effectively swayed by large political expenditures to select from the two candidates who represented the agents providing the financial backing to market their special interests.
Keywords. Special interests, Voter utility, Elections, Political marketing.
JEL. D71, D72, F50.

1. Introduction

The association between the political expenditures of special interest groups and voter choices at the polls has long been the subject of controversy.[1] Theories of that relationship, such as those developed by Bassetti & Pavesi (2017), Bombardini & Trebbi (2011), Grossman & Helpman (1996, 2001), and Baron (1994), have generally been based on an assumption of all political participants acting to rationally maximize the different benefits they expect to receive from the competing candidates or political parties after their election. Within the context of these models, the campaign contributions of special interests only serve to inform voters of the government policies which the politicians promise to pursue and from which voters derive fixed utility.

However, Brennan & Buchanan (1984) long ago indicated that voting decisions may be heavily influenced by factors associated with the consumption utility each individual derives from just making a particular ballot selection in a fashion analogous to rooting for a sports team. For instance, there is strong evidence that many voters cast ballots to express their political opinions (Pons & Tricaud, 2018). Such factors unrelated to the

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election outcome, as well as the broad spectrum of voter preferences for government policies that is characterized by a heterogeneously wide diversity of convictions, may be subject to various degrees of influence through different political expenditures focused on influencing the individual aspects of the utility functions of the electorate. The influence on the political economy associated with manipulating voters' opinions is an area that has been largely neglected in the literature (Passarelli & Tabellini, 2017).

This research expands on existing theories of all voters, special interest groups, and politicians maximizing their individual benefits by integrating psychological and social factors into voter utility which can be manipulated by the political marketing funded by wealthy agents to promote their special interests. Voter utility functions, which are specified to be stochastically determined by a parsimonious number of variables, can be heterogeneously affected by diverse political expenditures that enable the financial supporters of politicians to influence government policy for their own benefit. The model facilitates understanding optimal strategies for political marketing and estimation of the polling effects of campaign spending, including with respect to marginal candidates who have minimal chances of electoral success.

In an application of the model to the 2016 U.S. Presidential election using information on political expenditures, it is shown that campaign spending largely attracted votes to the nominees of the two major parties by drawing support away from fringe candidates. The model is thereby demonstrated to supply a more precise understanding of how special interest spending is able to sway voters away from political parties who may better reflect their first choices. It also indicates that Trump was much more successful in drawing support away from the third parties than Clinton despite her agenda being potentially more consistent with the interests of many of those voters.

In Section I, a brief survey of the most relevant political research is provided. Section II specifies the simple model, which supplies useful implications for optimal voter behavior and political marketing expenditures. Section III applies the theory to the recent U.S. Presidential election campaign to illustrate insights provided by the model in explaining the actual polling effects of political spending for the two mainstream candidates as well as for two fringe contenders. A summary of the paper is supplied in Section IV. This research can assist in optimization of actions by all those participating in, or affected by, the political process, as well as in prediction of outcomes of elections for government offices.

At least since Tullock's (1967) seminal paper indicating the incentives groups of people or businesses have to expend resources to create and protect special privileges or monopolistic power, political economists have recognized the motivation of businesses to expend resources to influence government policy that may not benefit the governed people in the aggregate (Congleton, 2018). Baron (1994) long ago developed a model of

how government policy is set by the interaction between the utility functions of voters, special interest groups, and politicians who often include incumbent officials. Political processes tend to coalesce around two major parties or candidates for strategic reasons, as shown by Dellis (2013), Forand & Maheshri (2015), and Peeters, Saran, & Yueksel (2016) across different electoral systems. Grossman & Helpman (1996) demonstrated theoretically that political parties, through which candidates for public office tend to run in elections, are motivated to maximize "a weighted sum of the aggregate welfare of informed voters and members of special interest groups".

Special interest groups are generally assumed to exercise their influence on government policy through campaign contributions to politicians that affect the choices of uninformed voters (Bombardini & Trebbi, 2011). Special interest groups seeking to have particular government policies implemented make campaign contributions to candidates for public office to sway the uninformed voters and thereby affect election results. Unpopular special interest groups are shown to offset any negative impact their preferred government policies may have on the preferences of informed voters with fixed views by making political campaign contributions to influence sufficient uninformed voters to win elections of pliable government leaders. More generalized theories that assume overall political spending can impact the choices of any voters have been developed by researchers such as Bassetti & Pavesi (2017) do not specify the components of voter utility functions which are most tractable to political marketing expenditures that are strategically targeted.

Social and emotional factors have been shown to be instrumental in voter decisions (Altomonte, Gennaro, & Passareli, 2019), and many ballots have been found to be cast for a candidate even when that particular selection is most likely to have an impact on an election outcome unwanted by the voter (Pons & Tricaud, 2018). While there are disadvantages to protest voting in comparison to casting ballots strategically to prevent the election of a less preferred leading candidate (Myatt, 2015), voters dissatisfied with the existing system are heavily motivated by collective feelings and the benefits of common actions for a cause (Gaffney, *et al.*,2018). Those variables and their interactions that motivate voting decisions may be effectively targeted for influence through the use of political spending employing different marketing strategies. For instance, adoption of particular ideologies emphasizing the taxation costs of government welfare spending have been shown to significantly affect voter choices (Shin, 2016).

Political campaign funding has been shown to have an effect on voter choices in many ways. For instance, money may be spent to assist in the registration and transportation to polling booths of particular sets of eligible voters, who are strategically selected to be more likely to view a promoted candidate favorably (Schickler, 2016). Huber & Arceneuaux (2007) have found that simple political advertisements can impact the

preferences of voters who are reasonably well informed in unspecified ways. Voter opinions about candidates' ability to deliver on promises relating to valence issues that are universally desired, such as economic prosperity and crime prevention about which there is uncertainty regarding the degree of success that any politicians and policies would bring (Ansolabehere & Snyder, 2000), may be especially maleable by political marketing.

While public dissemination of politicians receiving large amounts of campaign contributions from wealthy special interest groups can negatively impact the electoral successes of those politicians (Fergusson, 2014), much of the political spending that occurs in the U.S. is legally undisclosed (Dowling & Wichowsky, 2013). Many political expenditures are made to influence public opinion through donations to educational charities that serve the special interests of the donors (Wang & Qian, 2012). Green, McGrath, & Aronow (2013) have shown that even strongly entrenched views on particular issues can be changed over time through effective promotions which can reverse seemingly fixed opinions among the aggregate populace.

This research develops a simple, generalized theory of political processes that specifies all voters are characterized by preferences which are held with heterogeneously varying degrees of conviction that can be influenced by different types of political expenditures focused on the most maleable components of their utility functions. The model, which integrates the influence of the political expenditures of special interest groups on voter utility with their ballot choices in the context of relevant social, psychological, and strategic considerations, enables new insights on campaign spending and polling outcomes, as shown by an application to the 2016 Presidential election campaign in the U.S.

2. A model of the heterogeneous susceptibility of voter utility to political expenditures

Political participants, including all voters, agents with special interests, and politicians are assumed to maximize the expected value of their individualized von Neumann-Morgenstern (1953) utility functions. In particular, each potential political participant j acts to maximize u_j

$$u_j = E[\{P_{s,j}U_{js}\{B_{js} - C_j\}], \quad (1)$$

where $P_{s,j}$ is j's perception of the chance of a particular state of the world occurring (where the state s can be the outcome of an event such as an election), U_{js} is j's utility value of a benefit from an event in state s (measured in terms of having a dollar in that state), B_{js} is the expected value to j of all the summed gross benefits to j in state s resulting from an expenditure C_j to influence government policy, and E is the expected value operator. The values of B_{js} and C_j are calculated as the equivalent present value of having a certain monetary unit such as a dollar in the current time

period when costs and/or benefits occur in the future, are uncertain, or are intangible.

As opposed to be fixed, the utility value in (1) that each agent assigns to the value of costs and benefits measured in dollars in any state, as well as the probabilities of the states occurring, are allowed to be both time-varying and changeable by external events, which include social influences and persuasive marketing by others. The changing nature of the factors and values that affect human happiness and feelings of self-contentment in varying degrees (Ryan & Deci, 2001) is consistent with this generalized form of utility functions that reflect the real world and therefore permit realistic modeling of political behavior and spending in the context of economic and political theory.

Each agent j seeking to influence government policy will make political contributions $c_{j,n}$ to politician n that maximize the value of the net benefit (i.e., u_j) from spending to influence the exercise of government power

$$b_{j,n}-c_{j,n}>0_j, \quad (2)$$

where $b_{j,n}$ is the expected value of the gross benefit to j from a political expenditure $c_{j,n}$ for the benefit of politician n. Agents choosing to be candidates for public office also seek to maximize (1), and each such politician n will seek to maximize the expected value of the net benefit $b_{n,j}$ to n across all $c_{j,n}$ and j, where

$$b_{n,j}=c_{j,n}+b^*_{n,j}. \quad (3)$$

and $b^*_{n,j}$ is the positive, negative, or zero expected value to n arising from n accepting a political contribution from j and therefore pushing the government policies desired by j.[2] Politicians n derive utility from being elected and therefore benefit from political contributions $c_{j,n}$ to their election campaigns that enable them to spend more money to increase their electoral prospects.[3]

Advocacy for government actions wanted by j may create positive (negative) utility to n, thereby resulting in a positive (negative) value of $b^*_{n,j}$, because the policies desired by j are, without political marketing, desirable (undesirable) to many voters z and therefore increase (decrease) the probability v_n of n being elected. The positive or negative benefits $b_{j,n}$ of a political expenditure by agent j in (2) are affected by the impact which that $c_{j,n}$ has on $b^*_{n,j}$ in (3) to influence politician n through (3).

Each eligible voter may be considered to be a special type of agent who, in addition to being able to make political expenditures in money and kind (including via volunteer campaigning activities of all types), also has a direct impact on the outcome of an election through the individual's ballot choices. A precise modeling of voter utility can enable improved estimation of the variable values which determine the interaction between the various

political participants and thereby enable maximization of their utility functions in (1).

2.1. Modeling voter behavior

As shown by Grossman & Helpman (2001), the likelihood of n being elected is determined by voter choices at the ballot box that in turn are affected by the benefit perceived by each voter z from enactment of a particular policy pushed by n for the benefit of j. The benefits or disadvantages of any policies to each eligible voter z are often not totally clear due to their complex effects on matters of concern to z that can be impacted by the enactment of other policies and perceptions about the politician(s) carrying them out. In particular, many policies proposed by candidates for political office relate to "valence issues" like economic prosperity about which the ability of politicians to achieve outcomes desired by the voting public are uncertain (Ansolabehere & Snyder, 2000). The utility $U_{zs,n}$ to voter z in a state s,n where z casts a ballot for a particular politician n can therefore be affected by qualitative variables which influence voter perceptions about which candidates are most likely able to deliver benefits from carrying out their proposed policies. The perceived probability of any particular politician winning an election also impacts the likelihood of a voter obtaining a benefit from a balloting outcome (Bouton, Castanheira, & Saguer, 2017).

In addition, voters' utilities are a function of social and psychological factors which are unrelated to the advantages or disadvantages z obtains as a result of an individual ballot choice in influencing the actual election outcome (Brennan & Buchanan, 1984). For example, each voter z may derive satisfaction derived from voting for a candidate n whom z perceives to be the best candidate based on policy proposals and ideology, as well as based on personal characteristics, irregardless of that politician's chance of winning the election and the strategic impact such a vote may have on the election outcome (Pons & Tricaud, 2018).

Social benefits may also be derived from voting, such as may stem from acting in concert with others in a voter's social network (Spinney, 2017), including with respect to engaging in protests against leading contenders (Gaffney, *et al.*, 2018). The emotional utility derived by an individual from casting a ballot for a particular candidate is magnified when acting as part of a community-wide movement (Altomonte, Gennaro, & Passareli, 2019). Becker, Tausch, & Wagner (2011) have shown that people increase their self-esteem, pride, and happiness by merely participating in a collective action to express a political opinion. Such impacts on voter utility, along with those relating to actual election outcomes, may be affected by political marketing expenditures $c_{j,n}$ that can influence z's perceived total utility from casting a ballot for a particular marketed candidate.

The expected value of the utility $u_{z,n}$ to each eligible voter z from voting for any politician n can be broken up into two main components consisting of a factor unrelated to the election impact of a single ballot selection and a

variable which is a function of n's chance of z's vote affecting an election outcome. The former factor relates to any social or psychological benefits from merely casting a ballot for a political candidate that Shayo & Harel (2012) have indicated may relate to the utility derived from expressing a preference, exercising a moral duty, and maintaining a self-image. The latter variable includes not only the benefits to z arising from the election of a politician with more desirable policy proposals but also from a reduction in the probability of a less desired politician being elected instead.

In particular, the utility $u_{z,n}$ to z from voting for any n is

$$u_{z,n} = u^*_{z,n} + w[v_n b^*_{z,n} - v_n b^*_{z,x}], \quad (4)$$

where $u^*_{z,n}$ is the expected value of the utility a voter z derives merely from casting a vote for a particular candidate n for social and psychological reasons unrelated to the impact that single vote has on the actual polling result, w is the probability perceived by a voter that a single ballot will determine the electoral outcome, $b^*_{z,n}$ denotes the benefits provided to voter z from candidate n winning at the polls, and x is the politician whose $v_n b^*_{z,x}$ is the lowest of all candidates for whom z can instead vote. Each z maximizes utility across all politicians n in (4) to vote for the politician n=N who provides the highest expected utility to z that involves comparing z's utility measured across a set of separate computations for each candidate. In contrast to models which attempt to artificially categorize voters into a small number of fixed types (Kawai & Watanabe, 2013), this equation allows for a complete continuum of voter utility functions which may be manipulated with varying degrees and types of political marketing expenditures.

In (4), $wv_n b^*_{z,n}$ represents the benefit to z derived from the impact a vote for politician n has on increasing the chance of n being elected, while $wv_n b^*_{z,x}$ measures the effect of a vote for n in reducing the probability of a less desired politician x being the electoral victor. The latter variable can motivate strategic voting in non-binomial elections, insofar as a candidate may be selected over another more desirable one to reduce the probability of a less desirable third candidate winning at the ballot box.[5] The natural inclination of people faced with complex choices that supply limited benefits and hence don't justify complex rational analysis to make decisions to use efficient subconscious algorithms focused most easily on two choices (Gigrenzer, 2007) would tend to motivate most voters to solve (4) by concentrating their analysis on only the two candidates with the greatest chances of being elected in pluralities like the U.S.

Any eligible voter z will only cast a ballot for a candidate if, for some politician n,

$$u_{z,n} > C_z, \quad (5)$$

where C_z includes the costs to voter z associated with registering and going to the polls, and $u_{z,n}$ denotes the expected value of the utility to voter z from casting a ballot for candidate n with the largest $u_{z,n}$. In inequality (5), which is based on the economic theory originally developed by Downs (1957), the cost C_z includes transportation expenses needed to register to vote and cast a ballot as well as the opportunity costs associated with doing so that incorporate time lost from employment and/or personal activities in freely disposable time.[4] The transportation and time expenses associated with voting can represent a higher cost for those with lower income (such as due to an inability to leave work on election day and lack of personal transportation), especially as a percentage of available time and money. As a result, eligible voters who are relatively poorer people may be less likely to cast ballots if it is more costly to register and vote as is affected by government laws that impose greater burdens on eligible voters and thus inhibit voter turnout, especially among poorer members of society, through increasing C_z in (5).

The costs C_z also include the time and expense related to obtaining and analyzing information on the candidates that can be significant for uninformed and less informed voters. The latter costs may be especially large when there is less media coverage and other campaigning for some candidates and political parties, as is typical in many elections for local government offices and for candidates n backed by little or no political expenditures. The very act of voting therefore becomes a luxury item imposing the costs of becoming informed. As a result, there tends to be greater participation in voting by those with the resources, education, and time to expend on becoming informed and casting a well-reasoned ballot (Economist, 2017b).

Since each eligible voter will only cast a ballot if the boundary condition in (5) holds, politicians n and the agents j they serve will be interested in C_z as well as $u_{z,n}$. Some political marketing by n may therefore be directed toward lowering C_z for sets of voters whose $u_{z,n}$ is believed to be the highest for candidate n. For instance, resources are often expended in voter registration drives and free transportation to the polls for eligible voters as well as through promotions of candidates biased to provide information likely to positively impact the decisions of such people who are not totally informed or convinced. Because eligible voters z tend to be part of a group of people who may perceive a civic duty to vote (Feddersen & Sandroni, 2006), some marketing expenditures may also be directed at raising the $u^*_{z,n}$ associated with the act of casting a ballot among the likely eligible voters for a candidate in order to increase the chances of (5) them acting going to the polls.

Most voters have common interests in terms of national economic prosperity and security, and so their $du^*_{z,n}$ is impacted by perceptions about the personal characteristics of candidates, such as relating to competence, integrity, and dedication to the common good. Many such characteristics of the politician as a person are ones with which voters

identify in terms of their own individual moral preferences, and so campaign spending to enhance the personal image of a candidate can be effective in impacting the social and psychological gains voters derive from voting that are incorporated into $u^*_{z,n}$.

The relative values of $u_{z,n}$ across all z and n in (4) determine both the decision to vote in (5) as well as any choice actually made at the ballot box. These decisions across the entire set of eligible voters then aggregate to establish the probability v_n of any politician n being elected and thus the crucial value of $b^*_{n,j}$ in (3) that interacts with $u_{z,n}$ in (4) and $b_{j,n}$ in (2) to determine the optimal $c_{j,n}$.

2.2. Interactive effects of political spending on the utility of political participants

Because each $u_{z,n}$ is impacted by the sum of all $c_{j,n}$ to the extent that a voter can be influenced by political expenditures, the policies desired by agents j that politicians choose to support are therefore determined by the interactions between (2-4). In particular, (3) and (4) are strongly influenced by the probability v_n of a politician winning an election that is determined by the $u_{z,n}$ of all the voters, whose utility and choices at the polls are in turn impacted by the $c_{j,n}$ across all j. With all voters' $u_{z,n}$ impacting v_n and hence $b^*_{n,j}$ that determines the optimal $c_{j,n}$ in the maximization of (2), $u_{z,n}$ and $c_{j,n}$ affect each other in an interrelated fashion.

Defining a variable's first derivative with respect to changes in $c_{j,n}$, and denoting Sn as the state s in an election where the politician n preferred by j wins, it follows from (1) that

$$db_{j,n} = dv_n B_{jSn}, \quad (6)$$

where dv_n is the change in the probability of candidate n winning an election as a a result of an increase in campaign spending $c_{j,n}$, and B_{jSn} is the benefit provided to j by the election of politician n. This equation indicates that political spending by j should increase up to the point where $B_{jSn}=1/dv_n$. This result implies that the inverse of the cost to influence a vote divided by the number of voters affects the benefit to agents donating to political campaigns. Assuming Bombardini & Trebbi's (2011) empirical estimate of $145 to buy a vote implies $dv_n=1/145$ divided by the number of voters, and so the benefit to agents donating to political campaigns would therefore be the inverse of that figure times the gains to j derived from n winning the election.

The benefit to any politician n from a change in the political expenditures for n equals

$$db_{n,j} = dv_n B_{nSn}. \quad (7)$$

If the spending for n is independent of n's policy proposals, as in the case of campaign donations to n by an agent j whose interests n has already

agreed to represent, $b_{n,j}$ is the expected value of the utility to n because n's proposals and $b^*_{n,j}$, are unaffected by the political expenditure in this situation. More campaign contributions would always be accepted from j in such a case because $dv_n B_{nSn}>0$ where politician n fully represents agent j's interest regardless of the amount of money donated.

On the other hand, dv_m can be negative for politicians m with optimal positions that do not exactly coincide with those of an agent j whose own preferred policies would have an adverse impact on the value of $b^*_{z,m}$, and hence on $b^*_{m,j}$ if m represents j's interests. In this case, a politician m would accept a donation from such an agent j only if the campaign contribution $c_{j,m}$ from j to m has an effect that exceeds the negative impact on v_m associated with m pushing any particular policy of that agent. The minimum size of a donation by j to buy a more desired policy proposal from m must therefore at least equal the cost to buy a vote times the number of votes lost as a result of adopting j's more desired policy. An agent might expend more than this amount up to the point where $B_{j,Sn}>1/dv_m$, which is determined by $du_{z,n}$.

Equation (4) indicates that the impact of changes in $c_{j,n}$ on voter utility is

$$du_{z,n} = w[v_n\{db^*_{z,n}-db^*_{z,x}\} + dv_n\{b^*_{z,n}-b^*_{z,x}\}] + du^*_{z,n}. \quad (8)$$

With a single vote almost never deciding an election outcome with a sizeable electorate, voters might rationally believe w is infinitesimally small, thus making the term $[v_n\{db^*_{z,n}-db^*_{z,x}\}+dv_n\{b^*_{z,n}-b^*_{z,x}\}]$ inconsequential in comparison to $du^*_{z,n}$ in (8). For instance, even if political spending caused z to perceive receiving $1 million more benefits from n's election victory (i.e., from $db^*_{z,n}$), an objectively estimated impact on voter utility would be no greater than $0.01 if there were a hundred million voters. Such a trivial effect may not contribute much to even motivating an eligible voter to go to the polls, as it covers no more than 0.01% of a C_z=$10 in (5) that might minimally exist for most people in the form of transportation expenses and opportunity costs of time associated with casting a ballot.[6]

Because $du^*_{z,n}$ is the primary determinant of $du_{z,n}$, the impact of political expenditures on actual candidate policy proposals may be may be minimal in the absence of psychological influences or social pressures. Political marketing focused on particular issues or ideology can actually be counterproductive in changing voters' entrenched views about some particular policies (LeConte, 2018), as may also promotion of candidates' competence in governing that can create an image of an elitist lack of concern for the plight of common people (Di Tella & Rotenberg, 2018). Campaign expenditures $c_{j,n}$ may therefore optimally focus on affecting the psychological and social factors which impact voter utility in order to maximize the impact on $u_{z,n}$ and thereby win more votes, thus raising v_n, that increases both $b_{n,j}$ and $b_{j,n}$.

The social environment of voters has been established to have an especially important impact on both ballot choices and active political campaign participation (Pietryka & DeBats, 2017) as well as on the decision to vote at all (Gerber, Green, & Larmer, 2008). In particular, social pressure among those with whom voters have direct or indirect relationships and with whom they identify significantly affects behavior in elections as does the groups of people with whom a person identifies (Spinney, 2017), and so polling results may be most efficiently impacted through political expenditures targeted at influencing that component of $u^*_{z,n}$. Organized dissemination of information about the common interests of particular categorizations of people (such as individuals with the same ethnicity, religion, social/economic class, etc.) has been shown to increase the participation of members of the identity groups in political actions by communicating a collective position on a particular government policy (Klandermans, 2014).

Marketing campaigns for candidates n are therefore often focused on identity politics or promotions of the particular candidate characteristics and policy advocacy which matter to various ethnic, religious, social-economic class, and other groupings of people, who pressure (and are pressured by) others in their ballot choices. Political marketing for candidates n accepting campaign donations from wealthy agents j pushing policies that are unpopular with the aggregate population (i.e., have a negative $b^*_{n,j}$ and hence $b^*_{z,n}$ below zero) can utilize this phenomenon to affect election results by emphasizing policies that are targeted to issues that are irrelevant to j but popular among particular segments of the population. Such political spending thereby raises voters' $u^*_{z,n}$ (and thus their $u_{z,n}$ that increases v_n) through the social gains derived from casting ballots as part of the segment of people with whom voters best identify.

One of the most important factors affecting voter utility is the negative impact relating to a sense of betrayal by politicians due to perceptions of corruption or self-dealing (Di Tella & Rotenberg, 2018) that can be related to expectations that candidates, if elected, will focus on serving their cronies and wealthy political donors. The tendency of people to be more likely to participate in political actions when they are part of larger groups with common interests that include collective superordinate ones of the nation as a whole (Klandermans, 2014) can be exploited by political marketing appealing to patriotic sentiments and the common interests of any majority groups (such as Caucasians in the U.S. and Europe) as well as by promotion of an image of a politician as representing the people as a whole against some elite group.

Wealthy agents seeking to maximize the monetary return on their political investments may optimally capitalize on the typical social and psychological tendencies of voters by supporting candidates who focus on non-economic policy positions which cater to different segments of the population by providing clear choices on non-economic issues which are of no relevance to the financial interests of the agents supplying the most

political capital. By backing only two different politicians who concentrate on opposing views of great importance among different social groups (such as with respect to abortion and civil rights) and hence have a material impact on the $u^*_{z,n}$ component of voter utility, voter attention is diverted away from the issues that affect the economic interests of those with the most money. The general psychological tendency to make decisions from two leading choices might thereby raise the share of the votes received by the two main candidates supported by those with the most money, especially when rising political expenditures for the politicians backed by the greatest financial resources increase public attention on them and move them into foreground in the polls. In addition, with voters being highly influenced by perceptions about how their ballot choices might best benefit their social or identity groups and the common good in the aggregate, $du^*_{z,n}$ is a function of $[v_n\{db^*_{z,n}-db^*_{z,x}\}+dv_n\{b^*_{z,n}-b^*_{z,x}\}]$ irregardless of the size of w. In particular, there is social pressure "not to waste" a vote by casting a ballot for z's most desired candidate who, however, has few chances of winning the election.[7]

Voter concentration on only the candidates backed by the agents with the most political capital to spend is facilitated through political parties create brand names for their candidates that coalesce people's preferences into separate national groupings which create a higher v_n with greater political expenditures, thereby increasing voter utility through ballots cast for their nominees for public office. Much of the branding effect of political parties on $u^*_{z,n}$ is created in prior election cycles which have focused strategic campaign spending on the Democratic and Republican Parties in the U.S. and therefore won the most votes in that country in the past. Most campaign donations are therefore motivated to continue to be directed to the candidates of those two parties in order to maximize $b^*_{n,j}$ in (3) and thereby minimize the needed $c_{j,n}$ for agent j to get politician n to implement the policies j desires. The higher v_n for the candidates of those two parties that results also motivates more media coverage of them, thereby expanding public discussion of those politicians and further increasing the social utility incorporated into voters' $u^*_{z,n}$.

The model develop in this research thus indicates that the expected utility $u_{z,n}$ of voters z from casting a ballot for candidate n can be influenced purchased through political marketing expenditures which are sufficiently high to affect their voting choices (and hence election outcomes) independently of the government policies sought by agents j investing the most capital into the political process. The political marketing expenditures of j essentially change voters' utility value U_{zS} in (1) derived from casting ballots for the candidate(s) n funded by j to obtain benefits B_{jS} from being able to successfully have n elected and thereby influence the exercise of government power. The simple theory here can be usefully applied to explain seemingly complex actual political phenomena, as indicated in the next Section.

3. Insights derived from value estimate of the model variables in the 2016 U.S. Presidential Election

Public data on the political expenditures and election results in the 2016 U.S. Presidential campaign may be utilized to illustrate insights obtainable through the theory that can help explain the results of the most recent U.S. Presidential election campaign. In this analysis, the values of some variables are estimated using various justifiable assumptions. In particular, public polling data indicating an average $145 in campaign spending to obtain another vote (Bombardini & Trebbi, 2011) is employed to determine the polling impact of political expenditures. In addition, it is assumed that the utility of a voter at the margin of choosing between two candidates (i.e. equally favoring both approximately) is reflective of the relative cross-sectional polls, including with respect to favorablility ratings for a politician. The latter assumption, which is valid with the incremental cross-sectional differences in utility across eligible voters for each candidate that are assumed here (as is effectively indicative of a uniform distribution for $u_{z,n}$that therefore varies from the average by a similar amount across the entire population of voters), then implies that $b_{n,}$ and $b_{j,n}$ equal the polling percentages B_{nSn} and B_{jSn}, respectively.

3.1. Spending impacts on the polling results for the leading two candidates

In the final 2016 Presidential election in the U.S., Clinton received, 2,868,891 more votes than Trump did across the country, at 65,845,063 vs. 62,984,825 out of a total of 136 million ballots cast (270ToWin, 2016a).Clinton had higher campaign spending than Trump at $794,875,608 vs. $408,496,207 (OpenSecrets.org, 2016) that should have had resulted in her winning by only {$794,875,608-$408,496,207}/$145=2,655,913 more votes if she had been as equally unpopular as Trump without such greater expenditures for her.[8] This result indicates that the median $u_{z,n}$ would have been greater for Clinton than for Trump even without more money being expended for Clinton, thus implying a lower $b^*_{n,j}$ for Trump. Nevertheless, even prior to the impact of the differential spending for the two main candidates, Clinton's $b^*_{n,j}$ was higher than for Trump that can be measured in dollar value or cost as {2,868,891-2,655,913}x$145=$30,881,810.

Polls in the week before the election indicated 54.4% of American voters had an unfavorable opinion of Clinton versus 57.0% against Trump (270ToWin, 2017b). This surveyed difference implies a the average voter had a higher $u_{z,n}$ of -4.4%-(-7.0%)=2.6% for Clinton in November 2016. This difference would indicate that she should have won by {0.026}{136 million voters}=3.536 million votes instead of only the 2.868 million more votes Clinton won in the actual election. One cause for the deviation between the 3.536-2.868=0.668 million in votes implied by the pre-election survey compared to the actual official totals could relate to eligible voters preferring Clinton to Trump but not casting ballots because their utility in

(4) did not exceed the boundary condition of covering the costs of voting in (5). For instance, although Clinton's proposed policies offered slightly more direct benefits to the average voter than did Trump, both of those two mainstream candidates promised policies friendly to businesses that may have been widely perceived to be insufficiently different to many eligible voters to justify the cost of bothering to cast a ballot. This factor appears to have cost Clinton 0.668/136 million=0.5% of the actual November 2016 totals, as may imply Clinton could have improved her results by that margin simply with more campaign spending focused on "getting out the vote".

The $385,107,401/$145=2.66 million votes purchased by Clinton's higher campaign spending indicates 2.66/136 million=1.9% of the total nationwide vote was actually bought by the greater political expenditures for Clinton in 2016. This result implies that the relative $u_{z,n}$ for the average voter z with respect to her was -4.4%+1.9%=-6.3% without the differential expenditures. Here, it is being assumed that political spending of equal amounts for Trump and Clinton were totally offsetting between those two candidates (including with respect to how unfavorable they were viewed), as both campaigns utilized positive promotions of their candidates as well as negative advertising of their main opponent.

The assumption that $145 in political spending influences a vote implies that a million dollars of expenditures increased v_n for a selected political recipient with 136 million ballots cast in the 2016 U.S. election by1/145x136=1/19,720=0.00507%. This result indicates from (6) that the benefit $B_{j,Sn}$ to a $1 million campaign contributor from the election of the preferred candidate n must have been at least $1,000,000/.0000507=$19.720 billion, or the dollars would not have been made. Given the very large returns to corporations derived from campaign donations (Cooper, Gulen, & Ovtchinnovkov, 2010), such a huge benefit from influencing government policy through election of a desired President could certainly have been accrued by interest groups such as the large corporations and business trade associations supporting Trump. Trump's proposals to lower business taxes and regulation that clearly provided extensive profits to companies that far exceeded this amount after his election, the foregoing computations and Trump's electoral victory indicates that the dv_n resulting from the actual $408 million in campaign contributions to him more than offset the change in v_n caused by Trump's adoption of such policies, so that the net $dv_nB_{n,Sn} \geq 0$ from (7).

The higher political expenditures for the Democratic and Republican Parties appear to have been successful in more than offsetting the negative $b^*_{z,n}$ they took on by representing the special interests of their donors such as wealthy individuals and large corporations. In particular, although the gross combined campaign expenditures of the Clinton and Trump campaigns that consisted of both positive and adversarial marketing of each other and their respective policies (but offsetting in their impact on their relative unfavorability ratings to the extent of the same level of

political spending), that money did provide a benefit to both those two candidates in terms of raising their respective v_n by November 2016 relative to the other political parties with very little financial backing. For instance, a June 2016 CNN poll that occurred at the conclusion of the primary election campaign indicated 42% for Clinton, 38% for Trump, 9% for Gary Johnson, and 7% for Jill Stein (Agiesta, 2016), leaving 4% undecided among those 4 candidates. The June advantage itself for those two main party candidates likely derived from the branding effect on $u^*_{z,n}$ resulting from their large political expenditures prior to July 2016.

The November 2016 vote totals were relatively higher for both Clinton and Trump but lower for Johnson and Stein, with the latter two receiving only 3.3% and 1.1% of the votes in the final election, respectively (versus Clinton's 47.8% and Trump's 46.4%). The change between the November vote totals and the June polls imply that the higher campaign spending for Trump and Clinton in 2016 largely took votes away from those other two "fringe" candidates. In particular, with $2.0 billion more in spending by the Republican and Democratic Parties than for the other parties after June 2016 (OpenSecrets, 2016) included not only the $1.2 billion spent by those parties' Presidential candidates but also $0.8 billion expended on Congressional and other party marketing that influenced at least some voters to cast straight tickets or along straight party lines, a total of $2 billion/$145=13.8 million votes were changed by the greater spending by the two main political parties. This estimated impact of 13.8/136=10.1% of the electorate is roughly consistent with the 5.7%+5.9%=11.6% of the share lost by Johnson and Stein between the summer and fall of 2016. While the extensive political spending by the Republican and Democratic Parties appears to have successfully directed voters into perceiving the highest utility by making ballot selections based on the choice offered by their two nominees for President, the small deviation between model and actual results here may possibly be explained by a splitting of the 4% of June undecided voters among all 4 candidates.

3.2. Analysis of the fringe candidate polling results

Polling data on Bernie Sanders, who ran unsuccessfully for the Democratic Party nomination in 2016, and who was were very similar to Stein on both policy proposals and candidate characteristics, provides useful insights on the overall 2016 election results. For example, Sanders as well as Stein proposed a higher minimum wage, international trade policies to promote employment, government jobs programs, national health care, free college education, improved environmental control, and a less militaristic foreign policy than other candidates. In addition, both were comparable in terms of being relatively unknown to the public prior to declaration as a Presidential candidate, not characterized by any adverse information about their character or corruption, and personally not very wealthy. Stein like Sanders refused to accept corporate campaign contributions and so was not perceived to be a handmaiden of corporations

and their wealthy owners. Stein's $u_{z,n}$ can therefore be reasonably assumed to be the same as that for Sanders.

These similarities justify using polling numbers for Sanders in the Democratic primary as equivalent to those for Stein. For instance, early 2016 surveys indicated that Sanders was more popular than Trump by an average of 8.7% according to the average of seven national polls, versus only a 4.6% voter preference for Clinton over Trump (Jacobson, 2016). Although Clinton received more funding than did Sanders in the Democratic primary elections and eventually beat him in the totals for that party's primary, the results in the early campaign suggest that $u_{z,N}$ was -4.6%-[-8.7%)=4.1% higher for Sanders with respect to the median voter z than for Clinton. The $u_{z,N}$ for Sanders among those voters can therefore be deduced to be less negative at -6.3%+4.1%=-2.2% overall before the post-June political expenditures.

A survey taken after the November 2016 indicated that about 80% and 12% of the Sanders supporters voted for Clinton and Trump, respectively, in the final election (Le Miere, 2017). This finding of few voters favoring Sanders casting ballots for Stein is consistent with Clinton's policy proposals appealing more to Sanders supporters than Trump's campaign platform did and choosing her rather than Stein because of all the campaign spending by the Democratic Party, which convinced those voters that the common good would be better served by voting for Clinton.[9] Thus, Clinton's vote share increased 5.9%x0.80=.4.7% due to the switch of Sanders supporters to Clinton versus only 5.9%x0.12=0.7% for Trump.

It is possible to analyze the early higher support for Stein in terms of the model's implied v_N for her in June (before the post-primary Presidential campaign spending by all the candidates) by inserting values for the other variables in (4) for the two alternatives to N=Stein with the best chances of winning the election. Here, Trump represents candidate x in (4) because he had a lower $u_{z,x}$ of -7.0% compared to the alternative m=Clinton, who had a $u_{z,n}$ of -6.3% before all her relatively enormous spending in the final Presidential election campaign after June 2016. Given the estimated $u_{z,nN}$=-2.2% for Stein and assuming that $u_{z,N}$ $u_{z,m}$, and $u_{z,x}$ were linearly proportional to their respective v_N, v_m, and v_x,[10] it follows from (4) that

$$-2.2v_N - (-7v_N) = -6.3v_m - (-7v_m),$$
$$v_N = 0.146v_m$$

in June 2016.

With the June 2016 poll indicating that 42% of American voters would choose Clinton in the election and thus implying v_m=0.42,[11] this result indicates from (4) that

$$v_N = (0.42)(0.146) = 0.061$$

for the marginal Stein voter. The 7% polling number for Stein in June reported by Agiesta (2016) is the same when 6.1% is rounded up. This finding is consistent with the differential campaign spending after June affecting the $u_{z,N}$ for Stein mostly through the change in her v_N that impacted the social utility $u^*_{z,N}$ from voting for her as well as through any perceived marginal benefit $w[v_N b^*_{z,N}-v_N b^*_{z,x}]$ derived from a vote for her impacting the election outcome.

The November results indicating that Clinton had her vote total increased by 4.7% from the 4.0% June advantage over Trump versus a rise in Trump's vote total of only 0.7% due to the votes of Sanders supporters implies that Clinton would have won by 4.0%+4.7%-0.7%=8.0% because of this switch. This finding implies that Trump (who lost by only 2% to Clinton in November) took 8.0%-2.0%=6.0% of the electorate from those supporting Johnson and others (or undecided) in June. Of the 5.7% of the electorate who supported Johnson in the early survey defecting in November and the further 2.6% of undecided voters in June defecting in the actual election (with 1.4% of the 4% of voters undecided among the 4 leading contenders in June voting for "fifth" party candidates in November), Trump apparently took the vast majority, increasing his vote share by 6.0%. In particular, the November election results indicate Trump took 7.1% of the 5.7%+2.6%=8.3% total switch by the June Johnson supporters and undecided voters, versus only 1.2% of those for Clinton.

The latter result is consistent with Trump's political marketing himself with an anti-establishment image (and independent of large corporate influences) that may have been decisive for many of the June supporters of fringe candidates. Trump having a more pro-business stance than Clinton apparently was also important in attracting a far larger share of the defectors from Johnson, whose Libertarian Party is pro-business at its core. Those two factors would have resulted in the $b^*_{z,n}$ (and thus on overall voter utility $u_{z,n}$ mostly because of the social impact on $u^*_{z,n}$ of $[v_n b^*_{z,n}-v_n b^*_{z,x}]$ regardless of the actually trivial w impact) for Trump among the marginal supporters for the Libertarians and others being higher than for Clinton in June, thereby enabling him to win more of their votes in November despite Clinton higher campaign expenditures after June.

More campaign spending by Johnson than by Stein, at $13,370.851 versus $3,713,170 (OpenSecrets.org, 2016), $13,370.831-$3,713,170=$9,457,681 net, may have contributed to Johnson winning a larger share of the vote than Stein by 3.3%-1.1% in the final election count in November. For instance, the greater promotional expenditures for Johnson than Stein may have made more voters aware of Johnson and his policy positions than for Stein. However, given that Johnson's $9,457,681 in greater spending would only buy $9,457,681/$145=65,225 more votes at the assumed $145 cost per vote, only about 0.1% of the total 136 million votes may be concluded to have been cast for Johnson as a result of his campaign spending.

Thus, it could be deduced that 2.2%-0.1%=2.1% of the higher November polling numbers for Johnson versus Stein could be attributed to factors unaffected by the differential campaign spending. This percentage is almost identical to the 2% greater polling percentage for Johnson compared to Stein reported in June 2016 (Agiesta, 2016) that occurred before the impact of all the massive political marketingafter the nominating conventions.

The fact that Johnson's June supporters did not defect at a rate as high as for Stein (i.e., he kept 3.3% of 9% of the electorate's vote versus the mere 1.1% of the 7% Stein had in June) may have stemmed from Libertarians having a free enterprise agenda. In particular, such pro-business policies had for decades been promoted by wealthy agents to provide more long-term benefits to voters through greater economic growth and had thereby raised the $u_{z,n}$ for politicians advocating for policies favoring business interests. Polls indicating that more Sanders supporters actually voted for Trump than Stein in the 2016 election (Le Miere, 2017) provides some evidence supporting this hypothesis, as Trump's policies were clearly pro-business despite his image of being anti-establishment which attracted some voters who supported the Green Party in June. The large rise over time in the number of U.S. business executives becoming U.S. Congressional leaders to over 20% by 2014 (Babenko, Fedaseyeu, & Zhang, 2017) also provides some empirical support for this hypothesis of a long-term impact of political expenditures, as does the ursuping of the century-old slogan of "America first" from a progressive dream of a common national good with equality for all into a right-wing ideal of nationalist free enterprise pushed by politicians like Trump (Churchwell, 2018). Propagating the understanding of modern economic theories can certainly be used to direct populist sentiment into support for free markets that enrich corporations and their wealthy owners (Boyer, 2018).

The Libertarian party name and policies promoting personal freedom from government interference in people's lives may have also resulted in Johnson keeping a larger percentage of his June supporters in the November election than Stein.[11] The Libertarian name alone have created an image more appealing to voters protesting against infringements on such rights. While the Greens promised personal rights similar to those advocated by Johnson, the Libertarian name may have been more identified with such freedoms, whereas the Green name could have been associated with radical environmental policies which might impinge on personal freedoms. Given that many if not most voters had inadequate information about the proposed policies of those two parties backed by relatively little financing, this latter conjecture seems to be feasible.

The overall results are consistent the hypothesis that the massive amount of political spending, including the negative sorts which portrayed the other leading contender in a negative light, was successful in attracting attention and votes away from third parties even if it may have had a neutralizing impact with respect to taking support from those favoring the

main alternative. All such expenditures may have created more social bipartisanship among the supporters of the two leading candidates that created social pressure on fringe party supporters to choose the lesser of the "two evils". The 2016 results indicate that the Trump campaign was much more successful in attracting more defectors from third parties, including those whose interests may have been more aligned with the Clinton agenda in at least some respects (such as the Libertarians who favored more personal freedoms). Trump's success may have related to his marketing strategy to promote himself as an outsider representing the white male voters in the U.S., and patriots in general, against an elite politician who focused on policies of interest to minority interest groups.

3.3. Variable estimation error

Thus, the model can precisely explain the 2016 U.S. Presidential election results entirely without invoking any particular news item, revelation, or other event. It must be emphasized, however, that all the foregoing calculations and deductions are based on estimates of the model variables and their distributions. Some of these values derive from average figures obtained from surveys as well as from an assumption of a uniform distribution for $u_{z,n}$. Perhaps most important is the use of the value of $145 estimated in the past to win an additional vote that may have a low degree of reliability in many circumstances and across time.

Older studies by Green & Krasno (1988), and Levitt (1994) with different statistical methodologies imply a wide variation in the estimated cost for a vote ranging between less than $20 and nearly $400. However, extremes across the $20-$400 range seem rather unlikely to be valid for the most recent Presidential election. For instance, employing a cost of $20 to buy a vote implies that Clinton's higher spending should have won her $385million/$20=19.425 million more votes as a result. The fact that she only won 2.868 million more votes than Trump despite the higher spending would imply that her $b^*_{n,j}$, and hence average $u_{z,n}$, were substantially lower than for Trump prior to the campaign for her as the Democratic Presidential nominee. A $20 price for a vote is therefore inconsistent with Clinton being 4% more popular than Trump at the time of the June 2016 poll. In addition a value of $20 to influence a vote implies $2billion/$20=100 million votes should have been purchased by the two main parties, as should have resulted in fewer, if any, ballots being cast for the fringe party candidates in November and far less people eligible to vote failing to do so.

An assumption of $400 being needed to influence a vote also leads to questionable results. In particular, such a cost implies that fringe party candidates should have received only $2billion/$400=5 million less votes as a result of the spending by the main parties that is very far from the actual 11.6% reduction in the share of the polling numbers for Johnson and Stein between June and November (for a discrepancy of 15.8-5.0=10.8 million votes less taken from those two fringe party candidates than actually were).

Research from a prior gubernatorial election also indicates a much lower cost of $107 to win a vote via simple mail and phone bank activities (Cardy, 2005).

Thus, the analysis of the 2016 Presidential election here indicates a price of $145 per vote is rather accurate in explaining the actual polling results. Although this value was originally estimated by Bombardini & Trebbi (2011) with data on U.S. Congressional elections using a model restricting campaign spending influences to a homogeneous group of uninformed voters, the current study here shows it also fits well the data on U.S. Presidential elections in 2016.[12]

Future research might examine how much this estimated cost of $145 to influence a vote varies across elections, including in other countries. It might be especially interesting to observe how this price fluctuates over time as the model developed here itself might contribute to reducing that cost by providing a framework to facilitate political marketing. For instance, special interest groups and politicians alike could conduct specific surveys to estimate the values of the individual variables in (8) to detect the factors which are decisive in affecting voter utility and which might therefore be efficiently influenced with the lowest political expenditures. Potentially effective marketing strategies with the highest estimated $du_{z,n}$ might be implied from such analysis that could then be carried out on small scale samples to enable optimizing modifications and expansions of successful trials. Such pilot studies to influence voter utility might optimally involve integrated multidimensional approaches, which could include testing out the effect on the utility of marginal voters in (8) associated with changing or refining one or more of a candidate's proposals.

4. Conclusion

This research utilizes a simple mathematical model that incorporates the complex interrelationships between political expenditures by special interest groups and voter behavior into a small set of categorized variables that can enable an improved understanding of the behavior of all political participants in election processes. The model demonstrates political marketing can most effectively influence election outcomes through the social and psychological factors that have a dominant impact on voter utility. Special interests and politicians optimally target those maleable variables in their political spending to exercise maximum influence on voter choices in the process of exercising control over government power.

An application of the model using public polling information from the U.S. 2016 Presidential election supplies evidence on the explanatory power of the theory. For instance, the model indicates that most of the campaign spending in that election caused voters to switch their support from the candidates of fringe political parties and thereby increased the ballot totals of the Democratic and Republican nominees. This research thus indicates the overwhelming power of special interests endowed with substantial

financial resources to determine election outcomes despite the high cost of swaying a vote in contemporary times. It thereby supplies insights that may be of use to all those affected by, participating in, or forecasting political processes.[13]

Notes

1. Prior empirical studies, such as by Ansolabehere, Figueiredo, & Snyder (2003), Cooper, Gulen, & Ovtchinnovkov (2010), and Hill, Kelly, Lockhart, & Van Ness (2013), have found that the average return on political capital invested through corporate campaign donations is abnormally high. Addoum, Delikouras, Ke, & Kumar (2018) have shown empirically that the election of politicians more favorable (unfavorable) to firms' operations have persisting long-term impacts on the positive (negative) returns to their stocks. Although Aggarwal, Meschke, & Wang (2012) have found some evidence of the political soft money donations of corporations (that were allowed prior to 2003) to be negatively related to be associated with negative stock returns over the next year, that research did not evaluate the long-term impact of such political expenditures, which were unrelated to actual lobbying activities and direct contributions to individual candidates and which may therefore have had an effect on politicians, elections, and government actions only over longer periods of time because the influence was more indirect and gradual.
2. This result was initially shown by Murphy (2019). Politicians cater to the wishes of agents making campaign contributions to them because the costs of non-compliance can be prohibitive, as is often assumed in many political models of the impact of campaign contributions (Baron, 1994). For instance, the real but potentially unstated threat of donors associated with discontinuing political expenditures for a non-compliant politician, as well as the risk of agents making donations to political opponents of the uncooperative politician who fails to support the policies of donors, is instrumental in enabling moneyed interests to influence government policy (Chamon & Kaplan, 2013). Billionaire investors in political campaigns have openly admitted that "we expect a return on our investment" (Cathcart, 2016), and that a "political consequence for opposition and a political reward for support" exists with respect to campaign contributions to politicians (Scheiber, 2017).
3. Politicians benefit in numerous ways from being elected, such as the power, fame, and self-satisfaction generated from winning an election, as well as from the valuable compensation paid by the government for their service in office and having the power to promote their personal views. Politicians may also gain valuable benefits after leaving office through the "revolving door" to companies and special interest groups obtained through lucrative employment and contract opportunities after compliant government service to their donors (Economist, 2017a).
4. The dollar cost of foregoing an hour of paid work is higher for those with higher income (Faravelli, Kalavci, & Pimienta, 2017), but the marginal utility of an extra unit of time or expense generated through just registering and voting may be greater for lower-income individuals because a single dollar is more valuable to the less affluent (given declining marginal utility of wealth and free time).
5. Strategic voting is motivated almost universally because the number of elected government representatives is invariably less than the number of voters, so that voter utility is decreased by choosing candidates or parties unsure to exceed the hurdle minimum. Strategic voting is more important in pluralities or in countries that have a minimum number or percentage of votes for a political party or candidate to be represented in government (as is common in many nations' rules for elections to parliament that often have a threshold like 5% of the vote total to be represented in government as well as exists whenever some number of votes is required to have any representation whatsoever).
6. Brennan & Buchanan (1984) long ago showed mathematically the extremely small chance that an individual's vote will have on the election outcome. Shayo & Harel (2012) have indicated that probability to be one in sixty million in U.S. Presidential elections. Although Faravelli, Kalavci, & Pimienta (2017) have indicated people tend to overestimate the

importance of their votes, the very small objective estimate for w shown here makes it unlikely that $w[v_n\{db^*_{z,n}-db^*_{z,x}\}+dv_n\{b^*_{z,n}-b^*_{z,x}\}]$ would exceed even a tiny C_z. The existence of elections for multiple candidates (as well as for ballot referendum issues) can potentially increase the summed benefits from going to the polls by making several strategic voting choices at once (Coate & Conlin, 2004), but it is unlikely that even a modest value for C_z would be exceeded in any event, especially since voter turnout is much lower in the U.S. for elections not related to casting a ballot for President.

7. Faravelli, Kalavci, & Pimienta (2017) have found that voters generate positive utility from casting a ballot for the winning candidate or party, as is consistent with social pressure to serve the common good as measured by the choices of other voters.

8. Trump became the President despite not receiving as many popular votes as Clinton did nationwide because he garnered more of the U.S. system's electoral college votes, which each of the 50 U.S. states generally allocates as a unified set on a winner-take-all basis determined by the popular vote within each state. Trump's electoral victory therefore was partially related to more judicious use of money expended by his campaign to strategically win the votes in the states with narrow margins of victory using improvements in the concentrated voter targeting tactics of political expenditures described by Huber & Arceneuaux (2007).

9. Sanders' endorsement of Clinton after he had lost the Democratic nomination (Hill, Merica, & Zelaney, 2016) may have been very useful for Clinton's spending to persuade his supporters to vote for her after the June 2016 poll. Although a 2016 survey by states indicated that Sanders would also have won the electoral college with 311 votes in a direct electoral competition against Trump (270ToWin, 2017b), Bernie's inability to win the Democratic nomination was certainly a factor in his decision to promote a strategic vote for Clinton in a failed effort to defeat Trump.

10. A linear proportionality follows from the impact of $[v_nb^*_{z,n}-v_nb^*_{z,x}]$ on $u^*_{z,n}$, as well as from the $w[v_nb^*_{z,n}-v_nb^*_{z,x}]$ term, in (4). The equating of v_n with the actual polling numbers here (for June 2016) prior to all the campaign spending and media coverage seems reasonable given that the value of this variable in (4) and (8) represents each voter's estimate that may be based on very little information or analysis. While voters might estimate candidate popularity from information on the opinions of just a few others (Fisher & Myatt, 2016), Myersen & Weber (1993) have indicated how the media can manipulate voting results simply through their reporting of survey results. Although Fey (1997) has shown where polls can be useful to voters in coordinating strategic casting of ballots to defeat a least desired candidate, that researcher recognized that media coverage and surveys themselves could be manipulated to attain an outcome which is desired by those financing firms involved in public dissemination of information and pre-elections polls. Even if there is an incentive to provide programming to attract a larger audience and thereby maximize advertising and subscription revenues (Dyck, Moss, & Zingales, 2013), the media is also motivated to serve the special interests of the wealthy owners (Herman & Chomsky, 2006), who were best served by focusing attention away from their least favorite candidate.

11. Clinton's failure to take more of this voter sentiment favoring more personal freedoms might have have resulted from her emphasis on her catering to special "identity" groups with entrenched voter opinions unlikely to positively change the $u_{z,n}$ of the marginal voter.

12. It is also similar to the $150 average marketing cost for a traditional bank to win a new customer, although that price is substantially lower for new financial tech banks (Kutler, 2019). The price per vote could be lower for revolutionary political parties and candidates without a long promoted brand name, relatively less promoted currently, and thus not widely known. On the other hand, the impact of a low v_N in (4) can greatly reduce $u^*_{z,N}$ due to social perceptions that ballots cast for third parties in the U.S. are wasted, and so the cost per vote won for fringe candidates might actually be higher until some greater level of v_N were reached. Evidence of such an effect was discovered by Green & Krasno (1988), who found that the marginal cost of buying additional votes was higher at very high levels of expenditures but was larger at very low levels of political spending. The latter empirical findings are consistent with $u^*_{z,n}$ being a function of v_n despite the insignificance of w in impacting $u_{z,n}$ in (4).

[13] For instance, applying the model to primary elections such as exist for the Democratic and Republican Parties in the U.S., fringe candidates without personal brand name appeal or the backing of wealthy special interests would seem to have the same disadvantages in attracting support, small donor funding, and votes as the nominees of fringe parties according to (4). As a result, wealthy agents may therefore be able to utilize their greater financial resources to focus public attention on candidates representing their special interests, thereby leading to social pressure to choose only from those politicians who are supported by agents with sufficient funding to compete in buying attention and votes through their marketing expenditures. The model might be useful in evaluating the feasibility of an electoral victory for one of the candidates for the Democratic Presidential nominee advocating for the Green New Deal, which involves large spending to avoid the huge costs of pollution as well as provide Medicare for all and a universal income that may be economically efficient if it could be financed (Dsouza, 2019). While drastically reducing military spending might be sufficient to fund program, doing so would motivate armaments producers to add to the already massive potential for enormous political expenditures by other wealthy agents (like dirty energy firms and health insurance companies) to engage in whatever marketing is necessary to prevent actual government implementation of such proposals at some point in the political processes.

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