How Does Campaign Spending Affect Election Outcomes? A Review and Comparative Analysis of Approaches to Endogeneity

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ABSTRACT

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By Whitney Dawn Cole

The cost of winning an election has steadily been on the rise in recent decades. Because the amount of money being spent is so large, knowing its effect on election outcomes is incredibly valuable information. Much of the previous research done on this subject has shown that while challenger spending has a significant negative effect on the vote share of the incumbent, incumbent spending has a negligible, and sometimes even negative, effect on the incumbent’s vote share. Many researchers point to a statistical problem known as endogeneity to explain these counterintuitive results.

While many attempts have been made to correct the problem of endogeneity, each attempt uses a different sample, which makes for a difficult comparison of results. The purpose of this paper is to survey the literature, then choose three models that offer a convincing solution to the endogeneity question and to replicate these models on a single sample using House elections from 1998 to 2008.

My findings fall in line with much of the previous research which indicated that incumbent spending has no impact on an incumbent’s vote share, while challenger spending has a significant negative impact on an incumbent’s vote share. These findings raise many questions about why incumbents spend in campaigns, and even more importantly about why individuals contribute to incumbents’ campaigns.
How Does Campaign Spending Affect Election Outcomes? A Review and Comparative Analysis of Approaches to Endogeneity

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I. INTRODUCTION

From 1990 to 2004, the price of winning a seat in the House of Representatives rose from $550,000 to over $1,000,000—an increase of nearly one hundred percent (Gruber 2007). Not only has the amount of money spent on campaigns for political office in the United States been rapidly increasing in recent years, but these expenditures are also very large sums of money. It is therefore important to know what effect this campaign spending, if any, has on voter behavior. One would expect a ceteris paribus increase in a candidate’s campaign expenditures to increase the number of votes that candidate receives. However, research has shown that this may not always be the case. In fact, some studies, which will be reviewed in Section II, have shown campaign spending by incumbents to negatively affect their vote shares. Most of these authors have attributed this unexpected result to bias caused by a statistical problem known as endogeneity.

A number of things could be expected to affect what fraction of the vote a candidate receives in an election. Some of these are not under the candidate’s control, and might include underlying voter preferences and certain candidate characteristics.1 Other factors that determine vote share are — at least to some extent — under a candidate’s control, however, including platform choices and campaign spending.

To explain the effects of campaign expenditures on the incumbent’s vote share without bias, one would have to perfectly measure incumbent spending, challenger

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1 For example, Armstrong, Green, Jones and Wright (2008) have attempted to measure the effect of the physical appearances of candidates on their vote shares.
spending, candidate characteristics, and constituency preferences, or use the regression equation:\(^2\):

\[
\text{incumbent vote } \% = \beta_0 + \beta_1\text{incumbent spending} + \beta_2\text{challenger spending} + \beta_3\text{candidate characteristics} + \beta_4\text{constituency preferences} + u.
\]

However, while the variables “incumbent spending” and “challenger spending” can be easily measured, it is impossible to capture all of the variables that would properly measure “candidate characteristics” and “constituency preferences.” The information for those variables left out of the regression equation will be captured in the error term, \(u\). If this information in the error term is correlated with challenger and incumbent spending, the coefficients on challenger and incumbent spending will be biased, or systematically wrong.

There are a few different ways that the missing information might be correlated with candidate spending. To use an example from Stratmann (2005), a strong constituency preference for a Republican incumbent will likely lead to a smaller number of donations to that candidate’s campaign due to the fact that it is probable he or she will win reelection regardless of the amount spent. In this case, the coefficient on incumbent spending would be underestimated because the equation has failed to control for partisanship. This correlation will cause \(\beta_1\) to be biased upward, or too positive, and \(\beta_2\) to be biased downward, or too negative.

\(^2\) Stratmann (2005)
The problem of endogeneity of campaign spending has been recognized since at least Sullivan and Giertz (1977), and researchers have used a variety of methods to try to solve this problem. Some of these methods include trying to better measure candidate characteristics and constituency preferences by assessing the closeness of a race, whether or not a contender was involved in a scandal, and the incumbent’s vote share in the previous election. While many of these methods have added a new approach, each of them has used a different sample to test their results. Some use election results from the House of Representatives, while others use election results from the Senate. The election results used also span many different years. This does not allow for an easy comparison of the researchers’ findings. The purpose of this paper is to discuss and analyze each of the various approaches that have been utilized, and to replicate some of these studies using a single sample so that the results can be compared to determine whether and by how much the estimates differ using these solutions.

The relevant literature is reviewed in Section II. In Section III, more detail is given on the models that will be replicated. A description of the data sources used in the replications and the characteristics of the overall sample are found in Section IV. In Section V, the results of the replications will be given and any significant differences between the original models and the replications will be discussed. Section VI will include a comparison of the coefficients of interest in each replication. Lastly, Section VII will offer a conclusion.
II. LITERATURE REVIEW

A variety of methods have been used to address the problem of endogeneity in the context of campaign spending. Several authors have used methods based on ordinary least squares, including Giertz and Sullivan (1977), Jacobson (1978), Palda and Palda (1998) and Grier (1989). Giertz and Sullivan (1977) were among the first to study the issue of endogeneity of campaign expenditures with respect to election outcomes. They organize campaign expenditures by party and estimate a reduced form regression where the dependent variable is the Democrat’s vote share. Giertz and Sullivan note that their structural equation cannot include the Democrat’s own expenditure, so, as they say, “the significance of these results can be oversold.” These findings indicate that, as would be expected, Republican spending negatively affects the vote share for the Democratic candidate.

Branching off from this study, Jacobson (1978) argues in favor of organizing the data by incumbency status, rather than party, because incumbent and challenger expenditures affect the vote share in different ways. Part of this differing effect is due to the fact that incumbents enter an election with an advantage—they have much greater access to and control of campaign funds. Jacobson notes that reverse causality could be occurring in the relationship between campaign spending and vote share in ordinary least squares regressions because these regressions assume unidirectional causality—that campaign spending influence vote shares. However, as Jacobson argues, reverse causality—the fact that an expectation of high vote shares could influence spending—is also plausible. This is Jacobson’s argument for endogeneity. Because of this reverse
causality, the estimates obtained from ordinary least squares regressions are likely biased. Jacobson runs a simple ordinary least squares regression on data from the House and Senate for the years 1972 and 1974 where the dependent variable is the percentage of the vote received by the challenger. He finds that challenger spending has a large, positive impact on challenger vote share, while incumbent spending has a very weak negative impact. These signs are expected, but because the effect of incumbent spending is estimated to be so close to zero, Jacobson argues that the magnitude of the effect of incumbent spending is underestimated. He also employs a two-stage least squares regression incorporating instruments for incumbent spending and challenger spending in an attempt to correct the endogeneity bias and finds the same results. Because correcting for endogeneity does not change the basic result that incumbent spending has little effect, Jacobson argues that incumbents exhibit reactionary spending, or spend in response to the magnitude of the challenge.

Similarly, Palda and Palda (1998) estimate the effects that campaign expenditures have on incumbents’ vote share for the 1993 elections to the French legislature. They suggest that a new category — the source of candidate funding — should be added to regressions on this subject because a voter may be less likely to vote for a candidate whose campaign is financed by very narrow bases of support. Palda and Palda estimate equations with incumbent vote share as the dependent variable. Like Jacobson, they find that incumbent campaign expenditures have only a small effect on the election outcome.

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3 Jacobson regresses challenger and incumbent spending on all of the exogenous variables used in his equation. He uses those estimated parameters as instruments in the original regression equation to find the effect on the challenger’s share of the vote.
and this effect is more than offset by the much larger effects of challenger spending. However, they also find that incumbent expenditures can have a negative effect on incumbent vote share if campaign contributions come from the “wrong” source.

Grier (1989) runs a simple ordinary least squares regression on data from U.S. Senate elections from 1978 to 1984 where he incorporates a lagged dependent variable (incumbent’s vote share in the previous election) and a scandal dummy variable. Grier’s results from a linear specification show that incumbent spending has a significant positive effect on incumbent vote share, while challenger spending has a significant negative effect on incumbent vote share, which is the expected result. Thus, he argues that these additional variables adequately control for candidate characteristics and constituency preferences. Grier also utilizes a quadratic functional form to allow for diminishing returns to campaign spending. He finds that challenger spending is more effective than incumbent spending at low spending levels, but incumbent spending is more effective in the long term. The result that challenger spending is more effective at lower spending levels could be explained by the fact that incumbents start campaigns with a higher level of political capital than challengers. Spending meant to increase political capital would be expected to have a larger effect for the less-known candidate.

Abramowitz (1991) hypothesizes that the lack of competition in recent elections is due to a decline in the efficiency of challenger spending. He tests this hypothesis with data from House elections for the years 1984 and 1986. Abramowitz incorporates

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4 By lack of competition, Abramowitz is referring to the fact that challengers rarely win (at least in the sample he is using). He attributes the low levels of competition to the increasing cost of running a campaign for the House and the challenger’s inability to raise campaign funds.
variables to measure the partisan makeup of the district, the incumbent’s personal
popularity, the incumbent’s seniority, the type of committee that the incumbent has
served on, the candidate’s rate of defection from their party’s position and a scandal
dummy variable. Even after controlling for all of these factors, Abramowitz finds that
incumbent spending has a very small positive effect on incumbent vote share, but the
effect is not statistically significant. Challenger spending, on the other hand, has a rather
large negative effect on the incumbent’s vote share. His results show that the challenger’s
campaign spending is the most important determinant of competition levels, which is
consistent with much of the earlier evidence.

Several researchers have tried methods other than standard ordinary least squares
regression to correct for the endogeneity problem. These alternative methods include
using two-stage least squares regressions, instrumental variables regression, and panel
data methods.

Gerber (1998) explains endogeneity as a result of expectations about the closeness
of an election. He argues that a candidate’s campaign spending levels increase both when
the probability of that candidate’s victory increases and when the election is close,
because it is easier in those situations for candidates to raise money. Supporters are more
likely to make contributions to the campaign of the candidate expected to win, and are
also more likely to contribute when the race is close and their contribution will have a
larger effect. Gerber’s ordinary least squares estimation produces results consistent with
the previous research—incumbent spending has a small positive effect on incumbent vote
share, while challenger spending has a much larger negative effect. However,
ncorporating candidate wealth and state population as instruments for incumbent and challenger spending shows that the effects of incumbent and challenger spending are statistically equivalent at the margin.

Green and Krasno (1988) also perform a two-stage least squares regression on House elections from 1978, using lagged spending as an instrument for incumbent spending. Green and Krasno re-evaluate Jacobson’s finding that incumbent spending in House elections has a negligible effect on the vote. They argue that Jacobson failed to control for challenger quality, take into account interaction effects, and used an inadequate treatment for reverse causality and therefore his coefficient estimates for incumbent spending are underestimated. Green and Krasno incorporate into their model a point scale to measure challenger quality. Their findings, however, are consistent with Jacobson in that they find incumbent spending to have almost no effect on the vote.

Like Green and Krasno, Levitt (1994) argues that candidate quality must be taken into account in these regressions to produce more accurate results. Levitt utilizes panel data to control for candidate quality and unobserved district-specific factors and examines only those races involving “repeat challengers” (candidates who run against one another more than once). By using repeat challengers, Levitt argues that he is able to control for the impact of candidate quality because it remains constant across two or more elections. He finds that campaign spending, regardless of whether the spending is done by the incumbent or challenger, has no significant effect on that candidate’s vote share. These findings are different from much of the previous literature, which finds challenger spending to have a significant negative effect on incumbent’s vote share.
Some researchers have used game theoretic models to estimate campaign spending effects. Potters, Sloof and van Winden (1997) argue that campaign advertising may convey information to voters about a candidate’s policy position. They use a payoff matrix to illustrate the observation that campaign spending increases a candidate’s probability of being elected. Erikson and Palfrey (2000) also use a game theoretic model to argue that there is no endogeneity problem in races that are expected to be close. They test their argument by running separate regressions for elections ranging from those that are not close at all to those that are very close. Erikson and Palfrey argue that the coefficients for the very close races are the most reasonable, and conclude that those coefficients are not biased. Based on this finding, they incorporate a variable for the expected closeness of the race to solve the problem of endogeneity.
III. REPLICATED STUDIES

For this paper, I will replicate three models—Grier, Levitt and Erikson and Palfrey—each of which uses a very different technique to address the problem of endogeneity. All of these studies have identified a very convincing solution to this problem. Grier’s incorporation of a lagged vote share variable should be a good measure of how well the candidate was liked in the previous election. Unforeseen events sometimes arise, however, and Grier has also accounted for this by incorporating a scandal dummy variable. Grier uses Senate elections, which, as stated above, means that the effect of incumbent spending should be significant, if the results are in line with the previous literature. If this is true, then it may be possible that this technique is not truly a fix to the endogeneity problem, but rather just appears that way because Senate races are used. Using House data will show whether this is the case.

Erikson and Palfrey incorporate the expected closeness of an election, which should have a major impact on a candidate’s spending decisions. Intuitively, candidates will spend more when they expect the election to be close and not much at all if they expect a landslide election. Thus, it should be of great social value to know if this spending even matters. Lastly, I think that Levitt’s approach is particularly interesting in the way that he has accounted for candidates’ qualities and characteristics. Because these should remain constant across elections, looking at repeat challengers should remove this influence.

a. Grier
First, I will replicate the two main empirical models from Grier (1989):

\[
\% \text{VOTE} = \beta_0 + \delta_1 \text{D8284} + \beta_1 \% \text{VOTE}_{-1} + \delta_2 \text{SCANDAL} + \beta_2 \text{CHAL}\$ + \beta_3 \text{INC}\$ + u
\]

\[
\% \text{VOTE} = \beta_0 + \delta_1 \text{D8284} + \beta_1 \% \text{VOTE}_{-1} + \delta_2 \text{SCANDAL} + \beta_2 \text{CHAL}\$ + \beta_3 \text{CHAL}\$^2 + \beta_4 \text{INC}\$ + \beta_5 \text{INC}\$^2 + u
\]

The dependent variable, \% \text{VOTE}, is the incumbent’s proportion of the total vote using a range of 0 to 100. \text{D8284} is a dummy variable to shift the intercept for the elections in 1982 and 1984.\textsuperscript{5} \text{SCANDAL} is a dummy variable which equals 1 for the incumbent with the largest scandal in that election year. \text{CHAL}\$ measures the challenger’s spending in 1972 dollars spent per thousand people in the state, and \text{INC}\$ measures the incumbent’s spending in the same way. \text{CHAL}\$^2 and \text{INC}\$^2 are quadratics in the candidates’ spending.

The sample Grier uses to estimate this equation is made up of 101 races involving elected incumbents who ran against an opponent in the Senate elections from 1978-1984. Grier estimates both a linear model and a quadratic model on the entire sample and on two subsets of the sample—one subset for the elections from 1978-1980 and another for the elections from 1982-1984.

\textsuperscript{5} Grier never explains the reason for including the dummy variable to shift the intercept. It is possible that he has done this in response to redistricting, which usually occurs about two years after the Decennial Census. The intercept shift variable would allow Grier to control for gerrymandering of districts that would give an advantage to one candidate over another.
Grier incorporates two variables to address the endogeneity problem: %VOTE and SCANDAL. By including the percentage of the vote received by the incumbent in the previous election, Grier is attempting to control for the incumbent “brand name” that often develops due to past expenditures and other political achievements, which can have a very large effect on the vote. Additionally, the use of a scandal dummy variable helps to control for another aspect of political campaigns that can have an extremely negative impact on an incumbent’s vote share.

Grier also runs a second regression incorporating quadratic spending variables to control for the possible diminishing returns to campaign spending. This inclusion is important because if campaign expenditures are subject to diminishing returns, the unexpected results could be attributed to the fact that incumbents spend more in a campaign than challengers.

**b. Levitt**

Second, I will replicate the model from Levitt (1994):

\[
\text{DEM \% OF 2-PARTY VOTE} = \beta_0 + \beta_1(\text{CHALLENGER SPENDING} \times \text{INCUMBENT}) + \beta_3(\text{INCUMBENT SPENDING} \times \text{INCUMBENT}) + \beta_4\text{OPEN-SEAT SPENDING} + \\
\delta_0\text{INCUMBENCY} + \delta_1\text{SCANDAL} + \tau\text{YEAR} + \gamma\text{INDIVIDUAL} + \epsilon
\]
The dependent variable, DEM % OF 2-PARTY VOTE, measures the Democrat’s share of the two-party vote on a scale of 0 to 100. CHALLENGER SPENDING measures challenger campaign expenditures and INCUMBENT SPENDING measures incumbent campaign expenditures. Both spending variables are in terms of $100,000 of 1990 dollars. OPEN-SEAT SPENDING measures net campaign expenditures (Democratic spending – Republican spending) in open-seat elections. INCUMBENCY is a dummy variable that equals one if the incumbent is a Democrat, -1 if the incumbent is a Republican and zero otherwise. SCANDAL is a dummy variable to measure the seven scandals that were found to have occurred during the period of Levitt’s sample. YEAR is a vector of year dummy variables and INDIVIDUAL is a vector of dummy variables identifying the candidate pairing.

CHALLENGER SPENDING and INCUMBENT SPENDING are interacted with the dummy variable for incumbency. Including these interaction terms allows us to see whether the effect of incumbent spending and challenger spending on the democrat’s percentage of the two-party vote depends on whether or not the candidate is an incumbent. This means that in a race where the incumbent is a Democrat, the spending variables are multiplied by one, and so their signs are unchanged. However, in a race where the incumbent is a Republican, the spending variables are multiplied by negative one, reversing the signs on the coefficients (a negative coefficient on incumbent spending and a positive coefficient on challenger spending).

Levitt’s sample consists of the House elections from 1972 to 1990 where the same two candidates face one another in more than one election. This results in 633 races for
the sample. Levitt argues that by examining only those elections with repeat challengers, one is able to account for unobservable characteristics and qualities of individual candidates. These characteristics and qualities are assumed to remain constant across both elections, so Levitt employs a fixed effects model to allow these factors to drop out of the regression.

c. Erikson & Palfrey

Lastly, I will replicate the model from Erikson and Palfrey (2000):

\[ VSI = \beta_0 + \beta_1 \text{LOG(I)} + \beta_2 \text{LOG(C)} + \beta_3 \text{EXPECTED VOTE} + u. \]

The dependent variable $VSI$ is the vote share of the incumbent. LOG(I) is the natural log of incumbent spending and LOG(C) is the natural log of challenger spending. EXPECTED VOTE is the expected pre-spending incumbent vote, and is estimated in a separate regression. The explanatory variables in this secondary regression include the incumbent’s vote share in the previous period, the district’s vote for the incumbent’s party in a Presidential election near the same period, and dummy variables for year, incumbent party and southern states.\(^6\)

\(^6\) There are different possible definitions of which states are southern, and Erikson and Palfrey do not specify their definition. In this study, the southern states are defined as those that were in the Confederacy (Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas and Virginia). Data for Louisiana were not used, however, as data for that state is not collected for the other variables.
Erikson and Palfrey’s sample consists of House elections from 1974-1980 and 1984-1990 that include an incumbent. They do not include the year 1982 because they incorporate a lagged incumbent vote variable, and the 1980 vote does not match with the 1982 vote because of redistricting.
IV. DATA DESCRIPTION

The dataset for this paper will include the elections for seats in the House of Representatives from 1998 to 2008. Data on expenditures, incumbency and party are from the Federal Election Commission. Data on vote share in the years 1998, 2002, 2004, 2006 and 2008 are taken from the CNN elections website. Results for the year 2000 are not available through CNN, so data for this year are from Wikipedia. The scandal variables used by Grier and Levitt come from the election previews in the Congressional Quarterly (CQ) Almanac. The scandal variable included in the replications is from the CQ Almanac only for the years 2004 and 2006, as no scandals were noted in that source for other years.\(^7\) An Internet search for additional House scandals indicated that scandals also occurred in the years 1998 and 2002, so the scandal variable for those years is taken from CNN and the Washington Post website, respectively. No evidence was found that major scandals occurred in 2000 or 2008. Data for the district Presidential vote for the incumbent’s party are from Polidata. Population information are from the U.S. Census estimates of state population. The real spending variables were calculated using the U.S. Bureau of Labor Statistics Consumer Price Index.

From the CNN data, there were 4,596 candidates during this period who were opposed and one of the top two contenders in a race. Of these candidates, 462 could not be matched to FEC data and were dropped from the sample.\(^8\) From the initial FEC data,

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\(^7\) The scandal variable was rather time-consuming to collect. It involved searching the election previews in the CQ Almanac for each year individually, then, as noted above, doing an Internet search for each year as well.

\(^8\) There were 507 observations for which data appeared to be available on vote share, but not on expenditures. There were many spelling and typographical errors in the FEC data, and 45 of these 507
101 candidates could not be matched to the CNN data and were dropped from the sample. All data for the state of Louisiana were dropped from the sample, as elections in that state are by “blanket primary,” where all candidates run in a single election without having a primary first. This means that the top two candidates to advance could be from the same political party, and that there could be several serious contenders in the race.

For the dataset that will be used to replicate the studies of Erikson and Palfrey and Grier, 3,186 candidates were left once everything above was accounted for. Because the unit of analysis is the race, the full sample consists of 1,593 races. For the Levitt dataset, races that were not between “repeat challengers” were dropped from the sample. This leaves 704 candidates, or 352 races in the Levitt sample.

The summary statistics for the samples used to replicate the studies of Grier, Levitt and Erikson and Palfrey can be found in Tables 1, 2, and 3 respectively. Erikson and Palfrey do not offer any summary statistics for comparison with my results. My summary statistics for Grier and Levitt’s models, however, are incredibly similar to the authors’ findings. The size of the averages for the incumbent’s percentage of the vote, incumbent spending, and challenger spending in my replication were about the same as those found by Grier. Like Grier, there is a large difference between incumbent spending and challenger spending in my sample: over the period 2000 to 2008, incumbents spend $2.50 for every $1 spent by challengers.
V. REPLICATIONS

The following table presents the estimates for the coefficients of interest (incumbent spending and challenger spending) from each of the studies I replicated:

<table>
<thead>
<tr>
<th>Model</th>
<th>Time Period</th>
<th>Office</th>
<th>Chal$</th>
<th>Inc$</th>
<th>Chal$^2</th>
<th>Inc$^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grier</td>
<td>1978-1984</td>
<td>Senate</td>
<td>-0.0069***</td>
<td>0.00107</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>1978-1984</td>
<td>Senate</td>
<td>-0.0235***</td>
<td>0.0037***</td>
<td>0.0000057***</td>
<td>0.00000026</td>
</tr>
<tr>
<td>Levitt</td>
<td>1972-1990</td>
<td>House</td>
<td>0.0071</td>
<td>-0.0439</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

**NOTE.—** The spending variables for Grier are measured in 2000 dollars per thousand persons in the state. The spending variables for Levitt are in terms of $100,000 of 2000 dollars. The spending variables for Erikson and Palfrey are measured in 2000 dollars.

*** Statistically significant at the 99% level
** Statistically significant at the 95% level
* Statistically significant at the 90% level

The results from replicating Grier’s model can be found in Table 4. In his linear specification, Grier finds the intuitive result that incumbent spending helps and challenger spending hurts the incumbent’s chances of re-election. Grier has a positive and statistically significant coefficient on incumbent spending, and a negative and statistically significant coefficient on challenger spending. Although my coefficients are somewhat smaller in magnitude, I also find a negative coefficient on challenger spending and a positive coefficient on incumbent spending. Challenger spending is statistically significant, however, while incumbent spending is not. The fact that Grier finds a positive and statistically significant coefficient for incumbent spending could be due to the fact that Grier is using Senate data, while I am using House data. Thus, it is possible that Grier really did not fix the problem of endogeneity because, as noted earlier, challenger
quality may be higher in Senate races causing the impact of incumbent spending to typically be positive and statistically significant.

As mentioned above, the quadratic specification is important because it allows for diminishing returns to campaign spending. In his quadratic specification, Grier again finds a negative and statistically significant coefficient on challenger spending and a positive and statistically significant coefficient on incumbent spending. The coefficients on the quadratics for challenger and incumbent spending are both statistically significant and in the opposite sign of the spending coefficients, demonstrating the diminishing returns to spending. Again, I find the negative coefficient for challenger spending and the positive coefficient for incumbent spending. However, in this specification, both incumbent and challenger spending are statistically significant. Although the coefficient estimates are still smaller in magnitude than Grier’s, the estimate for challenger spending in the quadratic specification is much closer in magnitude to Grier’s. The quadratic of challenger spending, however, is the only quadratic coefficient to be statistically significant, suggesting that challenger spending has a diminishing marginal effect but incumbent spending does not. It could be that spending has a lower marginal effect because more is being spent in the years of my sample as compared to the time period used by Grier.

The regression results for the replication of Levitt are reported in Table 5. It is important to remember here that Levitt is using a different dependent variable than both Grier and Erikson and Palfrey—the Democratic percentage of the two-party vote. Levitt finds a very large, positive coefficient for challenger spending and a much smaller
positive coefficient for incumbent spending. The signs of Levitt’s coefficients would indicate that spending by the challenger and the incumbent both increase their vote shares if the coefficients were statistically significant and challenger spending would have a much larger effect. However, Levitt reports that none of the coefficients on the spending variables are statistically significant and therefore argues spending does little to affect election outcomes.

While I also find a positive coefficient for challenger spending, mine is much smaller in magnitude than Levitt’s. Unlike Levitt, I find a negative coefficient estimate for incumbent spending that is again much smaller in magnitude than Levitt’s. Neither of my spending variables are statistically significant, however, and so my results are qualitatively the same as Levitt. These results suggest, again, that candidate spending has little effect on election outcomes.

The regression results for the replication of Erikson and Palfrey are in Table 6. Since they argue that there is no endogeneity problem in close races, Erikson and Palfrey divide their sample into categories to measure the closeness of the race. The races get less competitive as one moves right in the category columns. The coefficients for the full sample, then, are a weighted average of the coefficients from the various categories.

Erikson and Palfrey find a negative coefficient on the log of challenger spending that is only significant in very close races. Again, they argue that these are the only correct estimates in their findings. Consistent with most of the previous literature, I also find a negative coefficient on the log of challenger spending. Erikson and Palfrey find

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9 Since the incumbent is expected to win most elections, very close races are defined by Erikson and Palfrey as those where the incumbent is expected to get less than 52% of the vote.
statistically significant coefficients for both challenger and incumbent spending in the
specification for very close races. I, on the other hand, find that only the coefficient on
challenger spending is significant in very close races. Again, my results are consistent
with earlier findings.

Erikson and Palfrey find that as the races get less competitive, incumbent
spending has less of a positive effect on incumbent vote share and can appear to actually
hurt the incumbent. That is, their coefficient estimates for the log of incumbent spending
get smaller as the races move away from very close, and become negative in races that
are not close at all (where the incumbent is expected to win more than 58% of the vote).
All of the coefficient estimates in the divided sample are statistically significant, except
for the specification for races that are not close at all. Recall that Erikson and Palfrey
argue that close races will not suffer from endogeneity, but the problem presumably gets
more severe as races become less close. Their results, then, show that the bias on the
coefficient for incumbent spending becomes more pronounced as the races become less
close.\(^{10}\)

I also find that the coefficient estimate for the log of incumbent spending becomes
more negative as the races move away from being very close. In my results, the effect of
incumbent spending on incumbent vote share becomes negative in the specification
where incumbents are expected to get between 55% and 58% of the vote. The natural log
of challenger spending is statistically significant in all specifications, whereas the natural

\(^{10}\) Since the regression run on the full sample is essentially a weighted average of the subsamples and those
results have mixed signs, it is not surprising that the coefficient in the full sample is not statistically
different from zero.
log of incumbent spending is only significant in the specification where all cases are combined, and the specification for the races not expected to be close at all (where the incumbent is expected to get more than 58% of the vote). These results are again consistent with much of the previous literature finding that incumbent spending has no effect.

Although the magnitudes of my coefficients are overall much smaller than Erikson and Palfrey’s, there is one interesting thing to note. In their results, they find a negative coefficient for both challenger and incumbent spending in cases where the incumbent is expected to get more than 58% of the vote. The coefficient on challenger spending, however, is much more negative than the coefficient on incumbent spending. In all cases, their coefficient on incumbent spending is very small but positive, while the coefficient on challenger spending is very large and negative. My results are somewhat different. I find that in cases where the incumbent is expected to get more than 58% of the vote, the coefficient on incumbent spending is actually more negative than the coefficient on challenger spending. The same is true for the all cases specification. This would suggest that in races that are not very close, and in all cases overall, the bias is more pronounced.
VI. COMPARISON OF RESULTS FROM DIFFERENT REPLICATIONS

It is difficult to make a comparison across all three models, as a different dependent variable is used in one of the replications. The dependent variable used to replicate Levitt is the Democratic share of the two-party vote, while the dependent variable used to replicate both Grier and Erikson and Palfrey is the incumbent’s percentage of the two-party vote. Some comparisons are possible, though. In both replications for Grier and Erikson and Palfrey, it seems that challenger spending has a greater impact than incumbent spending, while just the opposite is true for Levitt. In both replications for Grier and Erikson and Palfrey, challenger spending has a negative impact on the incumbent’s vote share. Although the magnitude of the coefficient on challenger spending appears to be much larger in Erikson and Palfrey, it is important to remember that these variables are measured differently by each author. Conversely, incumbent spending has very small impact across all three specifications and the impact is positive in two of the three replications. The difference in magnitude is especially apparent in both Levitt and Erikson and Palfrey. This could be due to the fact that both of these models not only use a much larger sample than Grier, but also estimate the effects in House elections rather than Senate.
VII. CONCLUSION

The results in my replications are consistent with much of the previous research. Like all of the models I have replicated, I find that challenger spending has a much larger impact on election outcomes than incumbent spending does. The signs on the coefficients of interest are also what is expected. Incumbent spending is only statistically significant in the replication of Grier’s quadratic specification, and has no significant effect in the other regressions, while challenger spending is statistically significant in all model replications excluding Levitt. My findings indicate that incumbent spending has very little effect on the incumbent’s vote share.

Figure 1 shows a vote share function representing what one would expect to see from challenger and incumbent spending. It is well established that, in general, incumbents spend more during campaigns than do challengers. This, coupled with the possibility that campaign expenditures are subject to diminishing returns, offers some new insight into this subject. Although I find only challenger spending to have a diminishing marginal effect, it is plausible that the levels of spending are responsible for the unexpected results found by many researchers.

If campaign spending is subject to diminishing returns, this means the returns from campaign spending will increase at a decreasing rate until they flatten and become zero. At very high levels of spending, the effect becomes negative. This can be seen in the shape of the curve in Figure 1. Spend* represents the level of spending at which the returns with respect to vote share are zero. So, it could be that the level of spending by challengers is at a point so low that their returns are still positive (SpendC) while
incumbents spend so much that the marginal dollar of spending has a negative effect on the incumbent’s electoral success \((\text{Spend}_I)\). Calculating the point at which the returns from spending are zero for both challengers and incumbents using the coefficient estimates from Grier yields results in line with this possibility for challengers, but not for incumbents. Average challenger spending is $78,100 per person in the district, which is well below the $2,050,610 level at which the effect would become negative. The empirical evidence does not support this prediction for incumbents, however. Both spending coefficients are positive for incumbents, which means that their vote share function is increasing at an increasing rate with respect to spending. Therefore, there is no spending level at which the effect will become negative.

It remains to be seen whether this is because the endogeneity problem has not been adequately addressed, or whether incumbent spending really does little to affect the outcome of an election — or even hurts a candidate’s chance of success. If the latter is true, it raises interesting questions about why incumbents seek campaign contributions, and why voters continue to contribute to incumbents’ campaigns. It could be that contributors are hoping for some kind of a policy favor in return, or that contributors are hoping to sway a candidate’s platform. Regardless, these possibilities could have many implications for the laws surrounding campaign financing.
References


Figure 1: Vote Share Function for Incumbents and Challengers
Table 1: Summary Statistics—Replication of Grier (1989)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. 2000 (N=275)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Vote</td>
<td>65.753</td>
<td>8.749</td>
<td>45.445</td>
<td>93.814</td>
</tr>
<tr>
<td>Incumbent$</td>
<td>168.031</td>
<td>240.463</td>
<td>4.742</td>
<td>1642.013</td>
</tr>
<tr>
<td>Challenger$</td>
<td>64.64</td>
<td>138.214</td>
<td>0</td>
<td>916.384</td>
</tr>
<tr>
<td>B. 2002 (N=226)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Vote</td>
<td>66.557</td>
<td>8.028</td>
<td>44.212</td>
<td>89.362</td>
</tr>
<tr>
<td>Incumbent$</td>
<td>187.117</td>
<td>348.020</td>
<td>6.726</td>
<td>2746.52</td>
</tr>
<tr>
<td>Challenger$</td>
<td>86.206</td>
<td>349.782</td>
<td>0</td>
<td>4348.262</td>
</tr>
<tr>
<td>C. 2004 (N=286)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Vote</td>
<td>65.822</td>
<td>7.731</td>
<td>38.384</td>
<td>92.857</td>
</tr>
<tr>
<td>Incumbent$</td>
<td>207.618</td>
<td>396.581</td>
<td>8.453</td>
<td>4736.925</td>
</tr>
<tr>
<td>Challenger$</td>
<td>82.888</td>
<td>260.242</td>
<td>0</td>
<td>2972.221</td>
</tr>
<tr>
<td>D. 2006 (N=286)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Vote</td>
<td>62.885</td>
<td>8.707</td>
<td>26.829</td>
<td>87.912</td>
</tr>
<tr>
<td>Incumbent$</td>
<td>223.399</td>
<td>351.055</td>
<td>7.479</td>
<td>2463.156</td>
</tr>
<tr>
<td>Challenger$</td>
<td>77.895</td>
<td>178.897</td>
<td>0</td>
<td>1559.104</td>
</tr>
<tr>
<td>E. 2008 (N=267)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Vote</td>
<td>63.659</td>
<td>8.593</td>
<td>40</td>
<td>89</td>
</tr>
<tr>
<td>Incumbent$</td>
<td>190.807</td>
<td>329.381</td>
<td>4.999</td>
<td>3745.959</td>
</tr>
<tr>
<td>Challenger$</td>
<td>80.063</td>
<td>231.463</td>
<td>0</td>
<td>2424.508</td>
</tr>
<tr>
<td>F. 2000-2008 (N=1340)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Vote</td>
<td>64.873</td>
<td>8.484</td>
<td>26.829</td>
<td>93.814</td>
</tr>
<tr>
<td>Incumbent$</td>
<td>196.055</td>
<td>337.360</td>
<td>4.742</td>
<td>4736.925</td>
</tr>
<tr>
<td>Challenger$</td>
<td>78.074</td>
<td>237.47</td>
<td>0</td>
<td>4348.262</td>
</tr>
</tbody>
</table>

Note.—% Vote is the incumbent’s percentage of the vote measured as incumbent’s percentage of vote + (incumbent’s percentage of vote + challenger’s percentage of vote). Incumbent$ and Challenger$ are measured in 2000 dollars spent per thousand persons in the state. Population figures are from the U.S. Census estimates of state population.
Table 2: Summary Statistics—Replication of Levitt (1994)

<table>
<thead>
<tr>
<th>Overall Contested Elections</th>
<th>A. Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Democratic percentage of vote</td>
<td>48.199 (11.479)</td>
</tr>
<tr>
<td>Incumbent’s percentage of vote</td>
<td>60.264 (16.583)</td>
</tr>
</tbody>
</table>

B. Breakdown by Status of Incumbent

<table>
<thead>
<tr>
<th>Incumbent</th>
<th>Percentage of Vote</th>
</tr>
</thead>
<tbody>
<tr>
<td>Democratic</td>
<td>56.447</td>
</tr>
<tr>
<td>Republican</td>
<td>55.709</td>
</tr>
<tr>
<td>Open seat (Democratic)</td>
<td>2.539</td>
</tr>
<tr>
<td>Open seat (Republican)</td>
<td>2.723</td>
</tr>
</tbody>
</table>

C. Campaign Spending per Candidate (Thousands of 2000 dollars)

| Incumbents | 10.183 |
| Challengers | 4.902 |
| Open seat | -0.12 |

NOTE.—Numbers in parentheses are standard deviations.

Table 3: Summary Statistics—Replication of Erikson & Palfrey (2000)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inc % Vote</td>
<td>64.757</td>
<td>8.466</td>
<td>26.829</td>
<td>98.529</td>
</tr>
<tr>
<td>Log (I)</td>
<td>13.648</td>
<td>0.628</td>
<td>10.967</td>
<td>16.381</td>
</tr>
<tr>
<td>Log (C)</td>
<td>11.277</td>
<td>2.390</td>
<td>-4.605</td>
<td>16.202</td>
</tr>
<tr>
<td>Expected Vote</td>
<td>64.229</td>
<td>6.144</td>
<td>41.752</td>
<td>88.936</td>
</tr>
</tbody>
</table>

NOTE.—Inc % Vote is the incumbent’s percentage of the vote measured as incumbent’s percentage of vote divided by (incumbent's percentage of vote + challenger’s percentage of vote). Log (I) and Log (C) are the logs of incumbent spending and challenger spending respectively. The spending variables are in terms of $100,000 of 2000 dollars.
Table 4: Regression Results—Replication of Grier (1989)

<table>
<thead>
<tr>
<th></th>
<th>Linear</th>
<th>Quadratic</th>
</tr>
</thead>
<tbody>
<tr>
<td>%Vote-1</td>
<td>55.9541***</td>
<td>50.719***</td>
</tr>
<tr>
<td></td>
<td>(2.346)</td>
<td>(2.287)</td>
</tr>
<tr>
<td>Scandal</td>
<td>-15.499***</td>
<td>-14.493***</td>
</tr>
<tr>
<td></td>
<td>(4.469)</td>
<td>(4.257)</td>
</tr>
<tr>
<td>Challenger$</td>
<td>-0.0069***</td>
<td>-0.0235***</td>
</tr>
<tr>
<td></td>
<td>(0.0011)</td>
<td>(0.0019)</td>
</tr>
<tr>
<td>Challenger$^2</td>
<td>---</td>
<td>0.00000573***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.000000551)</td>
</tr>
<tr>
<td>Incumbent$</td>
<td>0.0011</td>
<td>0.0036899***</td>
</tr>
<tr>
<td></td>
<td>(0.0008)</td>
<td>(.0012)</td>
</tr>
<tr>
<td>Incumbent$^2</td>
<td>---</td>
<td>0.000000257</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.000000375)</td>
</tr>
<tr>
<td>R²</td>
<td>0.3892</td>
<td>0.4471</td>
</tr>
<tr>
<td>Observations</td>
<td>1220</td>
<td>1220</td>
</tr>
</tbody>
</table>

**NOTE.**—The dependent variable is the incumbent’s percentage of the vote measured as incumbent’s percentage of the vote ÷ (incumbent’s percentage of the vote + challenger’s percentage of the vote). Challenger$ and Incumbent$ are measured in 2000 dollars spent per thousand persons in the state. Population figures are from the U.S. Census estimates of state population. Numbers in parentheses are standard errors.

*** Statistically significant at the 99% level
** Statistically significant at the 95% level
* Statistically significant at the 90% level
Table 5: Regression Results—Replication of Levitt (1994)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Linear Spending</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenger spending</td>
<td>0.0071 (0.0558)</td>
</tr>
<tr>
<td>Incumbent spending</td>
<td>-0.0439 (0.0522)</td>
</tr>
<tr>
<td>Open-seat spending</td>
<td>0.0259 (0.0593)</td>
</tr>
<tr>
<td>Incumbency</td>
<td>3.237*** (0.9770)</td>
</tr>
<tr>
<td>Scandal dummy 2000</td>
<td>0.3748 (0.686)</td>
</tr>
<tr>
<td>Scandal dummy 2002</td>
<td>-2.353*** (0.8533)</td>
</tr>
<tr>
<td>Scandal dummy 2004</td>
<td>-0.4339 (0.9265)</td>
</tr>
<tr>
<td>Scandal dummy 2006</td>
<td>2.141 (0.9628)</td>
</tr>
<tr>
<td>Scandal dummy 2008</td>
<td>1.788 (1.074)</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>Within=0.2982, Between=0.7254, Overall=0.6500</td>
</tr>
</tbody>
</table>

**F-test**

**NOTE.**—The dependent variable is the Democratic percentage of the two-party vote. Incumbent spending and Challenger spending are in terms of $100,000 of 2000 dollars and are multiplied by the Incumbency indicator variable. The numbers in parentheses are standard errors.

*** Statistically significant at the 99% level
**  Statistically significant at the 95% level
*   Statistically significant at the 90% level
Table 6: Regression Results—Replication of Erikson & Palfrey (2000)

<table>
<thead>
<tr>
<th></th>
<th>All Cases</th>
<th>&lt;52%</th>
<th>52-55%</th>
<th>55-58%</th>
<th>&gt;58%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Expected Incumbent Vote</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Constant</strong></td>
<td>45.981***</td>
<td>97.921***</td>
<td>57.438</td>
<td>54.78</td>
<td>40.61***</td>
</tr>
<tr>
<td></td>
<td>(4.042)</td>
<td>(26.675)</td>
<td>(46.923)</td>
<td>(33.728)</td>
<td>(4.229)</td>
</tr>
<tr>
<td><strong>Log (I)</strong></td>
<td>-1.378***</td>
<td>1.768</td>
<td>0.0623</td>
<td>-0.4794</td>
<td>-1.165***</td>
</tr>
<tr>
<td></td>
<td>(0.2459)</td>
<td>(2.09)</td>
<td>(1.515)</td>
<td>(1.0811)</td>
<td>(0.2595)</td>
</tr>
<tr>
<td><strong>Log (C)</strong></td>
<td>-1.045***</td>
<td>-3.07**</td>
<td>-2.278***</td>
<td>-2.861***</td>
<td>-0.9598***</td>
</tr>
<tr>
<td></td>
<td>(0.0646)</td>
<td>(1.132)</td>
<td>(0.5737)</td>
<td>(0.4216)</td>
<td>(0.0643)</td>
</tr>
<tr>
<td><strong>Expected vote</strong></td>
<td>0.7629***</td>
<td>-0.5687</td>
<td>0.4594</td>
<td>0.7988</td>
<td>0.7863***</td>
</tr>
<tr>
<td></td>
<td>(0.0245)</td>
<td>(0.3266)</td>
<td>(0.752)</td>
<td>(0.5461)</td>
<td>(0.0277)</td>
</tr>
<tr>
<td><strong>Adj. R²</strong></td>
<td>0.6838</td>
<td>0.5500</td>
<td>0.3419</td>
<td>0.4380</td>
<td>0.6216</td>
</tr>
<tr>
<td><strong>Obs</strong></td>
<td>1223</td>
<td>12</td>
<td>42</td>
<td>121</td>
<td>1048</td>
</tr>
</tbody>
</table>

**Note.**—The dependent variable is the incumbent’s percentage of the vote measured as incumbent’s percentage of vote ÷ (incumbent’s percentage of vote + challenger’s percentage of vote). Log (I) and Log (C) are the logs of incumbent spending and challenger spending respectively. The spending variables are in terms of $100,000 of 2000 dollars. Standard errors are given in parentheses.

*** Statistically significant at the 99% level
** Statistically significant at the 95% level
* Statistically significant at the 90% level