Public Choice (2009) 140: 357–377
DOI 10.1007/s11127-009-9425-z

How prices matter in politics: the returns to campaign advertising

Thomas Stratmann

Received: 22 August 2008 / Accepted: 3 March 2009 / Published online: 17 March 2009

Abstract The apparent ineffectiveness of incumbent campaign spending in congressional elections is one of the enduring puzzles in the political economy literature. Previous work in this area has assumed that advertising prices are uniform across congressional districts, and therefore that campaign spending alone is a good proxy for campaign advertising. However, candidates in different districts face widely different advertising prices and this paper shows that differences in advertising costs are one source of the apparent ineffectiveness of campaign spending. Accounting for the price of advertising, this paper shows that campaign spending is productive for both incumbents and challengers.

Keywords Campaign advertising · Campaign spending

1 Introduction

> "There are two things that are important in politics, the first is money—and I can't remember what the second one is." Marcus Hanna, 1895.

The apparent ineffectiveness of incumbent campaign spending in congressional elections is one of the major puzzles in the political economy literature. The literature is filled with results that incumbents' campaign spending either has no effect on outcomes or actually *reduces* their chances of winning (see, for example, Jacobson 1978, 1980, 1985, 1989; Feldman and Jondrow 1984; Ragsdale and Cook 1987; Abramowitz 1988, 1991; Grier 1989; Ansolabehere and Gerber 1994; Coates 1998). Other work has suggested that campaign spending is also unproductive for challengers (Levitt 1994). These results are surprising against the backdrop that incumbents and challengers appear to spend much time and effort on fundraising activities, and given the popular view that money is important for winning elections.

These results are even more surprising in light of the significant literature on the efficacy of political advertising (Kaid 2004, p. 166). Advertising has been shown to increase

T. Stratmann (✉)
George Mason University, Fairfax, USA
e-mail: tstratma@gmu.edu

candidate name recognition among voters (Kaid 1982), to affect voters' opinions of a candidate's likeability (West 2005), and to sway late deciders (Bowen 1994). Atkin et al. (1973) and Atkin and Heald (1976) document that voters are more informed about candidates after viewing television advertisements. Some work shows that television campaign advertisements are more effective in informing voters than newspaper advertisements (Brians and Wattenberg 1996). These findings suggest that advertising should be positively correlated with winning. Indeed, some studies find that advertising purchases can increase a candidate's vote share (Shaw 1999), and that voting decisions are affected by exposure to advertising (Goldstein and Freedman 2000).[1]

The findings that some forms of advertising are effective cast doubt on the conclusions of studies that suggest no relationship between campaign spending and victory. Resolving this conflict is important: the extent to which campaign spending can increase vote shares may have implications for campaign finance regulations. If spending helps neither the incumbent nor the challenger, then limiting campaign spending may not alter the identity of winners in elections. However, if spending is productive and its productivity differs for incumbents and challengers, then limits may alter the identity of the winning candidate.

Motivated by the puzzling effects of incumbents' spending on their vote shares, scholarly work has focused on the possibility that regression models suffer from an omitted variable bias. For example, if incumbent quality is unobserved, the campaign spending coefficient is biased downwards, because the high-quality incumbents get reelected even if they spend little, while low-quality incumbents in close races spend heavily in their reelection campaigns. Since the early work by Jacobson (1978), much effort has been spent on addressing this omitted variable bias, either through improved statistical techniques or through better measures of candidate quality and district preferences (see, for example, Green and Krasno 1988; Levitt 1994; Erikson and Palfrey 1998; Gerber 1998; Milyo 2001; Stratmann 2006).

However, none of this scholarly work has considered that the same amount of campaign spending may yield different amounts of campaign advertising, depending on whether the race takes place in a high-cost or low-cost media advertising market. Previous work has assumed that the price of advertising equals one, so that campaign spending equals campaign advertising. This assumption implies that a given amount of spending will purchase the same quantity of advertising in all congressional districts. Yet each dollar of campaign spending will purchase fewer advertisements in New York City than in, say, Idaho.

Theoretical models predict that campaign advertisements, and not merely campaign spending, are important for vote shares (Mueller 2003). The equal price assumption justifies the use of campaign spending as a proxy for campaign advertising spots. The use of campaign spending, however, allows for no inferences about the quantity of advertisements

[1] The relationship between the content of political advertising and its efficacy also has an extensive literature. An example is West (2005), who shows that a minority of advertisements pertain to domestic policy issues as opposed to valence issues. Work by Spiliotes and Vavreck (2002) shows that policy issues are discussed in candidate ads, although candidates often take vague stances on issues. Ballotti and Kaid (2000, p. 269) observe that winners tend to run "optimistic" advertising, while losers tend to run "realistic" advertising. The importance of content in political advertising has also been documented by the work of Brians and Wattenberg (1996), Jasperson and Fan (2002), and Benoit et al. (1997). Abrajano and Morton (2004) provide evidence for the strategic use of campaign advertising by documenting that incumbents advertise less verifiable informative content the further away their policy positions are from those of the median voter. Vavreck (2001) documents that incumbents and challengers differ in how they advertise with respect to the use of party labels and specific issue rhetoric. Political advertising motivates journalists to cover advertising as part of a campaign (Kaid et al. 1993) and differences between advertising by parties as opposed to candidates have been analyzed by Spiliotes and Vavreck (2002) and Simon (2002).

when media prices vary across districts. This study uses as a measure of the quantity of advertising campaign spending divided by the price of television advertising, and shows that this advertising measure resolves much of the puzzle in the literature.

But why would entering incumbent campaign spending in a regression generate a negative effect on incumbents' vote shares and the proposed advertising measure yield the predicted positive effect? Suppose that the price of an advertisement varies exogenously and that incumbents' demand for television advertisements is inelastic. In this case, places with higher ad prices have higher amounts spent on adds, but have smaller numbers of advertisements. In this example the standard regression gets it all wrong, while the proposed measure of advertising, spending divided by the advertising price, produces the predicted coefficients.

There is some evidence from the Wisconsin Advertising Project that the politicians' demand for advertisements is inelastic. Using these data for the year 2000, I regress the log number of advertisements on the log price of a television spot. I find that the price elasticity of demand for incumbents is 0.21 and for challengers is 0.32. Both estimates are significantly less than one. The fact that the challenger's elasticity is 50% larger than that of incumbents suggests that the bias in the standard regressions that use spending rather than the proposed advertising measure is larger for incumbents than for challengers.

When including campaign advertising, as opposed to campaign spending, in the regression, this paper shows that advertising has a positive and statistically significant effect on incumbents' and challengers' vote shares, even restricting the sample to repeat challengers which allows for controlling for incumbent-challenger pair fixed effects. When restricting the sample in this way, incumbent and challenger advertising continue to have a statistically significant effect on vote shares.

The next section of the paper describes the variation in advertising costs across districts, the magnitude of advertising spending as a portion of total campaign spending, and presents the hypotheses. Section 3 presents the data and methods used in this analysis. Section 4 presents the regression results. Section 5 contrasts the regression results with actual advertising data from recent years. Section 6 concludes.

2 Advertising and campaign spending

2.1 Television advertising costs

A commonly used measure of media advertising price is the cost per rating point for a television market (*Nielsen* Designated Market Area, or DMA). These price data are disseminated by *Spot Quotations and Data, Inc*. (*SQAD*). The cost per point measure is the dollar amount required to deliver one rating point (i.e., one percent of the audience of a designated population within a DMA) at a particular time of day. The price data used in this study are for 30-second advertisement spots during prime time.[2] Prices are from the third quarter of the election year.

[2]The "Lowest Unit Charge" rule was enacted as part of the Federal Election Campaign Act of 1971. It directs broadcasters (including cable systems), during the 45 days preceding a primary election and the 60 days preceding a general election, to charge legally qualified candidates for public office "the lowest charge of the station for the same class and amount of time for the same period."

The regulations that implement the law are such that candidates often pay the regular price. This is because there are two types of television spots: "fixed" and "preemptible." Fixed spots are guaranteed to run at a specific time, and thus are more expensive. Preemptible spots can be replaced [or "superseded" or "displaced"] if a higher bid arrives for the time slot, and thus are less expensive. Since "candidates cannot afford being bumped from prime time," they "are forced to

SQAD obtains advertising prices from actual advertising transactions between ad agencies and television stations. *SQAD* then estimates the average price for particular times of day in a viewing area.

Advertising prices are determined by supply and demand for advertising spots. One important determinant of demand is the size of the population reached. The demand for advertising spots is higher in urban areas and when many viewers are expected to view particular shows. This results in higher advertising prices in DMAs with large populations. The determinants of supply include the number of advertising spots available and the number of stations in the viewing area. Given that television advertising spots cannot be stored, and "perish" once the time for the spot has passed, prices are very sensitive to fluctuations in demand and supply. Thus, advertising prices have the potential to vary substantially across viewing areas and within viewing areas over time.

The television viewing area is based on Nielsen's DMA definition. The geographic area covered by a DMA does not change much from year to year, and the boundaries of these markets are relatively stable for the years analyzed in this study. There were 211 television markets in the United States in both 1996 and 2000.

2.2 Media markets and congressional districts

A congressional district may lie entirely within a single DMA or may encompass several DMAs. Over 60% of congressional districts—mainly urban—lie entirely within one DMA. The price of television advertising in these districts is unambiguous: the candidates face the DMA rate.

In rural areas, districts often encompass several DMAs. For these districts one definition of the price of television advertising is the dollar amount a candidate must pay to reach all voters in the congressional district. This price is obtained by summing the television advertising prices over all DMAs that are completely or partially within that congressional district. This sum is the cost to reach all voters in the district through a television advertisement.

Congressional districts that lie just outside metropolitan areas often include both high-cost and low-cost DMAs. These districts may have a small number of voters in high-cost DMAs, and a large majority of voters in low-cost DMAs. Candidates in these districts have an incentive to focus their television advertising on the low-cost areas. The previously described price measure (i.e., the sum of the advertising prices over all DMAs in the district) would overstate the advertising price in districts that have only a few voters in a high-priced DMA. This is because the price of reaching the vast majority of voters is much lower than implied by the sum of the advertising prices. To address this issue I create a weighted average as an alternative measure of the advertising price faced by a candidate. Thus, when a district spans multiple media markets the ad rate for such districts is a weighted average of those markets. For example, Virginia's seventh district covers both the Richmond, VA and Washington, D.C. DMAs. The latter DMA includes some of the Washington suburbs located in Virginia. Approximately two-thirds of the district falls in Richmond's low-cost DMA; the

pay the same high prices for ad time" as any other prime time advertiser (Buying Time: p. 52: http://www.brennancenter.org/programs/downloads/buyingtime2000/chapter6.pdf).

Fixed spots are counted as a separate advertising class, so stations have no obligation to sell candidates fixed spots at preemptible prices (http://edocket.access.gpo.gov/cfr2004/octqtr/47cfr73.1942.htm). This suggests that fixed spot rates are the appropriate measure of advertising cost. However, it is not obvious that the prime time spot rate is more representative for the actual rate paid than some other rate. To test for the robustness of the results, I also estimate regressions using the prime access rate instead. This rate is close to the average price over all time slots.

other third falls in Washington's high-cost DMA. So candidates in Virginia's seventh district face ad rates at 66.6% of the Richmond rate plus 33.3% of the Washington rate. In this alternative measure the television advertising price in the high-cost DMA still makes up part of the overall advertising price. But the high priced DMA has less weight in this price measure than if prices were summed over all DMAs.[3] I use the weighted price measure in the regressions reported in the tables of this paper, and additionally describe the results when I use the unweighted measure. The correlation coefficient between both measures is 0.95, and the results reported in this paper are very similar to those obtained with the unweighted measure.

District advertising prices vary across districts and within districts over time. In the year 2000, the price of television advertising ranged from $18 for a 30-second spot in the second district of Idaho to $1,676 in Los Angeles and $1,875 in New York City. Between 1996 and 2000, the country's population increased four percent, while DMA television advertising prices increased on average 43%. The price increase cannot be explained solely by population growth: San Antonio, Texas and Raleigh, North Carolina experienced similar population growths during this period, but prices fell by 30% in San Antonio and more than doubled in Raleigh. Los Angeles and New York City each grew less than five percent in population but saw advertising prices double in the same period.

2.3 The magnitude of television advertising in house campaign budgets

The larger the ratio of advertising spending to total spending, and the larger the variation in advertising prices, the more important is it to use campaign advertising instead of campaign spending to explain vote shares.

Perhaps the most systematic evidence regarding the importance of media advertising spending comes from the unique data source *Handbook of Campaign Spending* (Fritz and Morris 1992) for the 1990 and 1992 elections. This source divides total campaign spending into categories such as communications, overhead, polling, fundraising activities, and gifts to constituents. Communication spending is further divided into two subcategories: electronic media and other media. In 1990, for example, electronic media, defined as broadcast television, cable television, and radio, constitute 23% of total incumbent spending and 31% of total challenger spending. Other media, defined as billboards and print ads, comprise about 10% of total spending for both incumbents and challengers. The correlation coefficients between electronic media advertising and total spending are 0.73 for incumbents and 0.87 for challengers. Thus, electronic media advertising and overall spending move closely together.

More recent data on communication spending comes directly from the Federal Election Commission (FEC). Candidates have been required to file expense reports electronically since 2002. These reports, available from the FEC, include a free-form "purpose of disbursement" field. This field can be used to determine the amount candidates spend on mailings, newspaper ads, and "media buys." Some candidates go further and separate media buys into broadcast television, cable television, and radio. Based on these data, Herrnson (2004, p. 82) reports that the "typical 2002 House campaign spent approximately 22 percent of its budget on television and 12% on radio." The Campaign Media Analysis Group (CMAG) provides data on television advertising and advertising cost to the Wisconsin Advertisement Project. Those estimates are lower than those provided by Herrnson (2004) and indicate that candidates spend approximately ten percent of their budget on television advertising.

[3] The weighted and unweighted measures are identical when a district lies completely within one DMA.

I also analyzed the 2002 expenditure data and found that total communication expenses, defined as mailings, website development, and radio, television, cable, and newspapers advertisements (but excluding phone calls and associated staffing costs), constitute 43% of total challenger spending and 31% of total incumbent spending. These numbers are not directly comparable to the 1990 and 1992 data since the spending categories are not identical. However, as in the early 1990s, media advertising correlates highly with total spending. In 2002, the correlation coefficient between total spending and media spending is 0.8 for incumbents and 0.97 for challengers.

Candidates in high-cost media markets presumably have stronger incentives to use other forms of advertising than candidates in low-cost media markets. To investigate this substitution effect, I correlated spending on television advertising with spending on print advertising (newspapers and direct mail). For the 2001–2002 election cycle, the correlation coefficient for incumbents and challengers is 0.30, suggesting that television and print advertising move together. A high degree of substitution between these forms of advertising would imply negative, not positive, correlation coefficient.

2.4 A measure of television advertising

These stylized facts and the data from Herrnson (2004) suggest that TV campaign advertising is an important part of overall campaign activities. The large variability of advertising prices across districts, documented in Sect. 2.1, suggests that overall campaign spending is a poor indicator of the number of commercials aired by a candidate. Since spending on media advertising closely tracks overall campaign spending, I use total campaign spending in the 1996, 1998, and 2000 elections to compute a measure of the number of advertisements.[4] Assuming that total spending equals the number of media advertisements times the price of advertisements, the number of media advertisements is the ratio of campaign spending to the advertising price.[5] Thus, advertising is computed as total campaign spending divided by the price of television advertising.

To the extent that prices across DMAs are determined solely by the number of people in the DMA, the proposed measure is correct. However, if prices of equally sized DMAs differ because people in one DMA are much more likely to watch ads than in another, the price also captures audience shares, and it is not correct to divide spending by the price, because the price captures an important determinant of campaign spending, namely audience shares. To examine whether this is an important concern, I correlated DMA television prices with population in a DMA. The correlation coefficient between both variables in 2000 is 0.97. This supports the implicit assumption in the construction of the measure, namely that the average propensity to watch TV is equal across congressional districts.

Although this proposed measure remedies one error introduced by the use of total campaign spending when analyzing election outcomes, it introduces a new error. Candidates in high-cost media markets have an incentive to substitute away from television advertising to other forms of advertising, such as direct mail. Thus, this approach is likely to overstate the amount of effective campaign advertising in high-priced media markets. However, it does

[4] No breakdown of total campaign spending into various categories of spending is available for the election years examined in this study (1996, 1998, and 2000).

[5] As a robustness check I also calculated the number of advertisements using the price of radio advertising, which are based on *Arbitron* radio markets. The results from this measure are very similar to those reported in this paper.

not appear that candidates in low-cost districts spend proportionally less money on mail advertising than those in high-cost districts. For example, in 2000 print and mail expenditures constitute nine percent of total spending for candidates who face a lower than the median TV price, and ten percent of total spending for candidates how face a higher than the median TV price.[6]

The hypothesis that the number of advertisements instead of total campaign spending is the appropriate measure of advertising, and that advertising, not spending, matters for election outcomes, implies that campaign advertising has a positive effect on candidates' vote shares, while campaign spending may not.

One drawback to using broadcast television ad rates is that it fails to recognize that candidates also advertise on cable television and radio. However, this does not undermine the use of broadcast television ad rates as a deflator. First, it appears that, for the examined period (1996–2000), cable advertising represented a small (single-digit) share of overall television advertising. The Wall Street Journal reports (August 4, 2004, page B1) that "until recently, political campaigns have generally spent less than ten percent of their TV-ad budgets on cable." This statement suggests that cable comprises only a small portion of advertising in my sample. Second, radio ad rates are positively correlated with broadcast television ad rates. Using *SQAD* data for both radio and television rates, I found that these rates are highly positively correlated, with a correlation coefficient of 0.78. Thus, even if a significant portion of the total advertising figure is radio advertising, broadcast television add rates can be used as a deflator.

3 Data and methods

3.1 Statistical model

The empirical model estimated in this paper is

$$\mathrm{DV}_{it} = a_i + (\eta + \beta_1 \mathrm{IA}_{it} + \beta_2 \mathrm{CA}_{it} + \beta_3 Q_{it}) \times I_{it} + \mu_t + e_{it}. \quad (1)$$

The unit of observation is a general election contest for a seat in the U.S. House of Representatives, with an incumbent in the race, in district i in year t, where t is 1996, 1998, or 2000. The dependent variable is the percentage of the popular vote for the Democratic candidate (DV_{it}). Explanatory variables are advertising by the incumbent (IA), advertising by the challenger (CA), a measure of challenger quality (Q), district fixed effects a_i, and year effects μ_t. I_{it} is an indicator variable equaling $+1$ if the Democratic candidate is an incumbent and -1 if the Republican candidate is an incumbent. This interaction effect is needed because the dependent variable is defined as the Democratic candidate's share of the vote. While most studies have used the vote share of the incumbent as the explanatory variable, the specification in (1) is similar to that in Levitt (1994) and has the advantage of allowing for district fixed effects.[7] I employ three specifications for candidate advertising. In one specification, advertising enters the regression equation in linear form. The other two

[6] Further, as mentioned previously, spending on print and television ads are positively correlated.

[7] If the dependent variable were the incumbent's vote share instead of the Democratic candidate's vote share, district fixed effects would instead capture the average vote share of the incumbents who run in a particular district.

specifications allow for diminishing marginal effects by using logarithmic and square root forms respectively.

District fixed effects capture partisan alignments that simultaneously affect the amount of advertising and vote shares. For example, in a strongly Republican-leaning district, the Republican incumbent may advertise little because reelection with a high margin of victory is likely. Without a variable measuring these voter preferences, the coefficient on incumbent spending would be biased downward. District fixed effects eliminate this bias. District fixed effects capture district-specific voter preferences as well as other heterogeneities across districts that are constant over time, such as the degree of urbanization and population density. These effects also control for the possibility that the effectiveness of media advertising may differ between districts with high and low population densities. However, district fixed effects cannot control for the possibility that party preferences change within the district over time. I address this issue by examining a relatively short time period, during which it is reasonable to assume constant party preferences.

As documented previously, television advertising prices vary across districts and within districts over time. However, even if campaign advertising prices did not vary over time, district fixed effects in combination with campaign expenditures would still be an imperfect measure of campaign advertising. To see this, suppose that advertising prices do not vary over time, but that campaign expenditures and therefore advertisements change from election cycle to election cycle. In a regression with campaign advertising, district fixed effects remove the mean level of advertising, but do not control for how expenditures translate into advertising. For example, suppose that candidate A campaigns in a district where an advertisement costs \$1,000, and that candidate A increases campaign spending by \$100,000 from one election cycle to the next, resulting in 100 additional advertising spots. Candidate B campaigns in a district where an ad costs \$100, and increases expenditures by \$50,000, resulting in 500 additional advertising spots. Suppose candidate A increases his vote share by one percentage point by airing 100 extra ads and candidate B increases his vote share by four percentage points by airing 500 extra ads. In this case a district fixed effects regression with campaign expenditures would suggest a smaller marginal product of campaigning than a district fixed effects regression with campaign advertising. Thus, fixed effects regressions will produce different estimates of the marginal product of campaign advertising than of campaign spending even when the price of advertising does not change within a district.

I include challenger quality because this variable determines both challengers' vote shares and their campaign advertising. Challenger quality is measured by whether the challenger held public office prior to running for the House seat (Jacobson and Kernell 1983; Gerber 1998; Green and Krasno 1988; Abramowitz 1988; Squire 1989).[8] To test whether the estimated coefficients on advertising are sensitive to a specific measure of challenger quality, I develop an alternative challenger quality measure based on a four-point scale (3 = previous congressional office, 2 = previous state legislator, 1 = other elected public office, 0 = no office).

3.2 Repeat challengers

From the earliest literature on campaign spending, scholars have noted that unobserved variables affect incumbents' campaign spending and vote shares. These variables may include

[8] I would like to thank Gary Jacobson for generously providing with data on challenger qualities.

unobserved ideological leanings in a congressional district or unobserved candidate characteristics. For example, incumbents with good reputations and good track records of providing service for their constituencies may receive large vote shares even if they spend little in their reelection campaigns. In this situation the coefficient on incumbent spending is biased downwards. Similar issues exist for challenger spending. High-quality challengers attract campaign contributions, spend more on campaigns, and may receive higher vote shares than low-quality challengers. This leads to an overestimation of the effect of challengers' campaign spending. Alternatively, the challenger coefficient is underestimated if unobserved variables lead to higher challenger vote shares and less challenger spending.

While the previous discussion focuses on campaign spending, the rationale for the endogeneity of spending also applies to campaign advertising. In a subsample of candidates who meet repeatedly in consecutive elections, the district fixed effects in (1) become repeat challenger fixed effects. In this subsample, repeater fixed effects capture all observed and unobserved characteristics of incumbents and challengers who repeatedly compete against one another. This estimation technique cannot control for time-varying unobserved variables, but the estimates on incumbent and challenger advertising are unbiased if incumbent, challenger, district characteristics, and party preferences do not change between consecutive election cycles. It is likely that these characteristics do not change in the two-year period between consecutive elections.

While repeater fixed effects solve the endogeneity issue (Levitt 1994), if there are no time-varying omitted variables, the coefficients on incumbent and challenger advertising are biased if unobserved characteristics of the candidates change over time. To address this issue, I will use an instrumental variable method in the repeat challenger sample.[9]

3.3 Descriptive statistics

Table 1 presents descriptive statistics for the 1996, 1998, and 2000 election cycles. Campaign expenditure data and vote shares were obtained from the FEC. The sample examined is the universe of contested races for the U.S. House of Representatives. This includes races in which some candidates had no campaign expenditures. In contested races incumbents spent an average of $804,000 and spending ranged from $57,000 (Marshall Sanford, South Carolina) to $80 million (Newt Gingrich, Georgia).[10] Challengers spent an average of $281,000, with spending ranging from zero dollars to $44 million. The coefficient of variation is higher for challengers than for incumbents. Incumbents received, on average, 64% of the popular vote. They received 65% of the popular vote in the previous election. Incumbents who ran for election had served an average of five terms, and 22% of these incumbents faced challengers who held elected office prior to running for Congress.

The mean cost of television advertising in a congressional district is $418 per rating point. As seen from Table 1, the variation in television advertising cost is relatively large, as evidenced by the fact that the standard deviation is larger than the mean. This variation in media prices suggests that campaign spending alone may be an inappropriate proxy for advertisements. As noted previously, for a given amount of campaign spending, more advertising spots can be purchased in low-cost media markets than in high-cost media markets. Further, prices vary within districts over time. Between 1996 and 2000, real television advertising prices fell by over 35% in some districts, while prices doubled in other districts.

[9] Formally, the source of the bias due to mismeasurement of a independent variable is the same as the bias due to omitted variables.

[10] The results reported in the tables of this paper are not sensitive to the inclusion or exclusion of outliers.

Table 1 Summary statistics

	Mean (standard deviation)
Percent of popular vote obtained by the incumbent	64.10
	(9.66)
Incumbent spending (in $100,000s of year 2000 dollars)	8.037
	(6.348)
Challenger spending (in $100,000s of year 2000 dollars)	2.809
	(4.744)
Incumbent is a Republican = 1, 0 otherwise	0.522
	(0.500)
Incumbent's percent of popular vote in the previous election	65.38
	(13.39)
Challenger held elected office = 1, 0 otherwise	0.216
	(0.412)
Incumbent's seniority, measured as the number of 2-year House terms served	4.759
	(3.975)
Cost of television advertising (in $1000s of year 2000 dollars)	0.418
	(0.491)
Number of incumbent television advertisements (in thousands)	6.614
	(9.151)
Number of challenger television advertisements (in thousands)	2.227
	(4.853)
N	975

Notes: The unit of observation is a general election contest for a seat in the U.S. House of Representatives in 1996, 1998, and 2000

On average, real average television advertising prices in congressional districts increased 31% between 1996 and 2000.

The mean number of advertisements, measured in thousands, is 6.6 for incumbents and 2.2 for challengers. For both incumbents and challengers the coefficient of variation for advertising is larger than the coefficient of variation for spending. This suggests that the assumption of uniform advertising prices across districts leads to an understatement of the actual variation in campaign activities across districts.

Campaign spending and campaign advertisements (campaign spending divided by the media price) are positively correlated. For incumbents, the correlation coefficient is 0.33 and is statistically significant. For the full challenger sample, the correlation coefficient is 0.51, and for those with positive expenditures the correlation coefficient is 0.49. Since advertising tracks spending more closely for challengers, one would expect that campaign spending is a relatively better measure of advertising activity for challengers than for incumbents.

4 Results

To compare the results obtained from campaign advertising to those from campaign spending, I first show the results from specifications with campaign spending. The OLS estimates

Table 2 The productivity of campaign spending (Robust standard errors in parentheses below coefficient estimates)

Dependent variable: Incumbent's percentage of popular vote			
	(i) linear	(ii) log	(iii) square root
Incumbent spending	0.002	−0.778	0.042
	(0.055)	(0.371)	(0.313)
Challenger spending	−0.680	−2.724	−4.143
	(0.095)	(0.138)	(0.270)
Adj. R-squared	0.63	0.73	0.70
Covariates include: incumbent's party affiliation, incumbent seniority, previous vote share, challenger quality, indicators for election cycles			
Dependent variable: Democrat candidate's percentage of popular vote			
	(i) linear	(ii) log	(iii) square root
Incumbent spending	−0.059	−0.698	0.032
	(0.091)	(0.521)	(0.532)
Challenger spending	−0.371	−1.799	−2.673
	(0.110)	(0.162)	(0.4829)
Adj. R-squared	0.95	0.96	0.96
Covariates include: indicator for incumbents, challenger quality, indicators for districts and election cycles			

Notes: $N = 975$. The unit of observation is a general election contest for a seat in the U.S. House of Representatives in 1996, 1998, and 2000. Incumbent and challenger expenditures are measured in $100,000s of real 2000 dollars

from campaign spending are similar to those in previous studies (Table 2). The top panel of Table 2 reports results from estimating regressions of the form that have been traditionally estimated in the economics and political science literature, with the exception of Levitt (1994). Those regressions include a lagged dependent variable as well as incumbent seniority, party affiliation, challenger quality, and year effects. The bottom panel of Table 2 shows estimates with district fixed effects and corresponds to (1). The latter regressions, as well as all regressions in subsequent tables, do not include lagged dependent variables. The three columns of each panel show results from the three campaign expenditure specifications (linear, log, and square root forms).

The results in the top panel of Table 2 show that regardless of the functional form, the point estimates for incumbent spending exhibit either no effect, or a negative and statistically significant effect of incumbent spending on incumbents' vote shares. Challenger spending increases challengers' vote shares.

While not reported, the estimates on the remaining covariates have the same signs and similar magnitudes and levels of statistical significance as previously reported in the literature. The estimates, from the regressions shown in the top panel in Table 2, suggest that when an incumbent faces a high-quality challenger his vote share is reduced by about two percentage points. Replacing the challenger quality indicator with an ordinal quality measure also leads to the conclusion that higher quality challengers reduce incumbents' vote shares, while having no discernable effect on the other estimates in the regression model. As expected, the higher the vote share received by an incumbent in the previous election, the

Table 3 The productivity of television campaign advertisements: OLS estimates (Robust standard errors in parentheses below coefficient estimates)

Dependent variable: Democrat candidate's percentage of popular vote			
	(i) linear	(ii) log	(iii) square root
Incumbent advertising	0.120	2.483	1.644
	(0.076)	(0.735)	(0.559)
Challenger advertising	−0.423	−4.181	−3.401
	(0.098)	(0.499)	(0.523)
Incumbency	4.900	4.560	6.538
	(0.693)	(1.127)	(1.109)
Challenger held elected office	−1.896	−1.383	−1.631
	(0.486)	(0.423)	(0.458)
Indicators for congressional districts	YES	YES	YES
Indicators for election cycles	YES	YES	YES
Adj. *R*-squared	0.95	0.96	0.96

Notes: $N = 975$. The dependent variable is the Democrat candidate's percentage of the popular vote to the U.S. House of Representatives in the 1996, 1998, and 2000 general elections

higher the share received in the current election. Length of service has a consistently negative effect on incumbents' vote shares, but in most specifications the effect is not statistically significant.

The estimates on campaign spending are similar to the top panel of Table 2 when the model is estimated with district fixed effects as in the lower panel of Table 2. The impact of challenger spending is smaller when the model is estimated with district fixed effects. An extra $100,000 of challenger spending produces an increase in vote share of 0.4 percentage points (Table 2, bottom panel, column 1).

The estimates in Table 3 are based on campaign advertising instead of campaign spending. All specifications in Table 3 control for partisan district leanings via district fixed effects. Other control variables are challenger quality and incumbency.[11] While incumbent campaign spending (Table 2) has either no effect or a negative effect on incumbent vote shares, incumbent campaign advertising (Table 3) has a positive and statistically significant effect on incumbent vote shares in the log and square root specifications, and a positive and statistically significant effect at the 11% level in the linear specification.[12] As predicted, challenger advertising has a negative effect on incumbents' vote shares. The presence of a challenger who has held previous office reduces an incumbent's vote share by approximately

[11] Party affiliation is not included in the regressions with district fixed effects because there is no intra-district variation in party affiliation (Table 3). To test for the robustness of the specification in Table 3, I added log seniority to the model. The point estimate on this variable was not statistically significant and inclusion of these variables resulted in estimates for the other variables that are very similar to those reported in Table 3.

[12] For the log advertising specification I divide real total spending by advertising prices. Since advertising prices are always less than total spending, the result is always greater than one. Then I add one unit of advertising to each candidate and take the log. Consistent with previous work (Green and Krasno 1988) I added $5000 to the contributions for the log level estimates in Table 2 when contributions were zero. This procedure is motivated by the a FEC regulation which states that candidates do not have to file their contributions when they spend less than $5000 for the election campaign.

two percentage points and the incumbency advantage is estimated to be between 4.5 and 6.5 percentage points.

The point estimates on advertising imply that an additional 1,000 advertisements increase vote shares by 0.12 percentage points for incumbents and 0.4 percentage points for challengers (Table 3, column 1). The point estimate on incumbent advertising implies that a doubling of incumbent advertising relative to its mean increases incumbents' vote shares by 0.8 percentage points. An alternative way to examine the magnitude of the estimated effect is to examine the effect of a one standard deviation change in advertising. The estimates for Table 3, column 1 imply that a one standard deviation change in incumbent advertising increases vote shares by 1.1 percentage points. For challengers a one standard deviation increase in advertising produces a 2.1 percentage point increase in vote shares.

These results show that mis-measurement affects incumbent spending estimates more than challenger spending estimates. This is partly due to the possibility discussed in the introduction of this paper, that incumbents' demand for advertising is less elastic than challengers' demand. But it is also due to the fact that the omitted variable bias is likely to be larger for incumbents than for challengers. This is because incumbents receive publicity (i.e., free advertising) through the news media. Another reason is that incumbents can provide constituencies with "pork barrel projects" and the like. Much of this constituency service is either unobserved or difficult to measure and thus is omitted from the regression analysis, accounting in part for the omitted variable bias. Constituency service by incumbents and free advertising by the media increases incumbents' vote shares while making it less important for them to advertise.

Thus, incumbents have a stronger incentive than challengers to spend a larger share of their funds on staffers, offices, and other fixed costs which do not readily transfer to communications. To test this hypothesis I collected data from candidate expenditure reports, which are available electronically from the FEC starting with the 2001–2002 election cycle. My analysis of the 2002 election lends support to the hypothesis that challengers spend proportionally more on communication than incumbents. As mentioned previously, incumbents spend 31% of their total budget on communication (print, mail, media), while challengers spend 43% of their budget on communication with voters. Thus, spending is a better advertising proxy for challengers than for incumbents, leading to less mis-measurement and subsequently less attenuation of the estimated coefficients measuring the effectiveness of challenger advertising. Further evidence for the fact that spending is a better proxy for challenger advertising comes from the previously mentioned finding of a correlation coefficient between total spending and media spending of 0.8 for incumbents and 0.97 for challengers.

The results in Table 3 use a weighted measure of advertising prices. To test the robustness of these results, I calculated the amount of advertising using the unweighted sum of advertising prices over all DMAs within a district.[13] Using this measure, the corresponding point estimates to Table 3, column 1 are 0.17 for incumbents and −0.56 for challengers in the linear specification and 2.7 and −4.7 in the log specification, with similar levels of

[13]To address the concern that the results in Table 3 may be driven by high or low priced media districts, I partitioned the sample into five subgroups, based on advertising costs, and re-estimated the regressions for each subgroup. The results show that the findings in the paper are not driven by any one subgroup. To further test whether outliers are affecting the results I visually examined a partial regression plot; I found that the results are not driven by outliers. Finally, I dropped observations with "large" residuals (greater than 10 in absolute value) and found that the resulting estimates were very similar to those reported in the tables.

statistical significance as in Table 3. Thus, the estimates from this alternative price measure are similar to the estimates reported in the Table 3.[14]

A comparison of the results in Tables 2 and 3 shows that incumbent campaign advertising has a positive marginal effect on vote shares, whereas campaign spending alone does not. Thus, the introduction of advertising prices, which in turn help determine the number of television advertising spots, has important consequences for conclusions regarding the productivity of incumbent campaign activities. While incumbent *spending* has a negative effect on vote shares, the marginal product of incumbent *advertising* is positive and statistically significant.

The fact that incumbent campaign spending has a negative effect on vote shares (Table 2, bottom panel), but that campaign advertising has a positive and statistically significant effect on vote shares (Table 3), also holds for specifications that do not employ district fixed effects. When estimating the more traditional regression in the top panel of Table 2 with campaign advertising instead of campaign spending, the marginal product of incumbent advertising is positive and statistically significant in all specifications (not reported). In the linear specification (corresponding to Table 2, top panel, column 1), the point estimate on incumbent advertising is 0.13, and the point estimate on challenger advertising is −0.59. When interacting the advertising coefficients with district urbanization, the point estimate on the interaction effects is zero, suggesting that the effect of media advertising on vote shares is similar in urban and in rural districts.

To address the potential endogeneity issue of incumbent and challenger advertising that is due to time-invariant omitted variables, I examine the effect of campaign advertising in a sample of repeat challengers. In order to use repeaters from the 1996 election, I expanded the sample to 1994. This sample has 123 repeat challengers and 257 observations.

Table 4 reports the results for the repeat challenger regressions. In the repeat challenger estimates the coefficients on incumbent and challenger advertising are statistically significant regardless of whether advertising is expressed in linear, log, or square root form. In these specifications an additional 1,000 campaign advertisements increase the incumbent's vote share by 0.35 percentage points; a corresponding increase in challenger advertising increases the challenger's vote share by 0.44 percentage points. The point estimates on incumbent and challenger advertising are statistically similar in each specification, indicating that advertising is equally productive for incumbents and challengers.

One way to examine the quantitative importance of advertising is to assess the effect of a one standard deviation change of advertising on vote shares. A one standard deviation increase for incumbents produces an increase in incumbents' vote shares of 3.1 percentage points; a corresponding change for challengers produces a 2.1 percentage point increase for challengers. Another measurement of the importance of advertising can be found by computing the effect of an additional $100,000 in challenger and incumbent spending using the average price ($418) of advertising across all media markets. Under this measure, a $100,000 increase in spending produces approximately 250 additional ads. The point estimates suggest that 250 additional incumbent ads increase candidate' vote shares by approximately 0.1 percentage points. However, the distribution of television prices is skewed to the

[14] Many congressional media buys are done as packages. Packages include slots that are aired at different parts of the day. Thus the use of prime time costs may overstate the price of advertising. To address the concern that results may differ under an alternative measure of advertising cost, I re-estimated the model in Table 3 based on prime access, rather than prime time, spot rates. As mentioned previously, the prime access price is close to the average price over all time slots. I found that the estimates were similar to those reported in this paper. The standard errors were slightly larger, but the point estimates were still statistically significant.

Table 4 Repeat challengers. The productivity of television campaign advertisements: OLS estimates (Robust standard errors in parentheses below coefficient estimates)

Dependent variable: Democrat candidate's percentage of popular vote			
	(i) linear	(ii) log	(iii) square root
Incumbent advertising	0.347	2.806	2.610
	(0.131)	(1.374)	(1.043)
Challenger advertising	−0.438	−3.402	−3.149
	(0.144)	(1.498)	(1.153)
Incumbency	2.725	3.683	3.770
	(1.265)	(1.636)	(1.559)
Challenger held elected office	−2.454	−1.951	−2.286
	(2.275)	(2.073)	(2.180)
Indicators for repeat challengers	YES	YES	YES
Indicators for election cycles	YES	YES	YES
Adj. *R*-squared	0.97	0.97	0.97

Notes: $N = 257$. The dependent variable is the Democrat candidate's percentage of the popular vote to the U.S. House of Representatives in the 1994, 1996, 1998, and 2000 general elections

left, and the median district price is $205 as opposed the average price of $418. Thus for a candidate facing the median price, a $100,000 increase in advertising increases incumbents' vote shares by about 0.2 percentage points.

The estimate of the magnitude of the incumbency advantage fell from Table 3 to Table 4 by between 2.7 and 3.7 percentage points. This was as expected. In the full sample the incumbency advantage variable also captures unobserved quality differences between the candidates, while the subsample of repeat challengers removes these differences via a repeat challenger indicator. The point estimate on the challenger quality variable in Table 4 is negative as expected, but statistically insignificant. The imprecision of this estimate is due to the near-zero variation in the quality indicator for repeat challengers.

The magnitudes of the advertising coefficient estimates from the repeat challenger sample (Table 4) and the overall sample (Table 3) are similar. Unobserved, time-invariant, candidate characteristics are quantitatively unimportant; failing to account for them does not lead to large differences between the estimates from the overall sample and the repeat challenger sample. This suggests that using campaign advertising, as opposed to campaign spending, leads to a relatively small omitted variable bias when not controlling for the endogeneity of campaign activities.

Previous work addressing the potential endogeneity of incumbent and challenger spending via repeater fixed effects has found small and insignificant effects of spending on vote shares (Levitt 1994). The log spending estimates in Levitt (1994) were −1.04 for challengers and 0.61 for incumbents. The corresponding log advertising estimates in Table 4 are three to four times larger and statistically significant. Estimating the repeat challenger regressions in Table 4 using incumbent and challenger campaign spending instead of campaign advertising produces point estimates that are as small or smaller than reported in Levitt (1994).[15]

[15]These estimates are available from the author upon request.

Table 5 Repeat challengers. The productivity of television campaign advertisements: IV estimates (Robust standard errors in parentheses below coefficient estimates)

Dependent variable: Democrat candidate's percentage of popular vote			
	(i) linear	(ii) log	(iii) square root
Incumbent advertising	1.275	3.828	4.471
	(0.588)	(1.826)	(2.058)
Challenger advertising	−2.101	−4.966	−6.434
	(0.940)	(2.162)	(2.837)
Incumbency	6.128	4.504	7.137
	(2.909)	(2.434)	(3.586)
Challenger held elected office	−2.308	−1.782	−1.975
	(2.150)	(1.955)	(2.018)
Indicators for repeat challengers	YES	YES	YES
Indicators for election cycles	YES	YES	YES

Notes: $N = 257$. The dependent variable is the Democrat candidate's percentage of the popular vote to the U.S. House of Representatives in the 1994, 1996, 1998, and 2000 general elections

For example, the coefficient on log advertising is eight times larger than the coefficient on log spending for incumbents and 2.5 times larger for challengers. Thus, using campaign advertising instead of campaign spending not only generates estimates that have hypothesized signs and statistically significant effects, but also shows that advertising is more productive than estimated previously.

If incumbent and challenger characteristics change over time, the repeat challenger estimates may still suffer from an omitted variable bias. To address this issue, the proposed IV strategy follows Wald (1940), who suggests that the creation of an artificial instrument can lead to unbiased estimates. More recently, the correctness of this measure has been shown by Koenker and Bassett (1978).

I therefore introduce, as an instrument for incumbent advertising, the incumbent's quintile advertising rank. I do the same for challenger advertising. By definition, the incumbent (challenger) instrument is correlated with incumbent (challenger) advertising, thus fulfilling one of the conditions for the validity of instruments. Wald (1940) and Koenker and Bassett (1978) show that this instrument is also independent of the disturbance term in the second stage, thus fulfilling the second condition for a valid instrument.

Table 5 shows the effects of campaign advertisements using instrumental variables. The first stage (not reported) shows that the quintile rankings are statistically significant for both incumbent and challenger spending. That the rankings in the first stage have the anticipated signs and are statistically significant was anticipated, given that they were constructed from the advertising variables. The second stage estimates show that, as anticipated, the magnitudes of the estimated coefficients on advertisements increase.

The results from the repeat challenger sample show that campaign advertising has a qualitatively important effect on vote shares, in addition to its qualitatively important effect. An additional 1,000 advertisements increase incumbents' vote shares by 1.2 percentage points and challengers' vote shares by 2.1 percentage points (Table 5, column 1). The difference between these point estimates is statistically significant at the four percent level, suggesting that challenger advertising is more productive than incumbent advertising. However, the point estimates in the log and square root specification do not differ statistically.

An alternative assessment of the magnitude of these estimates can be obtained by examining the effect of an additional $100,000 of television advertising. Evaluated at the average TV cost a $100,000 increase in spending implies about 250 advertisements, and thus the estimates suggest a marginal effect on vote shares of 0.3 percentage points and 0.5 for challengers. Evaluated at the median TV cost the marginal effect is between 0.6 and 1 percentage point.

I investigated the possibility that coefficients on candidate advertising are relatively larger and have opposite signs simply because the predicted advertising variables are highly correlated. Examination of the data showed that the increase in the magnitude of the estimates is not caused by a change in collinearity from actual incumbent and challenger advertising to predicted advertising. The correlation coefficient between the actual advertising of both candidates is 0.79 and the correlation coefficient between the predicted advertising of both candidates is 0.80.

5 Television spots in 2000 and 2002

To test whether the results reported in the tables are consistent with the effects of actual advertising, I obtained actual television advertising data from the Wisconsin Advertising Project.[16] The 2000 dataset reports television advertising from the top 75 DMAs, covering over 80% of the U.S. population (Goldstein et al. 2002). The 2002 dataset, the last available when the first draft of this paper was written, reports television advertising from the top 100 Nielsen DMAs (Goldstein and Rivlin 2005). The datasets capture all advertisements carried by broadcast television stations, 25 national cable networks, and the satellite transmissions of the national networks (ABC, CBS, NBC, and Fox). I summed general election spot advertisements for incumbents and challengers and used these as explanatory variables in the repeat challenger regressions. I focus on repeat challengers because this sample allows for the effective control of the endogeneity of advertising in the presence of time-invariant omitted variables. The specification of the regression model is similar the one in Table 5.

The resulting estimates must be interpreted with caution due to the small sample size ($N = 54$) and the fact that redistricting occurred before the 2002 elections. I control for the latter via a redistricting dummy. The results are presented in Table 6. For the sample of repeat challengers, the mean (standard deviation) for the incumbent's vote share is 65.3 (8.66), the number of incumbent advertisements 246.1 (546.9), and the number of challenger advertisements 110.7 (297.6). The maximum number of advertisements is 2,404 for incumbents and 1,224 for challengers. Excluding those races in which the incumbent did not advertise, the mean number of advertisements is 633 for incumbents and 598 for challengers.

The regressions in Table 6 do not include an indicator for challenger quality because this value does not vary within a repeat challenger pair in this sample, and thus is perfectly collinear with the repeat challenger fixed effects. All three specifications (linear, log,

[16]The data-use agreement requires the following acknowledgments. For the 2000 data: "These materials are based on work supported by the Pew Charitable Trusts under a grant to the Brennan Center for Justice at New York University and a subsequent sub-contract to The Department of Political Science at The University of Wisconsin-Madison." For the 2002 data: "The data was obtained from a project of the Wisconsin Advertising Project, under Professor Kenneth Goldstein and Joel Rivlin of the University of Wisconsin-Madison, and includes media tracking data from the Campaign Media Analysis Group in Washington, D.C. The Wisconsin Advertising Project was sponsored by a grant from The Pew Charitable Trusts. The opinions expressed in this article are those of the author(s) and do not necessarily reflect the views of the Wisconsin Advertising Project, Professor Goldstein, Joel Rivlin, or The Pew Charitable Trusts."

Table 6 Repeat challengers. The productivity of television spots (Robust standard errors in parentheses below coefficient estimates)

Dependent variable: Democrat candidate's percentage of popular vote			
	(i) linear	(ii) log	(iii) square root
Incumbent television advertising	0.004	1.625	1.179
	(0.001)	(0.572)	(0.382)
Challenger television advertising	−0.007	−2.621	−2.022
	(0.002)	(0.767)	(0.551)
Incumbency	5.867	6.786	−6.653
	(0.809)	(0.676)	(0.677)
Redistricted	0.705	0.776	0.743
	(0.647)	(0.633)	(0.645)
Indicators for repeat challengers	YES	YES	YES
Indicators for election cycles	YES	YES	YES
Adj. R-squared	0.80	0.80	0.81

Notes: $N = 54$. The dependent variable is the Democrat candidate's percentage of the popular vote to the U.S. House of Representatives in the 2000 and 2002 general elections. The mean (standard deviation) for the incumbent's vote share is 65.3 (8.66), the number of incumbent advertisements 246.1 (546.9), and the number of challenger advertisements 110.7 (297.6)

and square root) produce point estimates on incumbent and challenger television advertising which are statistically significant. Repeating the caveat regarding the small sample size, the results indicate that an additional 100 advertisements produce an increase in vote shares of 0.4 percentage points for incumbents and 0.7 percentage points for challengers. Evaluated at the mean, this implies that a doubling of television advertisements leads to a one percent increase for incumbents and a 0.8% increase for challengers. The Wisconsin Advertising Project also reports the estimated cost of each advertisement. Those estimates indicate that for the data used in Table 6, the average cost per advertisement was $480. This suggests that an extra $50,000 in advertising spending increases incumbents' vote shares by 0.4 percentage points and challengers' vote shares by 0.7 percentage points. Average spending in repeat challenger races in 2000 was $924,000 for incumbents and $256,000 for challengers; in this context, a 50% increase in spending produces an increase in vote shares of 3.7 percentage points (($460,000/$50,000) × 0.4) for incumbents and 1.8 percentage points (($128,000/$50,000) × 0.7) for challengers. Thus, additional spending appears to be productive when candidates allocate non-television spending as productively as television spending. Put differently, if the marginal product of spending is equal across all campaign activities, a doubling of spending increases incumbents' vote shares by seven percentage points and challengers' vote shares by four to five percentage points.

6 Conclusions

This paper emphasizes the importance of advertising prices for the analysis of campaign spending. Advertising prices differ substantially across congressional districts and within districts over time. This suggests that the assumption of equal advertising prices across districts is strong and that a relaxation of this assumption may produce different estimates than

those reported previously. Recognizing that the same spending may buy different quantities of advertising in different districts suggests the examination of the effect of campaign advertising, rather than campaign spending, on votes.

Estimates that do not account for the price of media advertising show that incumbent campaign spending has no effect or a negative effect on incumbents' votes shares. This puzzle is solved by recognizing that advertising prices differ across districts. After accounting for the wide variation in media prices, the results show that incumbent advertising has a positive marginal product. Considering advertising prices is important when estimating the productivity of campaign activities. The advertising coefficients remain statistically significant with the predicted signs when controlling for potential biases.

While previous work has found largely qualitatively unimportant effects of incumbent spending, this paper documents statistically significant effects of campaign advertising for both incumbents and challengers. With respect to the quantitative importance of advertising, some of the estimates in this article suggest that $100,000 of extra TV advertising translates into in increase of 0.6 to a one percentage point increase when evaluated based on the median cost of advertising (Table 5). The estimates from actual TV advertising imply that an additional $50,000 of advertising increases incumbents' vote shares by 0.4 percentage points and challengers' vote shares by 0.7 percentage points (Table 6). These results suggest that advertising in campaigns is valuable for increasing vote shares. However, in most specifications the marginal product of spending is not statistically different between incumbents and challengers. Thus, campaign spending tends to be a zero sum game.

These findings do not necessarily suggest that candidates should spend more on television advertising. Spending more on television advertising would not be optimal for candidates that already equate the marginal returns from various types of media advertising, as well as the returns from spending on staff and the maintenance of offices.

Although accounting for differences in advertising costs results in positive marginal products of advertising for incumbents and challengers, the proposed measure of advertising is not without drawbacks. The measure is likely to understate advertising in high-cost media markets because candidates with districts in those markets have an incentive to substitute to other forms of advertising. Further work may examine a measure of effective units of advertising by considering differences in costs of other forms of voter communications.

Acknowledgements I would like to thank seminar participants at the University of Chicago, the Wissenschaftszentrum Berlin, and the CESifo Public Sector Economics Conference helpful comments and suggestions.

References

Abrajano, M. A., & Morton, R. B. (2004). *All style and no substance? The strategic calculus of campaign advertising*. Mimeo, New York University.

Abramowitz, A. I. (1988). Explaining Senate election outcomes. *American Political Science Review*, *82*, 385–403.

Abramowitz, A. I. (1991). Incumbency, campaign spending, and the decline of competition in U.S. House elections. *Journal of Politics*, *53*, 34–56.

Ansolabehere, S., & Gerber, A. (1994). The mismeasure of campaign spending: evidence from the 1990 U.S. House elections. *Journal of Politics*, *56*(4), 1106–1118.

Atkin, C., & Heald, G. (1976). Effects of political advertising. *Public Opinion Quarterly*, *40*, 216–228.

Atkin, C., Bowen, L., Nayman, O. B., & Sheinkopf, K. G. (1973). Quality versus quantity in televised political ads. *The Public Opinion Quarterly*, *37*, 209–224.

Ballotti, R. J., & Kaid, L. L. (2000). Examining verbal style in presidential campaign spots. *Communication Studies*, *51*, 258–273.

Benoit, W. L., Pier, P. M., & Blaney, J. R. (1997). A functional approach to televised political spots: Acclaiming, attacking, defending. *Communication Quarterly*, *45*, 1–20.
Bowen, L. (1994). Time of voting decision and use of political advertising: The Slate Gorton-Brock Adams senatorial campaign. *Journalism Quarterly*, *71*(3), 665–675.
Brians, C. L., & Wattenberg, M. P. (1996). Campaign issue knowledge and salience: Comparing reception from tv commercials, tv news and newspapers. *American Journal of Political Science*, *40*, 172–193.
Coates, D. (1998). Additional incumbent spending really can harm (at least some) incumbents: an analysis of vote share maximization. *Public Choice*, *95*(1–2), 63–87.
Erikson, R. S., & Palfrey, T. R. (1998). Campaign spending and incumbency: an alternative simultaneous equations approach. *Journal of Politics*, *60*, 355–373.
Feldman, P., & Jondrow, J. (1984). Congressional elections and local federal spending. *American Journal of Political Science*, *28*, 147–163.
Fritz, S., & Morris, D. (1992). *Handbook of campaign spending*. Washington: Congressional Quarterly Press.
Gerber, A. (1998). Estimating the effect of campaign spending on election outcomes using instrumental variables. *American Political Science Review*, *92*, 401–411.
Goldstein, K., & Freedman, P. (2000). New evidence for new arguments: Money and advertising in the 1996 Senate elections. *Journal of Politics*, *62*, 1087–1108.
Goldstein, K., & Rivlin, J. (2005). Political advertising in 2002. Combined file [dataset]. Final release. Madison, WI: The Wisconsin Advertising Project, The Department of Political Science at The University of Wisconsin—Madison.
Goldstein, K., Franz, M., & Ridout, T. (2002). Political advertising in 2000. Combined file [dataset]. Final release. Madison, WI: The Department of Political Science at The University of Wisconsin—Madison and The Brennan Center for Justice at New York University.
Green, D. P., & Krasno, J. S. (1988). Salvation for the spendthrift incumbent: reestimating the effects of campaign spending in House elections. *American Journal of Political Science*, *32*, 884–907.
Grier, K. (1989). Campaign spending and Senate elections, 1978–1984. *Public Choice*, *63*(3), 201–220.
Herrnson, P. (2004). *Congressional elections: campaigning at home and in Washington* (4th edn.). Washington: CQ Press.
Jacobson, G. C. (1978). The effects of campaign spending on Congressional elections. *American Political Science Review*, *72*, 469–491.
Jacobson, G. C. (1980). *Money in congressional elections*. New Haven: Yale University Press.
Jacobson, G. C. (1985). Money and votes reconsidered: Congressional elections 1972–1982. *Public Choice*, *47*, 7–62.
Jacobson, G. C. (1989). Strategic politicians and the dynamics of House elections, 1946–1986. *American Political Science Review*, *83*, 773–793.
Jacobson, G. C., & Kernell, S. (1983). *Strategy and choice in congressional elections* (2nd edn.). New Haven: Yale University Press.
Jasperson, A. E., & Fan, D. P. (2002). An aggregate examination of the backlash effect in political advertising: the case of the 1996 U.S. Senate race in Minnesota. *Journal of Advertising*, *31*(1), 1–12.
Kaid, L. L. (1982). Paid television advertising and candidate name identification. *Campaigns and Elections*, *3*, 34–36.
Kaid, L. L. (Ed.). (2004). *Handbook of political communication research*. Mahwah: Lawrence Erlbaum.
Kaid, L. L., Gobetz, R. H., Garner, J., Leland, C. M., & Scott, D. K. (1993). Television news and presidential campaigns: the legitimization of television political advertising. *Social Science Quarterly*, *74*(2), 274–285.
Koenker, R., & Bassett, G. (1978). Regression quantiles. *Econometrica*, *46*, 107–112.
Levitt, S. D. (1994). Using repeat challengers to estimate the effect of campaign spending on election outcomes in the U.S. House. *Journal of Political Economy*, *102*, 777–798.
Milyo, J. (2001). What do candidates maximize (and why should anyone care)? *Public Choice*, *109*(1/2), 119–139.
Mueller, D. C. (2003). *Public choice III*. Cambridge: Cambridge University Press.
Ragsdale, L., & Cook, T. E. (1987). Representatives' actions and challengers' reactions: Limits to candidate connections in the House. *American Journal of Political Science*, *31*, 45–81.
Shaw, D. R. (1999). The effect of TV ads and candidate appearance on statewide presidential votes, 1988–1996. *American Political Science Review*, *93*, 345–362.
Simon, A. (2002). *The winning message: candidate behavior, campaign discourse, and democracy*. Cambridge: Cambridge University Press.
Spiliotes, C. J., & Vavreck, L. (2002). Campaign advertising: partisan convergence or divergence. *Journal of Politics*, *64*(1), 249–261.
Stratmann, T. (2006). Contribution limits and the effectiveness of campaign spending. *Public Choice*, *129*(3–4), 461–474.

Squire, P. (1989). Competition and uncontested seats in the U.S. House election. *Legislative Studies Quarterly*, *14*(2), 281–295.
Vavreck, L. (2001). The reasoning voter meets the strategic candidate: Signals and specificity in campaign advertising, 1998. *American Politics Research*, *29*(5), 507–529.
Wald, A. (1940). The fitting of straight lines if both variables are subject to error. *Annals of Mathematical Statistics*, *11*, 284–300.
West, D. (2005). *Air wars: television advertising in election campaigns, 1952–2004* (4th edn.). Washington: CQ Press.