The Incumbent Puzzle

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Introduction

Over the past decades there have been numerous attempts to measure the effects of candidate's spending on election outcome. Many of the literature came up with the conclusion that the spending by challengers greatly increases the challengers vote share but that spending by incumbents has little or even negative effect. Many academics believe that this result doesn't seem reasonable. As Gerber says "In theory, incumbent spending may be more effective than challenger spending. Incumbents, typically, have advantages in organization and expertise that make their expenditures more efficient and therefore more effective dollar for dollar than those of challengers" (Gerber 1998, 402). And, even if according to Hubert Humphrey raising money is a "disgusting, degrading, demeaning experience", then why incumbents continue to raise money when they know from the scientist that campaign spending cannot raise their vote share (Levitt, 1995). According to Levitt (1995) the conclusion that the challenger's expenditures are effective but the incumbent's expenditures are not is a "conventional wisdom among political scientists".

This opposition between the theoretically expected and the empirically unexpected gave birth to a puzzle and actually few alternative choices really exist: to explain why these empirical findings make sense theoretically, to improve the empirical methods correcting for possible problems that emerge or even control for both of these.

Many academics used alternative estimation methods (TSLS, panel data etc.) to control for data problems that emerge (simultaneity bias etc) with cross-section analysis or used extra significant variables while others tried to give a theoretical explanation of the unexpected empirical result of incumbent's expenditures.

This article estimates the effect that incumbent's and challenger's spending has on incumbent's vote percentage using ordinary least squares and two stage least squares and the effect of these spending on the possibility that incumbents have to win the elections through logit regressions.

The results showed that challenger's disbursements for campaign effect negatively incumbent's vote percentage and also negatively incumbents possibility to win but their own campaign spending doesn't affect nether their vote percentage nor their victory possibility.

In the first section a quick view of the previous literature is described. In second section we see a quick review of the dataset, the variables and a summary of their

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descriptive statistics and in third section the used models and methodology. In forth section follows the results and finally the conclusions in the last section.

<div align="center">Literature</div>

  The result that challenger spending is important while incumbent spending is not has been verified consistently by OLS regressions.

  Grantz, Abramowitz and Burkart (1976) using ols regressions studied the 1972 House of Representatives elections .They found that challenger's, but not incumbent's, expenditures have a significant effect on the election outcome. The explanation they gave is that the campaign is the only opportunity the challenger has to make an impression on the electorate. So, if an incumbent enters the campaign with a well established reputation he probably can do little to change during the short campaign.

  Jacobson (1978) using the same estimating method came up with the same conclusion on House of Representatives and Senate elections in years 1972 and 1974. The same conclusion has been derived from the logit analysis that he used in his 1990's survey. He gave a similar theoretical explanation about ineffectiveness of incumbent spending, that the incumbent is well known to the voters, and so any additional advertisement (or communication) will add relatively little to their knowledge. Challengers, in contrast, are generally unknown and so benefit greatly from campaign exposure (Jacobson 1978, 1990).

  Abramowitz (1988) using OLS regressions found similar results for the Senate election outcomes between 1974 and 1986, where the spending by challengers had three times as large an impact on the election outcome as spending by incumbents. One of his conclusions is that "The challenger's campaign expenditures are the single most important variable affecting an incumbent senator's chance of being reelected. Although an incumbent faced with a well-financed challenger can usually respond by increasing his or her own campaign spending, the incumbent's spending has much less impact on the outcome of a Senate race than the challenger's spending" (Abramowitz 1988, 397).

  Gierzynski and Breaux (1991) through OLS regressions came up with the same conclusion, this time in state house elections, using data from 1984 to 1988. While money spent by challengers has a significant impact on the vote share in almost every

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state, money spent by incumbents apparently does not. Only in two states do incumbent expenditures appear to make a difference in the vote but, this result is undoubtedly due to the fact that incumbents spend because they are in trouble, writers says.

Palda and Palda (1998) using ols regressions, estimates the effect of campaign money on the votes of candidates for the 1993 elections to the legislative assembly in France. They found that challengers can expect to win at least twice as much as incumbent's challengers.

Under certain circumstances, Coates (1998) even suggests that additional spending by incumbents can hurt their chances to winning. In his paper no incumbent is found to have a positive and statistically significant marginal impact of spending, contrary some of them were distinguishable from zero but negative.

Hudson (2006) uses OLS to exam Florida congressional elections between an incumbent and a challenger from 1996 until 2006. His estimates, unlike the previous literature, show an extremely small impact of the candidate's spending on election outcomes of both incumbent and challenger.

Many academics believe that it is more possible that they have been unable to find significant positive impact of incumbent spending because of data problems (like simultaneity bias).

Although, Grier (1989), using OLS estimations in Senate elections between 1978 and 1984 show that there are a significant number of elections where incumbent spending does matter, and that simultaneity bias may not be a tenable explanation for results where incumbent spending do not matter. He argues that the simultaneity problem described by Jacobson is not theoretically inevitable, and present a statistical specification test that does not reject the validity of Ordinary Least Squares (ols) in that dataset (Senate).

The majority, however, of the researchers believe that the OLS models produce biased and inconsistent estimates of the true parameters because endogenous variables, treated as explanatory variables, are correlated with the error term.

That problem, known as "endogeneity" problem, means that the election outcome and campaign spending are simultaneously determined. Campaign spending may affect the vote, but the (expected) vote affects campaign contributions, and thus spending (Jacobson, 1990). As challenger's election prospects improve it is easier for them to raise money and thus spending by challengers may appear to be more

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effective than it really is. On the other hand as incumbents election prospects improve they reduce their campaign disbursements.

The Stone's, Fulton's, Maisel's and Maestras's (2004) result from 1998 election is that, incumbent spending increases dramatically with decreased incumbent vote share but challenger spending is associated with increases in their vote share. Data such as these make it easier to believe that incumbents are responding to a threatening situation (as evidenced by the level of challenger spending) by spending more.

To address the fact that both the election outcome and spending are endogenous variables, some academics have used simultaneous equation models (usually two stage least squares).

Jacobson (1978) using instrumental variables in House election upholds the traditional result that incumbent spending has negligible impacts on election outcomes.

Green and Krasno (1988) find that greater spending significantly improves the incumbent's share of the vote. To correct of simultaneity bias they used lagged incumbent spending as an instrument variable.

Gerber although worries about the assumption that Green and Krasno make in their article, that only incumbent spending is endogenous and challengers spending is exogenous. "If this assumption is false, then inconsistent estimates of both challenger and incumbent spending effects will result" (Gerber, 403). Green's and Krasno's (1988) article received also critic from Jacobson (1990).

Gerber (1998) using ols regressions (cross-sectional analyses) for the Senate elections can up with a conclusion that incumbent spending is only about half as effective as challenger spending. Although, after taking the endogeneity into account through TSLS estimations, came up with a conclusion that the marginal effects of incumbent and challenger spending are statistically equivalent.

Erikson and Palfrey (1998) using TSLS estimation analyzed spending effects for different seniority levels and find that current incumbent spending matters and that the effect of this spending varies systematically over the career, beginning as a very strong effect and eventually declining with seniority. That means that incumbent spending has a long term effect on incumbent success. Current spending not only affects current election outcome but has persistence to it, which it also contribute to the oftnoted advantage of the incumbency in congressional elections.

Erikson and Palfrey (2000) also show that endogeneity bias will be least severe among elections that are expected to be very close. "When a close race is expected, both spending and spending effects can be reliably estimated by OLS", they say (Erikson and Palfrey 2000, 595). Among these elections ols regressions reveals a significant positive affect of incumbent spending on their vote shares and the spending effects are of roughly equal magnitude for incumbents and challengers.

Abramovitz (1991) used OLS regressions on data from 1974-1976 and 1984-1986 House of Representative elections but attempted to neutralize the simultaneity bias by using Congressional quarterly forecasts of elections outcomes as a control of expectations. Even with this control negligible coefficients for incumbent spending were found and Abramowitz concluded that incumbent spending has little effect on the vote.

Stratmann (2006) using OLS and TSLS estimations for House general elections in 1996, 1998 and 2000 also finds that incumbent money effects outcomes in states elections, where the campaign spending are limited. "The marginal product of advertising expenditures is higher for all candidates when they run in states with campaign finance limits. The findings suggest that voters discount campaign advertising when they anticipate that candidates promise favors to interest groups in exchange for campaign contributions, and thus the findings are consistent with the hypothesis that contribution limits reduce the perception of corruption". "In races with incumbents and challengers, both candidates have the same marginal product of spending when they run in states with contribution limits" (Stratmann 2006, 24).

Pratt (2002a), Coate (2003) and Ashford (2003) also predict that voters are less responsive to the campaign message when they believe that candidates have obtained campaign funds by promising policy favors to contributors.

Another omitted variable issue also concerns academics. It is difficult to measure the quality of the candidates, especially that of the challengers. It is true that some people have the political skills and personal appeal that attract voters to them, while other people do not possess such qualities or characteristics and are not as popular at the polls. Characteristics such as charisma, physical attractiveness, oratorical and organizational skills and other characteristics make a candidate attractive to voters and raise his money ability and his vote's share. For an incumbent the holding of elective office, his political experience, can be a sign of his quality but for a challenger this issue is even more complicated.

Green and Krasno (1988) control for challenger quality (but not for incumbent) with an eight point scale the effect of which is statistically significant but it has minor effect on the spending coefficients and improve little models fitness.

We have to be careful although about this conclusion because everything depends on the construction of the variable through which candidates' quality is measured.

The lagged vote is also a variable that can reflect an expression of the candidate's quality and some academics (Stone, Fulton, Maisel and Maestras , 2004, Gierzynski and Breaux, 1991, Erikson and Palfrey,2000, etc.) have used these variables to control for quality, but no one can insist that this is the perfect solution.

It is also difficult to measure district-specific factors that make the districts differ systematically and perhaps these differentiations effects both vote share and campaign expenditures. An absence of these factors can lead to bias in cross-sectional regressions. As Levitt (1994) remarks partisanship across districts can be one of those factors. Obviously a Democratic challenger in a staunchly Republican district will have smaller ability to raise campaign funds and Republican incumbent's expenditures will also be low because he doesn't face any important challenger. That leads to an upward bias on the effects on challenger spending and a downward bias on the effects on incumbent spending (Levitt, 1994). It is interesting to notice that since the 1970s, and especially since 1992, there has been a substantial increase in partisan polarization among House districts (Abramowitz, Alexander and Gunning, 2006) that probably could give raze to the effectiveness of that variable on election outcomes.

Levitt (1994) analyses a subsample from 1972 to 1990 from congressional elections. He controls for unobserved candidate quality and district-specific effects using panel data set and estimating the effects of spending on elections outcomes among candidates who faced each other in, more than one, elections.

If the candidate's quality is constant over time this method eliminates all influences of quality. He also include variables such us incumbency status and national level partisan swings. While he finds challenger spending to be marginally more productive than incumbent spending, the difference is greatly reduced compared to previous studies. According to his words "campaign spending has an extremely small impact on election outcomes regardless of incumbency status. Controlling for candidate quality and district fixed effects reduces estimates of the value of challenger spending to only one-tenth of the level typically obtained in previous cross-sectional studies" Levitt (1994, 780).

According to Stone, Fulton, Maisel and Maestras (2004) omitted variables are incumbent and challenger electoral prospects. Without an independent measure of incumbent and challenger electoral prospects, problematic assumptions are necessary to estimate electoral prospects. They also believe that the incumbent-prospects measure provides reasonable leverage on the omitted variables problem in estimating the effects of candidate spending.

Theoretically and empirically we want to purse of the strategic component of candidates' and contributors' behavior. Their behavior and decisions are influenced by the strategy that all the other players will follow. If somebody wants to have a clear effect of candidate campaign spending he must pursed of this strategic component.

As the strategic politicians' literature points out, experienced candidates tend to enter races they think they can win and to refrain from entering races they anticipate losing (Jacobson and Kernell 1983, Cox and Katz 2002).

Stone and Maisel (2001, 2003) and Stone (2004) make a study on candidates' prospects and they measured electoral prospects of the incumbent and challenger directly using informed local observers.

Using these measures Stone, Fulton, Maisel and Maestras (2004) coming up with a conclusion that: "The better incumbent prospects are, the larger their vote shares in the election, and the less they spend." They believe that these opposite effects' of prospects on incumbent spending may produce the negative relationship between incumbent spending and election outcomes. Challengers prospects on the other hand relate positively to their vote share, but they also relate positively to spending.

They gave the same theoretical explanation with Jacobson, that incumbent spending has very little effect on incumbent vote share due to saturation in vote awareness and that challenger spending has substantial effects on voter's awareness, due to the relatively low level of vote's recognition of challengers (Jacobson 2004, 132-3).

Kenny and McBurnett (1992) estimate a dynamic model of the relationship between money and votes in a single congressional race in Indiana's third district in 1984 (with logit regressions). They found money to be not statistically significant for the incumbent, except if he waited more than two weeks to spend it (in which case the delay reduced the likelihood that someone could vote for him) and statistically significant for the challenger in several instances.

Ansolabehere and Gerber (1994) are trying something more. They breakdown total expenditures into three different components: those that involve direct communications with the voters, those that are campaign related but not involve direct communications with the voters, and those unrelated to the campaign, such as transfers to the candidates. Even with this separation, their analysis' finding is not different from the previous literature: challenger spending matters more than incumbent spending.

Lott (1991) suggests a theoretical explanation for Jacobson's perverse sign on incumbent spending, the omission of candidate brand name capital from the estimating equations. He demonstrates that higher brand name capital results in a greater probability of winning with a given level of expenditures. If one ignores the effect of brand name, the correlation between spending and probability of winning is negative. Lott contends that Jacobson finds a negative effect of incumbent spending on incumbent electoral success because of an omitted variable. He concludes that omission of brand name capital from the vote share regressions in the literature leads to a spurious negative relationship between incumbent spending and incumbent vote share.

Thomas (1989, 1990) develops and tests a theoretical model of the spending vote share relationship based on an advertising paradigm. His model implies that the marginal effects of incumbent and challengers expenditures depend on the level of spending of both candidates. Using OLS estimations for the 1978 and 1980 House of Representatives general elections show that the marginal productivity of incumbent spending is of the correct sign for most of the observations, though for some incumbents it is not. The wrong signed productivities are always very near to zero. He also argues that incumbent spending becomes more effective, at the margin, as opponent spending rises, and vice versa. Finally, Thomas argues that the absolute value of the challenger marginal productivity of expenditure should exceed that of the incumbent.

Magee (2010) develops and tests a theory to explain the incumbent puzzle following logic similar to that in Grier (1989). His theory goes like this: when the incumbent faces a well-funded challenger and his re-election becomes in doubt, the incumbent spending will be focused on defining the challenger in the eyes of the voters through negative advertisement. In this case, the incumbent's campaign spending will have a significant impact on the election outcome. When there is little chance of being

defeated in the election, the incumbent will spend money in ways that benefit him in the long run but that have little effect on the current election outcome.

In his empirical scale of work he used three alternative estimation methods (OLS, Instrumental variables and fixed effects regression) in raises between a Democratic and a Republican running for the House of Representatives between 1972 and 2006. He shows that campaign spending by incumbents has a significant positive effect on the incumbent's share of the vote only when challengers spend a significantly large amount of money in their election efforts.

Data

The dataset used in this study consist of 3777 races between incumbents and challengers in USA Congressional elections between 1982 and 2004. The used variables were:

Incumbent's total vote percentage defined as the incumbent's general election percentage in the district.

Incumbent's victory: is a dummy variable that takes value one if incumbent won the elections and zero if incumbent lost the elections.

Incumbent's total disbursements: is a variable that includes incumbent's total disbursements in US dollar deflated with the state gdp deflator (we took the deflator as an average of the two year election cycle).

Challenger's total disbursements: this variable includes challenger's total disbursements in US dollar deflated with the previous state gdp deflator.

Total disbursements are defined as the total amount that candidates spent to run for elections and include expenses that had been made to all directions.

Incumbent's beginning cash: is the incumbent's cash at the beginning of the election race in US dollar deflated with the state level gdp deflator, as above.

Challenger's beginning cash: is the challenger's cash at the beginning of the election race in US dollar deflated with the state level gdp deflator.

Democrat incumbent: is a dummy variable that takes value one if incumbent was running at the election race as a Democrat and value zero otherwise (as a Republican or from another party).

Republican incumbent: is a dummy variable that takes value one if incumbent was running as a Republican at the election race and value zero otherwise (as a Democrat or from another party).

All the above variables come from Federal Election Commission the website of which is www.fec.gov.

Incumbent leader: is a dummy variable which takes value one if incumbent was Speaker of the House, majority leader, minority leader, Democratic Chairman, Republican Chairman, Democratic Whips or Republican Whips during the election period and zero otherwise.

Incumbent had been leader: is a dummy variable which takes value one if incumbent had been Speaker of the House, majority leader, minority leader, Democratic Chairman, Republican Chairman, Democratic Whips or Republican Whips before the election period and zero otherwise.

Incumbent chair or ranking member: is a dummy variable which takes value one if incumbent was holding a committee chair or if he/she was a committee ranking member during or before the election period and zero otherwise.

Incumbent's army: is a dummy variable which takes value one if incumbent had served in the army and zero otherwise.

Incumbent's phd: is a dummy variable which takes value one if incumbent has a phd and zero otherwise.

Incumbent female: is a dummy variable that controls for gender differences and takes value one if incumbent is female and zero if is male.

State political conditions: is defined as the difference between the percentage of Democrats and the percentage of Republicans in each state. This variable is used to capture partisan differences across states (state partisanship).

These variables come from the United States House of Representatives the website of which is www.House.gov.

Unemployment rate: is the unemployment rate by state during the year of the election.

Real per capita personal income: is the state real per capita personal income in 2000 prices defined as the average of the two years election cycle.

Table 1 shows the descriptive statistics about the used variables.

table 1: Descriptive statistics					
Variable	Observations	Mean	Std. Dev.	Min	Max
Incumbent won	5583	0.948	0.222	0	1
Incumbent's general persentage	5583	68.079	16.339	0	100
Incumbent total disbursements	5534	637399.4	538802.300	0	7944668.0
Challenger total disbursements	4488	303680.7	527034.200	0	8466350.0
Incumbent's beginning cash	5491	157720.6	252242.700	0	4070605.0
Challenger's beginning cash	4488	1450.7	11042.710	0	370339.8
Incumbent leader	5583	0.016	0.125	0	1
Incumbent had been leader	5583	0.021	0.143	0	1
Incumbent chair or ranking	5583	0.259	0.438	0	1
Incumbent Army	5504	0.400	0.490	0	1
Iincumbent phd	5504	0.043	0.204	0	1
Incumbent female	5503	0.089	0.285	0	1
Democrat incumbent	5583	0.551	0.497	0	1
Republican incumbent	5583	0.445	0.497	0	1
State political conditions	4751	0.396	0.281	0	1
State real per capital income	5534	24795.0	5622.103	12015.0	47558
State unemployment rate	5534	6.158	1.977	2.258	16

As we can see, incumbents during this period received 68% of the votes on average which reveals the tremendous advantage that incumbents have over challengers in general.

Challengers spend on average $ 303,680 in real dollars while incumbents spend about $ 637,399 on average; difference which also reveals the monetary incumbent's advantage.

Incumbent's beginning cash is much higher than challenger's on average that shows the benefited incumbent's position from the beginning of the election race.

Only a few of the incumbents (1,6%) had the fundraising advantage of being in a leadership position and 2% of them had been in a leadership position in the past;

According to descriptive 26% of the incumbents were holding a committee chair or were committee ranking member.

A 8,9% were female, 4,3% had a phd and 40% served in the army.

Almost 40% was on average the percentage distance between Democrats and Republicans vote percentage at a district.

Finally, Democrat incumbents are 10% more than Republican and a very small percentage of them come from other parties

Model and Methodology

In the first part I estimate the following model using ordinary least squares (OLS) for years between 1982 and 2004 Congressional elections.

$$IV_{it} = \alpha + \beta_1\ ID_{it} + \beta_2\ CD_{it} + \beta_3\ IDem_{it} + \beta_4\ IL_{it} + \beta_5\ IhbL_{it} + \beta_6\ ICR_{it} +$$
$$+ \beta_7\ SPC_{it} + \beta_8\ RPCI_{it} + \beta_9\ U_{it} + e_{it} \qquad\qquad (1)$$

Where α is the intercept, the β's regression coefficients, and e the error or disturbance term. Where IV_{it} is incumbent's total vote percentage, ID_{it} and CD_{it} are incumbent's and challenger's disbursements, where $IDem_{it}$ is the dummy variable that controls for party differences, IL_{it} and $IhbL_{it}$ are incumbents present (during the election period) and previous leadership position, ICR_{it} is incumbent's experience as a chair or ranking committee member, SPC_{it} are the state political conditions, $RPCI_{it}$ is the state real per capita income and U_{it} is the state unemployment rate.

The Democrat incumbent variable is used as a party variable that accounts for short-term forces favoring one party or another in a particular election year. Both the party and state political conditions variables are expected to affect incumbent ability to raise money as well as to win votes and so must be taken into account.

Previous experience and leadership position can be one of those advantages that incumbents enjoy over the challengers. Being a leader may reflect a charismatic personality, communication abilities; recognition from the rest of the members; better fundraising abilities and better image in the eyes of the voters. Even if all of these are hypothesis it is not easy for someone to say that incumbents have no advantage from a position like this and that must be taken into account. The dummy variable "Incumbent chair or ranking member" counts for incumbent's political experience from holding an office; an experience that might benefit them and so must be taken into account.

Entered also independent variables to control for macroeconomic factors that might affect incumbent's vote share are unemployment rate by state during the year of the election and real per capita personal income in 2000 prices defined as the average of the two years election cycle.

Challenger and incumbent disbursements are entered as separate variables rather than as some composite because their coefficients are not expected to be the same.

The functional relationship between spending and votes is assumed to be linear. This has the advantage of simplicity but the drawback that it fails to allow for the diminishing returns that must apply to campaign spending.

A hypothesis that is been taken on the above is that there is no correlation between the independent variables. If such a relation exist than it must be taken into account. According to literature endogeneity bias exist in incumbents and challengers expenditures. To overcome these problems I used TSLS.

The first stage regressions for incumbent's and challenger's disbursements and the second stage regression for the incumbent's vote percentage are:

$$ID^*_{it} = b_0 + b_1\ IDem_{it} + b_2\ IL_{it} + b_3\ IhbL_{it} + b_4\ ICR_{it} + b_5\ SPC_{it}$$
$$\qquad + b_6\ RPCI_{it} + b_7\ U_{it} + b_8\ phd_{it} + b_9\ A_{it} + b_{10}\ G_{it} + v_{it} \qquad (2)$$

$$CD^*_{it} = a_0 + a_1\ IDem_{it} + a_2\ IL_{it} + a_3\ IhbL_{it} + a_4\ ICR_{it} + a_5\ SPC_{it}$$
$$\qquad + a_6\ RPCI_{it} + a_7\ U_{it} + a_8\ phd_{it} + a_9\ A_{it} + a_{10}\ G_{it} + u_{it} \qquad (3)$$

$$IV_{it} = \alpha + \beta_1\ ID^*_{it} + \beta_2\ CD^*_{it} + \beta_3\ IDem_{it} + \beta_4\ IL_{it} + \beta_5\ IhbL_{it} + \beta_6\ ICR_{it}$$
$$\qquad + \beta_7\ SPC_{it} + \beta_8\ RPCI_{it} + \beta_9\ U_{it} + e_{it} \qquad (4)$$

Where α, a_0, b_0, are the intercepts, the β's, b's and a's regressions coefficients, and e, v, u the errors terms. Vote share regression has two instrumental variables ID^*_{it} and CD^*_{it} defined as (2) and (3) equations and the rest of them are the same with these in ols regression. These variables exist also on the right hand of Incumbent's and challenger's disbursement regressions plus the variables phd_{it} for incumbent's phd, A_{it} for incumbent's army experience and G_{it} for incumbent's gender.

A candidate can win or lose the election. Under this perspective we can estimate not the effect that candidate's campaign spending has on the incumbent's election outcome but rather the effect that this spending has on the possibility that incumbent has to win the elections. In other words we will transform the vote share as a bivary variable with value one if the candidate's vote percentage is greater than 50% and value zero otherwise. The dependent variable is categorical, so an estimation technique appropriate to limited dependent variable is required. Probit and logit are the principle alternatives. I chose logit, as Jacobson did in his 1990 work, because some analyses involved unordered polychotomous dependent variables, and probit

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demands ordered categories (Jacobson, 1990). An analytic logistic regression's theory is described at the abstract.

The equation estimated with logit is:

$$IW_{it} = \alpha + \gamma_1 \ ID_{it} + \gamma_2 \ CD_{it} + \gamma_3 \ IDem_{it} + \gamma_4 \ IL_{it} + \gamma_5 \ IhbL_{it} + \gamma_6 \ ICR_{it}$$
$$+ \gamma_7 \ SPC_{it} + \gamma_9 \ RPCI_{it} + \gamma_9 \ U_{it} + e_{it} \hspace{2cm} (5)$$

where e_{it} is the error term, IW_{it} is the bivary variable that takes value one if incumbent won the elections and zero otherwise and the rest variables are the same with the variables on the right side of equations (1).

Results

Table 2 presents the results of the voting regression with ordinary least squares (OLS). The results shows the common OLS result in the literature that spending by challengers significantly reduces the incumbent's share of the vote, but spending by incumbents also appears to hurt the incumbent and both coefficients are statistically significant at the 1% level. More specifically an extra \$100,000 in challenger's money lowers the incumbent's vote share by 0.92% percentage points and the same extra amount in incumbent's disbursements can hurt her/his vote share by 0.17% percentage points keeping the rest variables stable.

Table 2: OLS Regression	
Depentent variable: Incumbent's total vote percentage in the district.	
Variable	**Coefficients**
Incumbent total disbursements	-0.171***
Challenger total disbursements	-0.918***
Democrat incumbent	0.720**
Incumbent leader	1.882
Incumbent had been leader	1.743
Incumbent chair or ranking	-0.544
State political conditions	12.401***
State real per capital income	0.0002***
State unemployment rate	-0.176*
Constant	59.942***
Observations	3777
Adj R-squared	0.297
F(9, 3767)	178.77
Prob > F	0.000
*,**,*** indicate that the coefficient is statistically significant at 10%, 5%,1% level.	

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But this result is been driver by the fact that the OLS regression threats spending by incumbents as exogenous. In reality the incumbents increase their efforts to raise money and spend it in the campaign as their share of the vote declines. These expectations make spending an endogenous variable and that must be taken under control. For that reason two stage least squares (TSLS) regression had been estimated.

Table 3 presents the first-stage regressions showing the determinants of spending by challengers and incumbents between 1982 and 2004.

Incumbents who had leadership position during election period or in the past spend $ 965,000 and $ 228,800 more than those who did not had such a benefit position and these results show the fundraising advantage that some incumbents have over the rest of the incumbents and the challengers. Unlike Magee results; challengers doesn't spend more money when they facing incumbents in leadership positions; and being a chair or a ranking member doesn't affect candidate disbursements.

table 3 : First Stage Regressions.		
	Incumbent's disbursements	**Challenger's disbursements**
Variable	**Coefficient**	**Coefficient**
Incumbent Democrat	-0.444***	-0.017
Incumbent leader	9.650***	0.967
Incumbent had been leader	2.288**	-0.016
Incumbent chair or ranking	0.266	-0.019
lincumbent phd	1.024***	0.928**
Incumbent female	0.394	0.974***
Incumbent army	0.005	0.014
Incumbent's beginning cash	0.258***	-0.046
Challenger's beginning cash	5.228***	12.154***
Real per capita income	18.680***	0.412
Unemployment rate	-0.022***	-0.009**
State political conditions	-4.989***	-5.138***
Constant	4.732***	5.048***
Number of obs	3751	3751
Adj R-squared	0.257	0.141
F(12, 3738)	109.23	52.40
Prob > F	0.0000	0.0000
*,**,*** indicate that the coefficient is statistically significant at 10%, 5%,1% level.		

The results shows also that it is not important for the challengers the money ability that incumbents have at the beginning of the election race. This result is inconsistent with the idea that high quality challengers who are capable to raising considerable

sums of money are deterred from entering races in which the incumbents has a large war chest available to spend.

Challengers who have cash at the beginning of the campaign end up spending considerably more in their efforts to unseat the incumbent.

Incumbents on the other hand end up spend $ 523,600 more in every extra $ 100,000 that challengers have at the beginning of the election race; which clearly means that incumbents spend more money when they are facing serious challengers; a common idea in the literature.

The army and the gender does not affect campaign spending of the incumbents but according to results female challengers spend more and perhaps receive more contributions than the male challengers. Challengers and incumbents with phd also spend more money.

As real per capita personal income raises incumbents spend more money; but that is not a factor for challenger's disbursements. Contrary to that as unemployment rate increase spending by incumbents and challengers declines.

According to results as the distance between Democrats and Republicans in each state getting wider incumbents and challengers feel safer about the election outcome and reduce their disbursements.

The F-statistic testing the hypothesis that all coefficients on the instrumental variables are zero are shown at the bottom of the table (F=109.23 and F= 52.40) and are large enough to allay fears that the instruments are weak.

The instrumental variables regressions presented at table 4 shows an importance difference from the previous OLS results. As in most of the papers challenger's disbursements have a negative effect on incumbents vote percentage but the coefficient of incumbent's disbursements is not statistically significant.

State political conditions seem to have a huge effect on the incumbents vote share; statistically significant in 1% level. An extra one point percentage distance between Democrat and Republican vote percentage in the district can increase the incumbent's vote share by 14%.

Coefficient of the incumbent's party identification is statistically significant at 10% level indicating that a Democrat incumbent (contrary to incumbents from other parties) has 0.7% vote precedence.

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Table 4: Instrumental Variables Regression (TSLS).	
Depentent variable: Incumbent's total vote percentage in the district.	
Variable	**Coefficients**
Incumbent total disbursements	-0.001
Challenger total disbursements	-0.760***
Democrat incumbent	0.724*
Incumbent leader	0.293
Incumbent had been leader	1.309
Incumbent chair or ranking	-0.560
State political conditions	14.044***
State real per capital income	0.0002**
State unemployment rate	-0.112
Constant	58.261***
Observations	3751
Adj R-squared	0.287
F(9, 3741)	89.88
Prob > F	0.000
*,**,*** indicate that the coefficient is statistically significant at 10%, 5%,1% level.	

Surprisingly according to results incumbent's leadership position or experience does not affect incumbent's vote percentage.

Finally the results show significantly and positive effect from the state real per capita personal income and insignificant effect from the state unemployment rate.

Table 5 present estimates from TSLS regressions by election period. As we can see challenger's disbursements coefficients are statistically significant only in five of twelve election periods with negative sign and at least in 10% level. Incumbent's disbursements coefficients on the other hand are insignificant in all cases confirming the above results (table 4).

Real per capita income and unemployment rate are not statistically significant (with one exception) and that is not absurd if we consider that the variability of these variables is limited to differences between the states and not between the elections periods as before. Additionally, these results could be different if the variables were in district rather than in state level.

Party variable is significant in seven of the twelve cases with negative and positive signs favoring and not favoring Democrats party in each particular election period.

Table 5: Instrumental Variables Regressions (TSLS) by election period.						
Depentent variable: Incumbent's total vote percentage in the district.						
	Coefficients					
Variables	**1982**	**1984**	**1986**	**1988**	**1990**	**1992**
Incumbent total disbursements	-0.123	1.130	-0.136	0.263	0.881	-0.507
Challenger total disbursements	-0.553	-2.160	-0.388	-0.707	-1.750*	-0.642
Democrat incumbent	6.384***	-5.162***	5.446***	1.075	2.324*	-1.330
Incumbent leader	-0.558	29.341**	-3.142	-4.264	-18.398	2.849
Incumbent had been leader	5.128	-27.731**	7.198	dropped	12.605	2.853
Incumbent chair or ranking	2.698	-0.559	-1.160	-0.930	0.120	0.133
State political conditions	15.836**	22.003***	17.542***	16.024***	9.364***	4.047
State real per capital income	0.0003	-0.00002	0.0003	0.0002	-0.0002	0.0004
State unemployment rate	-0.626	0.133	-0.191	0.701	0.377	0.263
Constant	57.068***	60.346***	55.608***	54.212***	57.686***	53.379***
Observations	320	319	293	310	294	320
Adj R-squared	0.233	0.413	0.388	0.346	0.141	0.190
F statistic	8.25	21.84	16.67	13.34	5.31	0.88
Prob > F	0.000	0.000	0.000	0.000	0.000	0.539
	Coefficients					
Variables	**1994**	**1996**	**1998**	**2000**	**2002**	**2004**
Incumbent total disbursements	-0.142	-0.768	-0.436	0.675	0.785	-0.511
Challenger total disbursements	-1.070**	-1.140**	-0.204	-1.130***	-1.000*	-0.515
Democrat incumbent	-8.283***	3.178	1.748	2.738**	-2.143	2.715**
Incumbent leader	10.421	21.433	12.217	-6.612	-7.326	2.767
Incumbent had been leader	-0.763	-5.152	-1.345	-2.155	-1.257	7.714
Incumbent chair or ranking	-2.289	-1.238	1.900	-1.389	-1.293	-3.724***
State political conditions	21.278***	9.449	23.434***	16.081***	14.350**	10.662
State real per capital income	0.0005**	0.0001	0.0002	0.0001	0.0002	0.0002
State unemployment rate	0.005	-0.110	0.318	-0.637	-0.361	-0.674
Constant	54.759***	66.320***	54.374***	57.679***	53.008***	65.185***
Observations	333	349	298	321	271	323
Adj R-squared	0.416	0.406	0.380	0.355	0.120	0.346
F statistic	20.93	25.15	18.61	16.21	4.67	14.69
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000

Table 6 presents estimates from logit regression with incumbent's victory as the dependent variable.

According to results coefficient from challenger's total disbursements is significant at 1% level but coefficient from incumbent's total disbursements in not; indicating that a raise in challenger's disbursements reduces incumbent's possibility of victory but a raise in incumbent's disbursements does not effects their possibility to win.

Similar to TSLS results incumbent's leadership position and experience doesn't affect their possibility to win.

Unlike the previous results if incumbent is Democrat his possibility to win the elections declines.

Table 6: logistic Regression.	
Depentent variable: Incumbent's won.	
Variable	**Coefficients**
Incumbent total disbursements	0.022
Challenger total disbursements	-0.180***
Democrat incumbent	-0.088***
Incumbent leader	1.741
Incumbent had been leader	-0.419
Incumbent chair or ranking	0.019
State political conditions	1.920***
State real per capital income	0.00007***
State unemployment rate	-0.118***
Constant	2.286***
Observations	3777
Pseudo R-squared	0.228
Log Likelihood	-615.21
*,**,*** indicate that the coefficient is statistically significant at 10%, 5%,1% level.	

State political conditions affect positively the possibility that incumbent has to win the election outcome. An extra one percent distance between Democrats and Republicans in a district can increase incumbent's victory possibility by 1.2 %.

Positively also effects incumbent's possibility of win an increase in real per capita income and negatively an increase in unemployment rate.

Conclusions

Purpose of this study was to measure empirically the effect of incumbent's and challenger's campaign spending on incumbent's vote percentage on USA congressional elections between 1982 and 2004. The dataset consist of 3777 races between incumbents and challengers.

I used OLS and TSLS regressions for these estimates as the previous studies did in an extended dataset (the same dataset with Magee but with new added variables like the state unemployment rate and the real per capita income) to compare for possible outcome differences.

I also view the dependent variable "incumbent's vote percentage" as a bivary variable and estimate through logit regressions the effect of incumbent's and

challenger's campaign disbursements on the possibility that incumbents have to win the elections.

Results from OLS regressions show a negative effect on incumbent's vote share from both challenger's and incumbent's disbursements. Although the endogeneity problem; the existence of which most academics remark; produce doubts about this result and for that reason a two stage least squares used.

The result from TSLS regressions showed that challenger's disbursements for campaign effect negatively incumbents vote percentage but incumbent's campaign spending does not significantly affect their vote share.

The logit estimates showed a similar result. A raise in challenger's disbursements reduces incumbent's possibility of victory but a raise in incumbent's disbursements does not affect their possibility to win.

The theoretical explanation about this according to the previous literature is that the incumbents are already known to the voters and that's why an extra advertisement cannot add something new to the voter's knowledge about them.

Another conclusion is that incumbent's spend more money when they face serious opposition; when for our instance they face challengers with big amount of beginning cash; a commonly accepted idea from the academics.

These conclusions do not actually solve or add something new to the existing knowledge about the "incumbent puzzle" and a wider search with new methods or/and new significant variable is I believe a necessity.

ABSTRACT

An analytic logistic regression's description follows:

We view y_i as a realization of a random variable Y_i that can take the values one and zero with probabilities p_i and p_i-1 representatively.

$$y_i = \{ \quad 1 \text{ if } y_i^* > 1/2$$
$$0 \text{ otherwise}$$

The distribution of Y_i with parameter p_i can be written:

$$\Pr (Y_i = yi) = p_i^{yi}(1-p_i^{1-yi})$$

for $y_i = 0; 1$. Note that if $y_i = 1$ we obtain p_i, and if $y_i = 0$ we obtain $1-p_i$. The expected value and variance of Y_i are

$$E(Y_i) = \mu_i = p_i$$
$$Var(Y_i) = \sigma_i^2 = p_i(1-p_i)$$

Any factor that affects the probability will alter not just the mean but also the variance of the observations.

If the probabilities p_i depend on a vector of observed covariates x_i and the simplest idea would be to let p_i be a linear function of the covariates, say

$$p_i = x_i^{'} \beta$$

where β is a vector of regression coefficients in our case the vector of γ's coefficients.

This model is sometimes called the linear probability model and is often estimated using maximum likelihood statistic.

The problem with this model is that the probability p_i on the left hand side has to be between zero and one, but the linear predictor $x_i^{'} \beta$ on the right hand side can take any real value, so there is no guarantee that the predicted values will be in the correct range unless complex restrictions are imposed on the coefficients.

A simple solution to this problem is to transform the probability to remove the range restrictions, and model the transformation on a linear function of the covariates. We do this in two steps.

First, we move from the probability p_i to the odds

$$odds_i = \frac{p_i}{1 - p_i}$$

defined as the ratio of the probability to its complement, or the ratio of favorable to unfavorable cases. If the probability of an event is a half, the odds are one-to-one or even. If the probability is 1/3, the odds are one-to-two. If the probability is very small, the odds are said to be long.

Second, we take logarithms, calculating the logit or log-odds

$$\eta_i = logit(p_i) = \log \frac{p_i}{1 - p_i}$$

which has the effect of removing the floor restriction. Note that as the probability goes to zero the odds approaches zero and the logit approaches -∞. At the other extreme, as the probability approaches one the odds approach +∞ and so does the logit. Thus the logits map probabilities from range (0,1) to the entire real line. Note that if the probability is 1/2 the odds are even and the logit is zero. Negative logits represent probabilities below one half and positive logits correspond to probabilities above one half.

The inverse transformation is sometimes called the antilogit, and allows us go back from logits to probabilities. Solving for p_i in previous equation gives:

$$p_i = logit^{-1}(\eta_i) = \frac{e^{\eta_i}}{1 + e^{\eta_i}}$$

We are now in a position to define the logistic regression model, by assuming that the logit of the probability pi, rather than the probability itself, follows a linear model.

This expression is the standard logistic distribution which is symmetric, has mean zero and variance $\pi^2/3$.

We assume that the logit of the probability p_i rather than the probability itself follows a linear model.

Suppose that the logit of the probability p_i is a linear function of the predictors

$$\text{logit}(p_i) = x_i^{'} \beta$$

where x_i is a vector of covariates and β is a vector of regression coefficients.
The regression coefficients βj can be interpreted along the same lines as in linear models, bearing in mind that the left-hand-side is a logit rather than a mean. Thus, βj represents the change in the logit of the probability associated with a unit change in the j-th predictor holding all other predictors constant.

Exponentiating equation before we find that the odds for the i-th unit are given by

$$\frac{p_i}{1-p_i} = \exp\{ x_i{'}\beta \}$$

This expression defines a multiplicative model for the odds.

Solving for the probability p_i in the logit model in equation $\text{logit}(p_i) = x_i^{'} \beta$ gives the more complicated model

$$p_i = \frac{\exp\{ x_i{'}\beta \}}{1 + \exp\{ x_i{'}\beta \}}$$

While the left-hand-side is in the familiar probability scale, the right-hand-side is a non-linear function of the predictors.

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