

Incumbency Advantage in an Electoral Contest

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Abstract: In a campaign spending contest framework, we investigate the potency of frequently cited sources of incumbency advantage in generating the observed patterns of campaign expenditure and re-election rates. Since one Dollar of extra spending should not change a certain loser to a certain winner, we extend the literature by allowing the electoral benefit of visibility to be stochastic. The model provides an explanation of earlier empirical findings that district variation in the cost of visibility does not influence incumbents' victory probability. Furthermore, in contrast to previous literature, the model predicts that campaign finance legislation can increase challengers' expected payoffs.

I INTRODUCTION

It is often suggested that the electoral playing field is tilted in favour of incumbents. Considerable empirical evidence indicates that officeholders enjoy sizeable electoral advantage when they run for re-election; incumbency advantage is typically estimated to be around 4 per cent vote share for low-level state offices and around 8 per cent vote share for federal and high-level state offices.¹ The re-election rate in US House elections varies between 85 and 98 per cent. A number

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¹ See Hirano and Snyder (2009).

of sources of officeholder benefits have been proposed to explain these observations. *Free media exposure* an incumbent enjoys may give her a competitive edge.² Incumbents also tend to benefit from greater *fundraising efficiency* since as officeholders they are in a position to deliver political favours to donors.³ Officeholders and challengers may also be asymmetric in their *effectiveness of campaign spending*; they may have different technologies for converting campaign spending into votes.⁴ For instance, the incumbent's use of official symbols in campaign material may help her to be perceived as more credible. We construct an electoral contest model of political campaign spending which includes these three potential sources of asymmetry between the incumbent and the challenger. The model is used to investigate which sources of officeholder benefits – greater fundraising efficiency, spending effectiveness or free media exposure – can generate the observed patterns of high re-election rates and greater campaign expenditure of incumbents.⁵ We then examine the effect of campaign finance legislation.

This paper analyses political campaign competition in persuasive advertising. There is considerable evidence demonstrating that a significant portion of political advertising has little direct informational content. Abrajano and Morton (2004) find that about 70 per cent of the political advertisements in the 2000 US congressional elections did not involve substance. In Senate campaigns from 1988 to 1992, Kahn and Kenney (1999) report that only 36 per cent of political advertisements made an issue a major focus. Mueller and Stratmann (1994) argue that television advertising is primarily persuasive and that the growth of television advertising signifies the growth of the relative importance of persuasive campaigning. This paper will not enter the debate on whether the majority of campaign spending is persuasive or informative either directly or indirectly. But rather it takes the existence of persuasive advertising as given and focuses on its equilibrium implications.

Two important aspects of political competition that are not addressed here are competition in policy/ideological space, and efforts to inform voters about candidate characteristics or policy position.⁶ Of course a full understanding of electoral competition would require both policy and non-policy competition. The goals here are more modest.

² See Jacobson (1981); Milligan and Rekkas (2008).

³ Palda (1992) shows that the larger the government wealth in control of the politician and the more power the politician has over the state budget, the more money the politician raises for his campaign. Hall and Wayman (1990) show that politicians with positions of power in congressional committees are better fundraisers.

⁴ Glantz *et al.* (1976); Jacobson (1978; 1981; 1985; 1990); Welch (1981); Abramowitz (1988); Green and Krasno (1988; 1990); Erikson and Palfrey (1998); and Samuels (2001).

⁵ The Center for Responsive Politics reports that on average, incumbents spend 35 per cent more than challengers.

⁶ There are well-developed theoretical models of informative political campaign advertising, for instance see Potters *et al.* (1997); Austen-Smith (1987); Prat (2002a; 2002b); Coate (2004a; 2004b); Konrad (2004); and Soberman and Sadoulet (2007). Campaign spending can provide indirect information to voters about the valence of the candidate via signalling as in Potters *et al.* (1997) and Prat (2002a; 2002b).

Our model is a reformulation of Meirowitz (2008). As in that paper we focus attention on the role of incumbency advantage and non-informative campaign spending by taking the incumbent and challenger as identical in all respects other than the identity of the officeholder. They are equidistant from the median voter in policy/ideological space.⁷ However the identity of the officeholder can lead to asymmetries in fundraising efficiency, spending effectiveness and access to free media exposure. Our departure from Meirowitz (2008) is the introduction of an alternative micro-structure which yields a stochastic outcome given candidate choices. Candidates simultaneously engage in campaign spending to enhance their visibilities to the voters. At the time candidates make their campaign decisions, they are uncertain about the extent to which voters will be influenced by their visibility. The model with stochastic marginal benefit to visibility is intuitively appealing since one Dollar of extra spending should not take a candidate from a certain loser to a certain winner as it would in Meirowitz (2008) and Pastine and Pastine (2012), where the outcome is deterministic given candidates' campaign effort levels. The second main benefit of the modelling departure from Meirowitz (2008) is that we are able to disentangle the effects of fundraising efficiency and campaign spending effectiveness. In Meirowitz (2008) these asymmetries are represented by a single parameter which is the cost of an effective unit of spending. Since both types of differences between incumbents and challengers are observed empirically their relative importance in the understanding of incumbency advantage is of value.

We show that the officeholder's free media exposure is insufficient to explain the pattern of spending and re-election rates.⁸ In equilibrium the incumbent spends up to the point where the marginal benefit from visibility is equal to the marginal cost of visibility. Improved access to free media exposure does not alter this marginal calculation, hence does not affect the equilibrium choice of visibility nor the incumbent's probability of victory. We also demonstrate that differences in campaign spending efficiency alone are not enough to explain the observed patterns in the data. The incumbent must have a lower cost of raising a nominal Dollar for spending. If candidates had the same cost of raising funds, then the incumbent would take advantage of the free media exposure and spend less than the challenger. Her higher efficiency of fundraising is what induces the incumbent to spend more in equilibrium. This is in line with empirical studies which strongly point toward incumbency advantages involving challengers' difficulty in raising resources as the cause of incumbent's electoral success in the US Congress.⁹

⁷Ashworth and Bueno de Mesquita (2009) and Herrera *et al.* (2008) model electoral competition where the candidates first choose policy platforms and then engage in campaign spending. Neither of these concentrate on incumbency advantage and the consequences of campaign finance reform.

⁸ This complements Meirowitz (2008) which finds that voter preferences alone cannot explain these empirical observations.

⁹ See Kazez (1983); Abramowitz (1991); Cox and Katz (1996); Levitt and Wolfram (1997); and Campbell (2002; 2003).

An interesting empirical regularity which, to the best of our knowledge, has resisted theoretical explanation is generated as natural result of the model. There are vast differences in the cost of communicating with constituents in different congressional districts – Stratmann (2009) finds the cost of reaching 1 per cent of voters in the highest cost district is 100 times that in the lowest cost district. It seems reasonable to think that the electoral value of incumbents' free media exposure and fundraising advantages would differ with such large variation in communication costs. But empirical differences in incumbency advantage between urban and rural districts are minor or non-existent. In the model, communication costs affect both candidates' level of spending and the incumbent's expected payoff but do not alter the re-election probability and would not affect estimates of incumbency advantage.

The model can shed some light on the efficacy of some types of campaign finance regulation. While some regulations influence fundraising efficiency, for example tax deductibility of contributions, matching public funds, contribution limits and timing of reporting requirements, others such as limits on the electioneering communications window have an impact on spending effectiveness.¹⁰ The qualitative predictions about the impact of campaign finance legislation on equilibrium probabilities of victory are consistent with previous work, but there are significant differences in the policy implications. When the electoral outcome is deterministic given the spending levels, as in Meirowitz (2008), campaign finance reforms that lower the cost of fundraising or increase the effectiveness of campaign spending do not improve the expected payoff to the challenger. Policies which at first glance favour challengers simply induce incumbents to campaign more aggressively and compete away any benefit the challenger might otherwise obtain from the policy. However in our framework, where candidates cannot perfectly predict voter behaviour, it is too costly for the incumbent to use her officeholder benefit to compete away all the challenger's surplus. Hence challengers have a positive expected payoff from entering the competition. This is consistent with the observation that challengers often compete vigorously in primaries for the right to be their party's standard bearer in the general election. They would not exert this effort if they had zero expected payoff in the general election. Furthermore, we show that with stochastic campaign effectiveness, campaign finance legislation can help to increase the expected payoff to the challenger. Therefore, a stochastic success specification is able to explain the contentious nature of campaign finance regulation. There are winners and losers. The model also suggests that there may be room for campaign finance legislation to help alleviate the entry deterrence effect of incumbency advantage.¹¹

¹⁰ See the International IDEA political finance database for details of the campaign finance legislative tools employed by 180 countries. This paper does not study the effect of spending limits as a campaign finance policy tool. In 1976, the US Supreme Court deemed campaign spending limits to be unconstitutional (*Buckley v. Valeo*). There are however many democracies where spending limits are in place. See Pastine and Pastine (2012) for a model of incumbency advantage and campaign spending limits.

¹¹ For the significance of the scare-off of incumbency advantage, see Cox and Katz (1996); Levitt and Wolfram (1997); Uppal (2010); Redmond (2015); and Redmond (2017), among others.

Section II presents the framework. Section III derives the equilibrium and discusses which sources of incumbency advantage could drive the patterns in empirical observations. Section IV examines the efficacy of campaign finance legislation. Section V concludes.

II FRAMEWORK

2.1 Candidates

Two risk-neutral candidates indexed by $i \in \{1, 2\}$ run for office. The officeholder is Candidate 1 and the challenger is Candidate 2. Candidates can increase their visibility through campaign spending $a_i \in [0, \infty)$. Each unit of visibility costs $c > 0$ Dollars. A candidate's visibility to the electorate is given by:

$$v_i = \begin{cases} \gamma + a_i/c & \text{if } i \text{ is the incumbent} \\ a_i/c & \text{if } i \text{ is the challenger} \end{cases} \quad (1)$$

The incumbent enjoys a *visibility advantage* $\gamma \geq 0$ due to the press attention she can generate as the officeholder without engaging in campaign spending. The value of winning the office is the same for each candidate and is normalised to one. In order to engage in campaign spending a candidate must raise the funds to do so which entails a utility cost of $\beta_i > 0$ for each Dollar raised. The effort expended to raise funds is sunk whether the candidate wins or loses, hence a candidate's payoff is given by:

$$\pi_i = \begin{cases} 1 + \beta_i a_i & \text{if } i \text{ wins} \\ -\beta_i a_i & \text{if } i \text{ loses} \end{cases} \quad (2)$$

Candidates may differ in their efficiency of raising funds; the lower β_i the greater is candidate i 's *efficiency of fundraising*.

2.2 Voters

Each member of a continuum of voters casts her vote based on her initial disposition toward the candidates and her disposition which is induced by their visibilities. Voter k 's initial disposition for Candidate 1 over Candidate 2 is denoted by $\alpha_k \in \mathbb{R}$. If $\alpha_k > 0$, voter k has an initial preference in favour of Candidate 1, and if $\alpha_k < 0$, she has an initial preference in favour of Candidate 2. If $\alpha_k = 0$, she is ex ante indifferent.

As in Meirowitz (2008) and Pastine and Pastine (2012), voters are "impressionable" in the terminology of Grossman and Helpman (1996). Given their preferences they make their voting decisions rationally, however as discussed in the introduction, the mechanism through which spending is persuasive is left as a black box.

After observing both candidates' visibilities, voter k 's utility is:

$$\pi_i = \begin{cases} \alpha_k + \phi_1 v_1 & \text{if Candidate 1 wins} \\ \phi_1 v_2 & \text{if Candidate 2 wins} \end{cases} \quad (3)$$

The more familiar a voter is with the winning candidate, the higher the utility the voter derives from the election result.¹² For each candidate the marginal benefit of visibility on voter perception is denoted by $\phi_i > 0$.

Voting for the candidate who yields the higher utility is a weakly dominant strategy for each voter, and we assume that voter k casts her vote for Candidate 1 if $\alpha_k + \phi_1 v_1 > \phi_2 v_2$, and for Candidate 2 if $\alpha_k + \phi_1 v_1 < \phi_2 v_2$. In case of equality there is an even chance that Candidate 1 receives the vote.¹³

Each voter's initial disposition is drawn independently from a p.d.f. $g(\alpha_k)$ with the c.d.f. $G(\alpha_k)$. The distribution of preferences across voters may favour either candidate. Here we are interested in the effect of incumbency advantage in the absence of any differences in character traits, ideology or demographic imbalances. Hence we assume that the median voter is initially not predisposed toward either candidate, $G(0) = 1/2$, and that such a median voter exists, $g(0) > 0$. Voters simultaneously cast their ballots and the winner is chosen by simple majority. The candidate who captures the vote of the median voter wins the election.

2.3 Stochastic Marginal Benefit to Visibility

The impact of visibility on voter utility, ϕ_i , is unknown at the time the candidates make their campaign spending decisions. For example, the big campaign rally could suffer from stormy weather; the jingle written for the campaign might become a big hit; the woman picked by the campaign as a metaphor for the middle-class American single mom might be adored by the public. It is common knowledge that both candidates' ϕ_i are drawn independently from standard inverse exponential distributions with p.d.f.s:

$$\phi_i \sim h_i(\phi_i) = \begin{cases} 0 & \text{for } \phi_i \in (-\infty, 0] \\ \Lambda_i \phi_i^{-2} \exp \{-\Lambda_i \phi_i^{-1}\} & \text{for } \phi_i \in (0, \infty) \end{cases} \quad (4)$$

and c.d.f.s:

$$H_i(\phi_i) = \begin{cases} 0 & \text{for } \phi_i \in (-\infty, 0] \\ \exp \{-\Lambda_i \phi_i^{-1}\} & \text{for } \phi_i \in (0, \infty) \end{cases} \quad (5)$$

¹² There is evidence that campaigning enhances familiarity with the candidate and that familiarity impacts people's voting decisions, see Stokes and Miller (1962) and Jacobson (2004).

¹³ Restricting attention to weakly dominant strategies eliminates equilibria where a mass of voters vote against their preferred candidate simply because no single voter would alter the outcome by switching her vote.

where $\Lambda_i = \lambda > 0$ if candidate i is the incumbent and $\Lambda_i = \eta\lambda > 0$ if candidate i is the challenger. The distribution with the higher Λ_i first-order stochastically dominates the distribution with the lower Λ_i , and hence the former is more likely to generate high realisations of ϕ_i and less likely to generate low realisations. So the parameter η represents the asymmetry in candidates' *campaign spending effectiveness* distributions. If $\eta < 1$ the incumbent is more likely to have higher spending effectiveness, and if $\eta > 1$ the challenger is more likely to have higher spending effectiveness.

2.4 Timing

Candidates engage in simultaneous competition in campaign spending before the marginal benefit to visibility shocks are realised. After observing both candidates' visibilities and after the realisations of the shocks, voters simultaneously cast their votes. Candidates and voters then receive payoffs based on the spending levels and the outcome of the election.

III EQUILIBRIUM

While visibility makes the candidate more desirable – note that $\phi_i > 0$ with probability one, see (5) – the increase in voter utility is stochastic. Prior to the realisation of the shocks, the standard inverse exponential distribution of ϕ_i yields a contest success function with asymmetric-ratio form.

Lemma 1. *Prior to the realisation of the shocks to the marginal benefit of visibility (ϕ_1 and ϕ_2), Candidate 1's probability of victory is given by $\theta_1 = v_1/(v_1 + \eta v_2)$ and Candidate 2's probability of victory is given by $\theta_2 = \eta v_2/(v_1 + \eta v_2)$.*

Proof. The probability that Candidate 1 wins, θ_1 , is given by:

$$\begin{aligned} \theta_1 &= P(\phi_1 v_1 > \phi_2 v_2) = P\left(\phi_2 < \phi_1 \frac{v_1}{v_2}\right) = \int_0^{\infty} H_2\left(z \frac{v_1}{v_2}\right) h_1(z) dz \\ &= \int_0^{\infty} \exp\left\{-\eta\lambda\left(z \frac{v_1}{v_2}\right)^{-1}\right\} \lambda z^{-2} \exp\{-\lambda z^{-1}\} dz \\ &= \int_0^{\infty} \lambda z^{-2} \exp\left\{-\lambda\left[\eta\left(z \frac{v_1}{v_2}\right)^{-1} + z^{-1}\right]\right\} dz. \end{aligned}$$

Using change of variable $u = -\lambda z^{-1}$,

$$\begin{aligned} \theta_1 &= \int_{-\infty}^0 \exp \left\{ u \left(z \frac{v_1 + \eta v_2}{v_1} \right) \right\} du = \left(\text{const} + \frac{v_1}{v_1 + \eta v_2} \exp \left\{ u \left(\frac{v_1 + \eta v_2}{v_1} \right) \right\} \right) \Big|_{-\infty}^0 \\ &= \frac{v_1}{v_1 + \eta v_2}. \end{aligned}$$

By construction $\theta_2 = 1 - \theta_1$. ■

The Lemma and its proof are direct applications of Jia (2008), Theorem 1 and Corollary 1, which give the stochastic derivation of the ratio form contest success function where performance is determined by effort and a multiplicative random shock.¹⁴

Candidates can increase their probability of victory via improved visibility. The greater η , the higher is the effect of challenger spending on her probability of victory. Since the value of winning is normalised to one, candidate i 's expected payoff is her probability of victory minus her cost of spending. Candidates 1 and 2 maximise their expected payoffs with respect to their spending levels, a_1 and a_2 :

$$\begin{aligned} \max_{a_1} E(\pi_1) &= \max_{a_1} \left(\frac{v_1}{v_1 + \eta v_2} - \beta_1 a_1 \right) \\ \max_{a_2} E(\pi_2) &= \max_{a_2} \left(\frac{\eta v_2}{v_1 + \eta v_2} - \beta_2 a_2 \right) \end{aligned} \tag{6}$$

where $v_1 = \gamma + a_1/c$ and $v_2 = a_2/c$ and subject to $a_i \geq 0 \quad \forall i \in \{1, 2\}$. These result in the Kuhn-Tucker marginal and complementary slackness conditions:

$$\begin{aligned} \frac{\eta a_2}{(c\gamma + a_1 + \eta a_2)^2} - \beta_1 + \Omega_1 &= 0 \quad \text{with c.s. } \Omega_1 a_1 = 0 \\ \frac{\eta(c\gamma + a_1)}{(c\gamma + a_1 + \eta a_2)^2} - \beta_2 + \Omega_2 &= 0 \quad \text{with c.s. } \Omega_2 a_2 = 0 \end{aligned} \tag{7}$$

where Ω_i denotes the Lagrange multiplier on candidate i 's non-negativity constraint. These yield the reaction functions:

$$\begin{aligned} R_1(a_2) &= \max \left\{ 0, \left[\left(\frac{\eta a_2}{\beta_1} \right)^{1/2} - c\gamma - \eta a_2 \right] \right\} \\ R_2(a_1) &= \max \left\{ 0, \left(\frac{c\gamma + a_1}{\eta \beta_2} \right)^{1/2} - \frac{c\gamma + a_1}{\eta} \right\} \end{aligned}$$

¹⁴ While the model yields the above ratio form success function from micro-foundations, exogenously specified ratio-form Tullock (1980) -style contest success functions like this are widely used. Applications include advertising, tournaments within organisations, patent and other technology races, lobbying, litigation, wars, sports and other types of conflicts. For campaign competition models with Tullock-style success functions, see Baron (1994) and Skaperdas and Grofman (1995). Konrad (2009) provides an extensive survey of applications.

Proposition 1. *The simultaneous move Nash Equilibrium is unique and is in pure strategies. Equilibrium spending levels are:*

1. If $\gamma \in [\eta/(c\beta_2), \infty)$, then $a_1^* = a_2^* = 0$;
2. If $\gamma \in [\eta\beta_2/[c(\eta\beta_1 + \beta_2)^2], \eta/(c\beta_2))$, then $a_1^* = 0$ and $a_2^* = \left(\frac{c\gamma}{\eta\beta_2}\right)^{1/2} - \frac{c\gamma}{\eta} > 0$;
3. If $\gamma \in [0, \eta\beta_2/[c(\eta\beta_1 + \beta_2)^2])$, then:

$$\begin{aligned} a_1^* &= \frac{\eta}{\beta_2} \left(\frac{\beta_2}{\beta_2 + \eta\beta_1} \right)^2 - c\gamma > 0 \\ a_2^* &= \frac{1}{\eta\beta_1} \left(\frac{\eta\beta_1}{\beta_2 + \eta\beta_1} \right)^2 > 0. \end{aligned} \tag{8}$$

Proof: See Appendix.

In order to save on space, below we only discuss the empirically relevant case where the incumbent has non-zero spending, $a_1^* > 0$. The incumbent actively engages in a campaign spending competition when her visibility advantage is not too large, $\gamma \in [0, \eta\beta_2/[c(\eta\beta_1 + \beta_2)^2])$. From (8) and the implied contest success function in Lemma 1, it is straightforward to calculate equilibrium probabilities of victory, θ_i :

$$\theta_1^* = \frac{\beta_2}{\beta_2 + \eta\beta_1} \quad \text{and} \quad \theta_2^* = \frac{\eta\beta_1}{\beta_2 + \eta\beta_1} \tag{9}$$

and expected payoffs:

$$E(\pi_1) = \left(\frac{\beta_2}{\beta_2 + \eta\beta_1} \right)^2 + \beta_1 c\gamma \quad \text{and} \quad E(\pi_2) = \left(\frac{\eta\beta_1}{\beta_2 + \eta\beta_1} \right)^2. \tag{10}$$

The visibility advantage increases the expected payoff of the incumbent by the disutility it would take to raise the money to generate that level of visibility through campaign spending. But candidates' probabilities of victory are independent of γ .¹⁵ In equilibrium, each candidates' expected marginal benefit of visibility is equal to its marginal cost. The degree of free media exposure the officeholder enjoys does not change these marginal relationships, and hence does not alter the candidates' equilibrium choices of visibility. So if γ increases, the incumbent spends less while achieving the same level of visibility (see Equation (8)). The effect of an increase in incumbent visibility advantage on the probability of victory is fully absorbed by lower incumbent spending. This provides a theoretical explanation for the empirical finding of Ansolabehere *et al.* (2006); they find no evidence that incumbency

¹⁵ In the terminology of Erikson and Palfrey (2000), γ affects the pre-spending anticipated margin of victory. However, for medium γ , in equilibrium it does not alter the victory probability.

advantage is higher in counties with in-state media markets than in counties with out-of-state media markets where the officeholder would receive less free access to media.¹⁶

3.1 Incumbency Advantage

The model is confronted with two observations about US elections: incumbents are more likely to win and they tend to spend more than challengers.

Corollary 1. *The incumbent's visibility advantage alone is insufficient to match empirical patterns: If $\beta_1 = \beta_2$ and $\eta = 1$, then*

1. *the incumbent does not have a higher probability of being elected than the challenger*
2. *incumbent spending is not higher than challenger spending.*

Proof. Part 1, from (9), $\theta_1 = \theta_2 = 1/2$. Part 2, from (8) equilibrium spending levels are given by $\alpha_1 = \frac{1}{4\beta} - c\gamma$ and $a_2 = \frac{1}{4\beta}$. ■

When candidates are asymmetric in visibility advantage only, the incumbent exerts less effort than the challenger and candidates have an equal chance of victory. Both these predictions are inconsistent with empirical record in elections for the US Congress. This compliments the result in Meirowitz (2008) where there is no electoral uncertainty given spending levels which finds that a head start based on voter preferences alone cannot explain these empirical findings either. Hence with or without electoral uncertainty, a campaign spending contest must involve asymmetry in the candidates' marginal spending decisions, i.e. in fundraising costs and campaign spending effectiveness.

Corollary 2. *The parameter space for which the model matches empirical patterns:*

1. *The incumbent has higher spending than the challenger when*

$\gamma \in \left[0, \frac{\eta(\beta_2 - \beta_1)}{c(\beta_2 + \eta\beta_1)^2} \right)$. *This is only possible if the challenger is less efficient at raising funds, $\beta_2 > \beta_1$.*

2. *The probability that the incumbent wins is higher than 50 per cent if the challenger has a higher cost of raising an effective unit of spending:*

$$\frac{\beta_2}{\Lambda_2} > \frac{\beta_1}{\Lambda_1} \Leftrightarrow \frac{\beta_2}{\eta} > \beta_1.$$

¹⁶ Prior (2006) however shows that incumbency advantage is related to the number of TV stations.

Proof. Part 1 is a straightforward application of (8) setting $\alpha_1^* > a_2^*$ which results in the requirement $\gamma < \eta(\beta_2 - \beta_1)/[c(\beta_2 + \eta\beta_1)^2]$. This is stricter than the requirement for an interior solution in Proposition 1 of $\gamma < \eta\beta_2/[c(\eta\beta_1 + \beta_2)^2]$ which is necessary for $a_1 > 0$. Maintaining focus on interior solutions by requiring $\gamma < \eta\beta_2/[c(\eta\beta_1 + \beta_2)^2]$, part 2 is a straightforward application of (9) setting $\theta_1^* > \theta_2^*$ and noting that $\Lambda_2 = \eta\Lambda_1$. ■

If γ is very large, the incumbent can relax and choose low campaign spending, safe in the knowledge that her challenger will either struggle to catch up with her visibility advantage, or simply give up. So, the incumbent spends more than the challenger if and only if the incumbents' visibility advantage is not too large. Moreover, for the model to yield higher incumbent spending despite her visibility advantage, the incumbent must have superior fundraising efficiency, $\beta_2 > \beta_1$. If candidates were equally efficient in fundraising, then the incumbent would exploit her free media exposure to spend less than the challenger.

The incumbent's probability of victory exceeds 50 per cent if and only if the challenger has a higher cost of raising an effective unit of spending. However, there is extensive empirical evidence demonstrating that challengers are more effective in turning campaign expenditure into votes.¹⁷ Incumbents are already known by the electorate, whereas challengers often need to campaign just to establish name recognition, providing an additional benefit to campaigning. This implies $\eta > 1$. If so, the requirement in part 2 of Corollary 2 for higher victory probability for the incumbent ($\beta_2 > \eta\beta_1$) is stronger than the requirement of $\beta_2 > \beta_1$ in part 1. Hence Corollary 2 suggests that both empirical regularities are primarily driven by incumbents' fundraising advantages, rather than by visibility advantages or asymmetries in spending effectiveness.

3.2 Variation Across Districts

While the model predicts that asymmetries between incumbents and challengers induce variation in the probability that incumbents are re-elected and in the expected value of entering the race for challengers, it suggests that there is much less scope for variation across districts to do so.

For example, between congressional districts there are vast differences in the cost of communicating with constituents even though districts have the same number of constituents. Stratmann (2009) finds that the cost of reaching 1 per cent of voters with TV advertising during prime time in the 2000 election cycle ranged from \$18 in Idaho's 2nd district to \$1,875 in New York City. Therefore, the value of fundraising to politicians is likely to vary across large and small media markets which may be associated with the degree of urbanisation and county size. Because of incumbents' fundraising advantage, one might expect that this would translate

¹⁷ Among others see Glantz *et al.* (1976); Jacobson (1978; 1981; 1985; 1990; 2006); Welch (1981); Abramowitz (1988); and Green and Krasno (1988; 1990).

into significant differences in incumbency advantage across districts. But there is no such pronounced pattern – Ansolabehere *et al.* (2006) report that “differences [in urbanisation and county size]... have not been found to be linked to the size of the incumbency advantage”. The implications of the model are consistent with this observation. Variations in the cost of creating visibility across electoral districts are captured by the parameter c . The relevant c would be low in districts with smaller media markets. But since the variation is symmetric across candidates in the same district, it does not alter the effect of incumbency on probability of victory.

Corollary 3. *An increase in the cost of attaining an additional unit of visibility via campaign spending (c) does not change the candidates’ probability of victory. Nor does it change the challenger’s equilibrium level of spending or expected payoff. However, the spending of the incumbent declines and the expected payoff to the incumbent goes up.*

Proof. Straightforward examination of (8), (9), and (10) yield the results. ■

In districts with a higher cost of reaching voters, the free media exposure that the officeholder is able to generate is of higher monetary value. This allows the incumbent to spend less than she would otherwise, giving her higher expected payoff. However, in equilibrium, the increase in the relative value of officeholder exposure and the reduced incumbent spending leaves the probability of victory unaltered.

There may also be variations across districts or over time in the degree to which visibility influences voter perceptions of the candidate – perhaps due to increased cynicism or a populous which is subjected to more media messages and hence is more inclined to ignore them. These differences can be captured by the parameter λ . Districts with cynical voters or voters who are saturated with media will have lower λ . However, such variation in λ will have the same impact on both candidates and hence will not affect spending levels, re-election probabilities or the payoffs of either candidate.

IV CAMPAIGN FINANCE LEGISLATION

Policies that symmetrically increase the fundraising efficiency of both candidates – such as allowing political contributions to be tax deductible or increasing contribution limits – hurt the incumbent but do not influence the challenger’s expected payoff.¹⁸ When β_i ’s symmetrically decline for both candidates, their

¹⁸ The effect of a regulation that symmetrically increases fundraising efficiency can be analysed by examining (10) for the expected payoffs and (9) for the probabilities of victory and scaling β_1 and β_2 down by a common factor $t \in (0, 1)$.

spending levels increase, leaving the probabilities of victory unaltered. The expected payoff to the incumbent decreases because the utility cost of the effort that it would take to raise the money to buy her visibility advantage declines. Overcoming the visibility advantage through campaign spending becomes easier for the challenger, but the effect of this on the expected payoff of the challenger is neutralised by increased incumbent spending. Likewise, any regulation that reduces the effectiveness of campaign spending (such as stricter restrictions on the timetable of electioneering communications) in a symmetric manner across candidates cannot mitigate the effects of incumbency advantage.¹⁹ Meirowitz (2008) reaches the same conclusion when candidates face no uncertainty about voter behaviour. Furthermore Meirowitz (2008) shows that asymmetric reforms that lead to a decline in the relative fundraising efficiency and/or campaign effectiveness of the incumbent have no effect on the expected payoff of the challenger. In the face of such reforms, incumbents campaign more aggressively and compete away any benefit to expected payoff the challenger would otherwise obtain from the policy reform.

However, the debate on political campaign finance reform is revived repeatedly prior to each election because reforms are contentious in their very nature. Consistent with this observation, we find that reforms with asymmetric effects on the incumbent and challenger can increase the expected payoff to the challenger when candidates cannot perfectly predict voter behaviour at the time they are making their campaigning decisions. Since the incumbent is uncertain about the influence of her campaign effort on voter utility she chooses not to compete away all of the challenger's expected surplus from the electoral contest. Therefore, the possibility of mitigating the negative effects of incumbency advantage is not so bleak.

Corollary 4. *An increase in the incumbent's relative cost of fundraising or a reduction in her relative campaign spending effectiveness yields higher expected payoff to the challenger.*

Proof. By straightforward examination of (9) and $E(\pi_2)$ in (10). Asymmetric changes in candidates' cost of fundraising involve altering either β_1 or β_2 . Asymmetric changes in the candidates' distributions of the effectiveness of spending involve altering η .

Legislation such as restricting the use of staff in the incumbent's office for campaigning purposes, banning donors from contributing to the incumbent when they have a clear interest in an issue being discussed in a committee where the incumbent has voting power, and disallowing the use of official incumbency symbols in campaign advertisement, asymmetrically influence candidates'

¹⁹ The impact of a regulation that symmetrically alters effectiveness of visibility can be captured by changes to the parameter λ , recall that $\Lambda_i = \lambda > 0$ if candidate i is the incumbent and $\Lambda_i = \eta\lambda > 0$ if candidate i is the challenger. Changes to λ are neutral on spending levels, on victory probabilities and on expected payoffs.

fundraising efficiency and campaigning effectiveness. These sorts of regulations can help level the playing field, and improve the chances of victory for the challenger as well as her expected payoff.

The literature on incumbency advantage identifies the scare-off effect of direct officeholder benefits as one of the major sources of the high incumbent re-election rates. The tendency for incumbency to deter the entry of high-quality opponents is documented by Cox and Katz (1996) and Levitt and Wolfram (1997). Potential high-quality challengers are likely to have high opportunity cost. When the expected payoff from entering the electoral race is smaller than what they could have outside of politics, they choose not to run. Campaign finance reform that augments the expected payoff to the challenger may help attract higher quality challengers, mitigating this deterrence effect.

V CONCLUSION

This paper develops a version of the Meirowitz (2008) electoral contest model of persuasive campaigning. The significant new feature of the model is that at the time that the candidates are deciding on their campaign expenditures they are not certain how persuasive these expenditures will be; they are uncertain about how voters will react to their campaign. This implies that one Dollar of extra spending will not change a candidate from a certain loser to a certain winner, even given her rival's spending. It also permits us to disentangle the effects of fundraising efficiency and campaign spending effectiveness. We find that officeholder visibility advantage is insufficient to explain the empirically observed pattern of spending and incumbent re-election rates in US congressional elections. Incumbents' superior fundraising efficiency is the key to matching these empirical patterns. The model is an abstraction from various important elements of competition in politics, such as ideological positioning, contests over policy favours, candidate character trait differences and partisanship. Hence policy recommendations based on the findings must be tentative. Nevertheless, the model is able to capture the contentious nature of campaign finance regulation. There is indication that campaign finance reforms that increase the relative efficiency of fundraising and/or campaign effectiveness of the challenger may succeed in increasing his expected payoff, and hence may mitigate the scare-off effect of incumbency advantage and attract higher-quality challengers.

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APPENDIX: PROOF OF PROPOSITION 1

For any given a_j player i 's objective Function (6) is strictly concave in a_i and decreasing for high enough a_i . Hence for any, degenerate or non-degenerate, mixed strategy of j , i 's objective function is a convex combination of concave functions and so is concave. Hence for any strategy of j , player i will have a unique best response in $a_i \in [0, \infty)$, so equilibrium will only exist in pure strategies. The outcome $a_1 > 0$ while $a_2 = 0$ cannot be equilibrium strategies since Player 1 could win with certainty with $a_1 = 0$.

Examine the other possible corner solutions.

Case 1: Setting $a_2 = 0$ in $R_1(a_2)$ implies $a_1 = 0$, and therefore $R_2(a_2)$ yields $a_2 = 0$ only if $\gamma \geq \eta\beta_2/c$.

Case 2: Setting $a_1 = 0$ in $R_2(a_1)$ implies $a_2 = \left(\frac{c\gamma}{\eta\beta_2}\right)^{1/2} - \frac{c\gamma}{\eta}$ is greater than zero when $\gamma < \eta/(c\beta_2)$ and therefore $R_1(a_2) = 0$ if $\gamma \geq \eta\beta_2/[c(\eta\beta_1 + \beta_2)^2]$. Therefore corner solutions require $\gamma \geq \eta\beta_2/[c(\eta\beta_1 + \beta_2)^2]$ and exist for this range of γ .

Examine possible interior solutions. If $a_i > 0$ then $\Omega_i = 0$ from complimentary slackness, so using (7) and rearranging the two players' optimality conditions to

eliminate $(c\gamma + a_1 + \eta a_2)^2$ yields $a_2 = \frac{\beta_1}{\beta_2} (c\gamma + a_1)$. Hence solving (7) under the

assumption of an interior solution results in $a_1 = \frac{\eta}{\beta_2} \left(\frac{\beta_2}{\beta_2 + \eta\beta_1}\right)^2 - c\gamma$ and

$a_2 = \frac{1}{\eta\beta_1} \left(\frac{\eta\beta_2}{\beta_2 + \eta\beta_1}\right)^2$. The resulting a_2 is clearly positive, as conjectured. But a_1 is only positive if $\gamma < \eta\beta_2/[c(\eta\beta_1 + \beta_2)^2]$ so an interior solution can only exist for that range of gamma, yielding case 3.

If $\gamma < \eta\beta_2/[c(\eta\beta_1 + \beta_2)^2]$ the single interior solution in Case 3 is the only equilibrium, if $\gamma \in [\eta\beta_2/[c(\eta\beta_1 + \beta_2)^2], \eta/(c\beta_2))$ then interior solutions are not possible and only the corner solution in Case 2 forms an equilibrium, and if $\gamma \in [\eta/(c\beta_2), \infty)$ then again interior solutions are not possible and only the corner solution in Case 1 forms an equilibrium. Hence the equilibrium is in pure strategies and is unique. ■