Campaign Cost and Electoral Accountability
Supporting Information

A Proofs

Proof of Lemma 1

We denote by $\sigma_j = (p_j, y_j) \in \{0,1\} * \{0,1\}$ the strategy of candidate $j \in \{L, R\}$, and by $V_j(\sigma_j; \sigma_{-j})$ his expected utility when he chooses strategy σ_j, and faces an opponent who chooses strategy σ_{-j}. To prove Lemma 1, we first prove the following lemmas and their corollaries.

Lemma A.1. *Denote by $\beta_j(y_j, y_{-j})$ the probability that candidate j is elected after the voter observes a communication vector $(y_j, y_{-j}) \in \{0,1\}^2$, $j \in \{L, R\}$. In any PBE, we must have: $y_j = 0 \Rightarrow p_j = 0$ or $\beta_j(0, y_{-j}) = 0$, $j \in \{L, R\}$.*

Lemma A.1 says that no communication implies that candidate j has chosen $p = 0$ or that he has no chance of getting elected.

Proof. Suppose $y_j = 0$ and $\beta_j(0, y_{-j}) > 0$. Then when candidate j chooses $p_j = 1$, he gets: $V_j(1, 0; \sigma_{-j}) = \beta_j(0, y_{-j})(1 - k) + (1 - \beta_j(0, y_{-j})) * 0$. When candidate j chooses $p_j = 0$, he gets: $V_j(0, 0; \sigma_{-j}) = \beta_j(0, y_{-j})(1) + (1 - \beta_j(0, y_{-j})) * 0 > V_j(1, 0; \sigma_{-j})$. This is because his policy choice does not affect his probability of being elected since the voter does not observe his platform. Therefore, whenever $y_j = 0$ and $\beta_j(0, y_{-j}) > 0$, then $p_j = 0$. Now suppose $\beta(0, y_{-j}) = 0$. Then $V_j(0, 0; \sigma_{-j}) = V_j(1, 0; \sigma_{-j})$ and the policy choice of candidate j does not matter. □

Corollary A.1. $p_j = 1 \Rightarrow y_j = 1$

Proof. This is the contrapositive of Lemma A.1. □

Corollary A.2. *The strategy $\sigma_j = (1, 0)$ is weakly dominated by $\sigma_j = (0, 0)$.*

Proof. We have $\forall \beta_j(0, y_{-j}) \in [0, 1]$, $V_j(0, 0; \sigma_{-j}) \geq V_j(1, 0; \sigma_{-j})$, with strict inequality whenever $\beta_j(0, y_{-j}) > 0$ from Lemma A.1. □

Corollary A.3. *On the equilibrium path, the voter believes that candidate j has chosen $p_j = 0$ when candidate j does not advertise ($y_j = 0$).*

Proof. Our equilibrium concept is PBE excluding weakly dominated strategies so candidate j never chooses $\sigma_j = (1, 0)$ which proves the result. □

Lemma A.2. *For any candidate j, the strategy $\sigma_j = (0, 0)$ strictly dominates the strategy $\sigma_j = (0, 1)$.*

Proof. Fix $-j$'s strategy to $\sigma_{-j} = (p_{-j}, y_{-j})$. Denote by $\mu(y_j)$ the voter's belief that the candidate has chosen $p_j = 1$. By Corollary A.3, $\mu(0) = 0$. As a consequence, $p_j = 0$ implies that $\beta_j(1, y_{-j}) = \beta_j(0, y_{-j}) = \beta$. This, in turn, implies that $V_j(0, 0; \sigma_{-j}) = \beta > V_j(0, 1; \sigma_{-j}) = \beta - c$ In other words, $V_j(0, 0; \sigma_{-j}) > V_j(0, 1; \sigma_{-j})$, $\forall \sigma_{-j}$, (the set of all possible σ_{-j} includes mixed strategies). □

Proof of Lemma 1. Using Corollary A.2 and Lemma A.2, when we exclude weakly dominated strategies, the strategy space for candidate $j \in \{L, R\}$ is $\{(0, 0), (1, 1)\}$. □

Proof of Proposition 1

Proof. We first check conditions such that a PBE exists when both candidates campaign on the high-effort policy. Suppose $\sigma_R = (1, 1)$. Then Candidate L's best response is $\sigma_L = (1, 1)$ if and only if: $V_L(1, 1; (1, 1)) \geq V_L(0, 0; (1, 1))$. We get $V_L(1, 1; (1, 1)) = \Pi_L(1 - k) - c$ (candidate L is elected with probability $\Pi_L = F_\varepsilon(0)$) and $V_L(0, 0; (1, 1)) = 0$ (since $\bar{\epsilon} < 1$ by assumption). Hence, L's best response to $\sigma_R = (1, 1)$ is $(1, 1)$ if and only if $k \leq 1 - \frac{c}{\Pi_L}$. Using the same reasoning, the best response for candidate R to $\sigma_L = (1, 1)$ is $(1, 1)$ if and only if $k \leq 1 - \frac{c}{\Pi_R}$, where $\Pi_R = 1 - \Pi_L$. Since candidate R is electorally advantaged $\Pi_L \leq \Pi_R$, this condition is not binding. So we have that there exists a PBE where both candidates choose to campaign on $p = 1$ if and only if $c \leq \Pi_L(1-k)$ as claimed.

We now show that $\{(0,0);(0,0)\}$ is a PBE if and only if $k > 1 - \Pi_L - c$. Suppose candidate R chooses the low-effort policy ($\sigma_R = (0,0)$). Then, candidate L chooses the same strategy if and only if $V_L(0,0;(0,0)) = \Pi_L \geq V_L(1,1;(0,0)) = 1-k-c$. Candidate L is elected with probability Π_L when he chooses the low-effort policy. He is certain to be elected but has to pay the cost of a high-effort policy and the campaign cost when he chooses the high-effort policy. This condition is equivalent to $c \geq 1-k-\Pi_L$. A similar reasoning as above shows that the condition for R is not binding.

We now show that $\sigma_j = (1,1)$ and $\sigma_{-j} = (0,0)$ cannot be an pure strategy equilibrium. For this to be an equilibrium, it is necessary that $1-k-c \geq \Pi_j$, and $0 \geq (1-k)\Pi_{-j} - c$. These two inequalities can be re-expressed as $1-\Pi_j-k-c \geq 0 \geq 1-\Pi_j-k+k\Pi_j-c$, which is clearly impossible.

We now consider the existence of a mixed strategy equilibrium. Both candidates must randomize in a mixed strategies equilibrium for all k but the knife-edge cases $k = 1-\frac{c}{\Pi_L}$ and $k = 1-\Pi_L-c$. Consider the following strategy: $\sigma_j = \alpha_j \times (1,1) + (1-\alpha_j) \times (0,0)$. To be willing to randomize, candidate L must be indifferent between $(1,1)$ and $(0,0)$, that is $V_L(1,1;\sigma_R) = V_L(0,0;\sigma_R)$, or equivalently $\alpha_R = \frac{1-\Pi_L-c-k}{(1-\Pi_L)(1-k)-\Pi_L}$. In order for α_R to be in the unit interval, it is necessary that either $(1-\Pi_L)(1-k)-\Pi_L \geq 1-\Pi_L-c-k \geq 0$ or $(1-\Pi_L)(1-k)-\Pi_L \leq 1-\Pi_L-c-k \leq 0$. The first set of conditions can be re-expressed as $c \in [\Pi_L(1-k), 1-k-\Pi_L]$, which, in turn, requires $k \leq 1-\frac{\Pi_L}{\Pi_R}$ to be non-empty. The second set of conditions can be instead expressed as $c \in [1-k-\Pi_L, \Pi_L(1-k)]$, which requires $k \geq 1-\frac{\Pi_L}{\Pi_R}$ to be non-empty. Since a pure strategy equilibrium where candidates always choose the high-effort policy exists whenever $c \leq \Pi_L(1-k)$, and our equilibrium selection retains the best equilibrium for voters, only the first case is relevant.

Let's now consider α_L. Candidate R is willing to randomize if and only if α_L is such that $V_R(1,1;\sigma_L) = V_R(0,0;\sigma_L)$, or equivalently $\alpha_L = \frac{k-\Pi_L+c}{1-\Pi_L-\Pi_L(1-k)}$. Under the assumptions, its denominator is always positive. Therefore, α_L is in the unit interval if and only if $k+c-\Pi_L \in [0, \Pi_R-(1-k)\Pi_L]$, which is equivalent to $c \in [\Pi_L-k, \Pi_R(1-k)]$.

Combining the relevant conditions for α_L and α_R, a necessary condition is: $c \in (\max\{\Pi_L(1-$

$k), \Pi_L - k\}, \min\{1-k-\Pi_L, \Pi_R(1-k)\})$, $k < 1 - \frac{\Pi_L}{\Pi_R}$. Notice that $\Pi_L(1-k) < \Pi_L - k$ if and only if $-\Pi_R k > 0$, which is impossible. Moreover, $\Pi_R(1-k) < 1-k-\Pi_L$ if and only if $\Pi_L k < 0$, which is impossible. As a consequence, a mixed strategy equilibrium exists and gives the highest payoff to voters (there are no other mixed strategy or pure strategy equilibria) if and only if $c \in (\Pi_L(1-k), 1-k-\Pi_L]$ and $k < 1 - \Pi_L/\Pi_R$. □

Proof of Proposition 2

We first show that the probability of one candidate committing to the high-effort policy $p = 1$ increases with c for c high enough. We start with the following lemma. Denote $d = 1 - 2\Pi_L + k\Pi_L$

Lemma A.3. *The ex ante probability of having a high-effort policy implemented in a mixed strategy equilibrium is:*

$$\alpha = \frac{(d - k\Pi_L)d - (\Pi_R - c)(c + k - \Pi_L)}{d(d-k)} \tag{A.1}$$

Proof. We have:

$$\alpha = \alpha_L + \alpha_R - \alpha_L \times \alpha_R = \frac{c+k-\Pi_L}{d} + \frac{1-c-k-\Pi_L}{d-k} - \frac{1-c-k-\Pi_L}{d-k}\frac{c+k-\Pi_L}{d}$$

The denominator is $(\Pi_R - \Pi_L(1-k))(\Pi_R(1-k) - \Pi_L) = d(d-k)$. The numerator, denoted N, is $N = (1-c-k-\Pi_L)d + (c+k-\Pi_L)(d-k) - (1-c-k-\Pi_L)(c+k-\Pi_L)$, which becomes $N = (1-2\Pi_L)d - (c+k-\Pi_L)(1-c-\Pi_L)$. □

Lemma A.4. $\frac{\partial \alpha}{\partial c} > 0$ *if and only if* $c > \frac{1-k}{2}$.

Proof. Using (A.1), we can see that $\partial\alpha/\partial c$ has the same sign as $-(1-k) + 2c$. Since $k \geq k^* = 1 - \frac{\Pi_L}{\Pi_R}$, we have $d - k > 0$ (cfr. Proposition 1). □

Lemma A.5. *In a mixed strategy equilibrium, the probability of having a high-effort policy implemented is increasing with the cost of communication if and only if* $k < 1 - 2\Pi_L$ *and* $c \in [\frac{1-k}{2}, \Pi_R - k]$.

Proof. α increases with c for $c \geq \frac{1-k}{2}$. However, we need to check that $[\frac{1-k}{2}, \Pi_R - k]$ is a non-empty interval. The condition $k < 1 - 2\Pi_L$ guarantees this. □

Proof of Proposition 2. Part (ii) follows directly from Lemma A.5. Part (i) follows from Lemma A.5 and the observation that, in a pure strategy equilibrium $Pr(p_e = 1)$ is either zero or one.

Part (iii). Denote $E_j = E(\epsilon_j)$, $j \in \{L, R\}$ and $\overline{E} = E(\max\{\epsilon_L, \epsilon_R\})$. The voter's expected utility when candidates play mixed strategies is:

$$V^{ME} = (1 - \overline{E})(\alpha_L + \alpha_R - \alpha_R\alpha_L) + E_L\alpha_L(1 - \alpha_R) + E_R\alpha_R(1 - \alpha_L) + \overline{E}(1 + \alpha_R\alpha_L) \tag{A.2}$$

It is immediate to show that $\lim_{\overline{\epsilon}\to 0} V^{ME} = \alpha_L + \alpha_R - \alpha_R\alpha_L = Pr(p_e = 1)$, which is, under the assumptions, strictly increasing in c. By continuity, there exists $\hat{\epsilon} > 0$ such that when $\overline{\epsilon} \in [0, \hat{\epsilon})$, sgn $\left[\frac{\partial V^{ME}}{\partial c}\right]$ = sgn $\left[\frac{Pr(p_e=1)}{\partial c}\right]$.

□

Proof of Proposition 3

Proof of Proposition 3. The result for $c < \Pi_L$ follows from the argument in the text. We prove the result for the mixed strategy equilibrium (i.e., $c \in (\Pi_L, \Pi_R)$), and then show the result for $c > \Pi_R$. In a mixed strategy equilibrium, under the assumptions, we have $\alpha_L = \frac{c-s-\Pi_L}{\Pi_R-\Pi_L}$, $\alpha_R = \frac{\Pi_R-c+s}{\Pi_R-\Pi_L}$. Which implies $\alpha_L + \alpha_R = 1$. Hence, in a mixed strategy equilibrium we have that

$$\begin{aligned} W(s) &= \overline{\epsilon} + 1 - \overline{\epsilon}\Pi_R\alpha_L - \overline{\epsilon}\Pi_L\alpha_R - \alpha_R\alpha_L\,(1 - \overline{\epsilon}) - s \\ &= \overline{\epsilon} + 1 - \overline{\epsilon}c + (\overline{\epsilon} - 1)\left(\frac{c(1-c) - \Pi_L\Pi_R}{(\Pi_R - \Pi_L)^2} + s\left(1 + \frac{2c - 1 - s}{(\Pi_R - \Pi_L)^2}\right)\right) \end{aligned} \tag{A.3}$$

where the second line follows from $\Pi_R\alpha_L + \Pi_L\alpha_R = c - s$. Denote $\mathcal{W}(s) := s\left(1 + \frac{2c-1-s}{(\Pi_R-\Pi_L)^2}\right)$. It can easily be checked that $\mathcal{W}''(s) < 0$. Since $\overline{\epsilon} < 1$, this implies $\frac{\partial^2 W(s)}{\partial s^2} > 0$. While the range of potentially beneficial subsidies is given by $[0, c - \Pi_L]$, by the convexity of $W(\cdot)$, one can simply look at the two extreme values of this set. No subsidy ($s = 0$) dominates

$s = c - \Pi_L$ if and only if $\mathcal{W}(0) < \mathcal{W}(c - \Pi_L)$, or equivalently $c > \Pi_R - (\Pi_R - \Pi_L)^2$.

There remains to show that whenever $c > \Pi_R$, $s = c - \Pi_R$ is optimal. At that level, the voter induces an equilibrium where $\alpha_R = 0$ and $\alpha_L = 1$. Notice that no value above $s = c - \Pi_R$ can improve the voter's payoff (by the convexity of $W(s)$ in $[c - \Pi_R, c - \Pi_L]$). Moreover, no value below $c - \Pi_R$ can induce an equilibrium with positive communication, hence $W(s) = W(0)$ for all $s \in [0, c - \Pi_R)$ There remains to show that $W(c - \Pi_R) > W(0)$. Using equation 4, we obtain $W(0) = \bar{\epsilon}$, and $W(c - \Pi_R) = \bar{\epsilon} + 1 - \bar{\epsilon}\Pi_R - (c - \Pi_R) > \bar{\epsilon} + \Pi_R(1 - \bar{\epsilon}) > \bar{\epsilon}$. □

Proof of Corollary 2

Proof. Throughout, we assume $c \in (\Pi_L, \Pi_R)$. Using (4), the voter's expected utility under the negative subsidy $s = -(c - \Pi_R)$ is $W(-(c - \Pi_R)) = 1 + \bar{\epsilon}\Pi_L$ (recall we assume the voter does not benefit from the tax proceeds). When $c > \tilde{c}$, the voter prefers a tax whenever $W(-(c - \Pi_R)) > W(0) = \bar{\epsilon} + 1 - \bar{\epsilon}c + (\bar{\epsilon} - 1)\frac{c(1-c) - \Pi_L\Pi_R}{(\Pi_R - \Pi_L)^2}$ (using (A.3)). It can be checked that $\frac{\partial W(0)}{\partial c} > 0 \Leftrightarrow c > \frac{1-\bar{\epsilon}}{2} + \frac{\bar{\epsilon}(\Pi_R - \Pi_L)^2}{2}$. Notice that $\frac{1-\bar{\epsilon}}{2} + \frac{\bar{\epsilon}(\Pi_R - \Pi_L)^2}{2} < \Pi_R$ as $\Pi_R < 1$. Since, in addition, $W(0)$ is continuous in c, $W(0)|_{c=\Pi_R} = W(-(c - \Pi_R))$, there exists $\widehat{c^t} \in [\Pi_L, \Pi_R)$ such that $W(-(c - \Pi_R)) > W(0)$ for all $c \in (\widehat{c^t}, \Pi_R)$. If $\widehat{c^t} \geq \tilde{c} \Leftrightarrow \bar{\epsilon} \geq 2\Pi_L$, denote $c^t := \widehat{c^t}$. Otherwise, denote $c^t := \Pi_L + \bar{\epsilon}(\Pi_R - \Pi_L) > \Pi_L$ the solution to $W(c - \Pi_L) = W(-(c - \Pi_R))$. □

B Extensions

B.1 Policy-motivated candidates

In the baseline model, we assumed that politicians are fully office-motivated, despite evidence that politicians in practice care substantially about the policies they enact. This extension shows that the rebalancing effect (Proposition 1) is not only robust, but might be even strengthened by introducing policy motivation. Suppose that politicians' payoff is augmented by a policy gain from having the high-effort policy implemented. Specifically j enjoys an additional payoff γ whenever the winner of the election chooses $p = 1$ (the case $\gamma = 0$

corresponds to the baseline model).

$$u_j(p_j, p_{-j}, y_j) = \mathbb{I}_{\{e=j\}}(1 - (k - \gamma)p_j) - cy_j + (1 - \mathbb{I}_{\{e=j\}})\gamma p_{-j}. \tag{B.1}$$

To illustrate the point in the starkest way, we also assume that Π_R is arbitrarily close to one. The strategic form associated to this game is given by[1]

$L\backslash R$	$p = 0$	$p = 1$
$p = 0$	$0, 1$	$\gamma, 1 - k - c + \gamma$
$p = 1$	$1 - k - c + \gamma, \gamma$	$\gamma - c, 1 - k - c + \gamma$

When $\gamma < k + c$ the unique mixed strategy equilibrium features $\alpha_L = \frac{c+k-\gamma}{1-\gamma}$ and $\alpha_R = 1 - \frac{c}{1-k+\gamma}$. Notice that the responsiveness of α_L is increasing in γ, while the responsiveness of α_R is decreasing: the rebalancing effect is *stronger* with policy motivation. The reason is that a politician benefits from the high-effort policy even when not in office. As a result, following an increase in the campaign cost, the leading candidate R must decrease substantially his probability of committing to the high-effort policy in order to incentivize his opponent to choose high effort.

In addition, the effect of greater campaign cost on the probability that the high effort policy is the same as in the baseline model. Indeed,

$$\alpha = \alpha_L + \alpha_R - \alpha_L\alpha_R = 1 - \frac{c}{1-k+\gamma} + \frac{c}{1-k+\gamma}\frac{c+k-\gamma}{1-\gamma}.$$

Therefore, $\frac{\partial\alpha}{\partial c} = \frac{2c+k-1}{(1-k+\gamma)(1-\gamma)} > 0 \Leftrightarrow c > \frac{1-k}{2}$. Hence, our results are robust to some policy-motivation as long as a politician's gain from implementing the voter's preferred policy is lower than the campaign and implementation costs associated with it.

B.2 Directly observable policies

Given its importance for the equilibrium analysis, an important question is whether Lemma 1 is robust to perturbations to the campaign technology. In particular, consider an extension

[1] It is straightforward to see that Lemma 1 extends with minor modifications to this environment: the 0 in both $V_J(1, 0, \sigma_{-j})$ and $V_J(0, 0, \sigma_{-j})$ is to be replaced by $\gamma\alpha_{-j}$ and $1 - k$ is to be replaced by $1 - k + \gamma$, and does not affect the comparison between the two.

of the model where j's platforms can be directly observed by the voter with probability ζ (the probability could be correlated with partisan imbalance) and are perfectly observable only when candidate j pays the campaign cost c.

While this makes the analysis more complicated, there is no equilibrium when one or both candidates do not advertise when $k > \zeta$. To see that, suppose both candidates were to commit to the high-effort policy and not advertise, candidate $j \in \{L, R\}$ would have an incentive to deviate to the low-effort policy whenever: $\Pi_j(1-k) < \zeta \times 0 + (1-\zeta)\Pi_j \Leftrightarrow k > \zeta$. Indeed, the voter anticipating commitment to $p = 1$ elects candidates according to the partisan shock in equilibrium. She would observe a deviation only with probability ζ which creates strong incentives for candidate j to deviate. A similar reasoning explains why an equilibrium with one candidate committing to $p = 1$ and not advertising does not exist. We thus conjecture that all our results hold whenever voter's probability of learning the platform is low without advertising (compared to the implementation cost).

In addition, if one were to relax the assumption that the partisan shock is not too large (i.e., relax $\bar{\epsilon} < 1$), a candidate's winning probability would be interior for any strategy pair. In particular, for each candidate the probability of reelection conditional on the voter not observing the platform ($\beta(0, y_{-j})$) would be bounded below by some $\underline{\beta} > 0$. As long as that lower bound is large enough, then Lemma 1 would go through and the analysis (albeit potentially complicated by the presence of more cases than the original model) would be unaffected.

C Additional information on data

Our empirical analysis of the $109th$ Congress is based on three main data sources: the University of Wisconsin Advertising Project,[2] the dataset compiled by Berry et al. (2010), and the 2005 *American Community Survey*.

[2]The data, obtained from a project of the University of Wisconsin Advertising Project, includes media tracking data from TNSMI/Campaign Media Analysis Group in Washington, D.C. The University of 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 University of Wisconsin Advertising Project or The Pew Charitable Trusts.

Our main dependent variable comes from Berry et al. (2010): *ln_outlays* is the logarithm of the total amount of discretionary federal spending (in 2005 dollars), averaged over the 2006 and 2007 fiscal years, received by each congressional district. In line with the existing empirical literature on political accountability (Snyder and Strömberg, 2010), we use this measure as a proxy for a representative's effort to secure beneficial policies for her/his district.

Our measure of campaign costs is the log weighted (by the share of the district population living in each of the relevant media market) average cost of the TV ads (we normalized its cost to a 30 seconds ad) aired during the 2003-2004 electoral campaign. Data on TV ads cost come from the University of Wisconsin Advertising Project *Presidential, Congressional, and Gubernatorial Advertising, 2003-2004* dataset (Goldstein and Rivlin, 2007). These data are observed at the media market (DMA) level, while our unit of analysis is the congressional district. To generate our measure we use information about zipcodes and zipcode population to construct, for every congressional district, an average ad cost weighted by the population in each of the media markets it belongs to.

Our measure of partisan imbalance is the log of (one plus) the percentage distance between the vote share of the Democratic and Republican candidates (John F. Kerry and George W. Bush) in the 2004 Presidential Election.[3]

D Details on robustness tests

To produce the baseline estimates reported in Table 1, we made a number of choices. Here we investigate whether these estimates are robust to these choices. We also provide evidence that the set of district-specific covariates that we employ are able to explain a large share of the variance in the ad cost variable, thereby allowing us to control for several potential confounding factors.

Using ad cost data from local and presidential races As argued in the paper, while not as severe as in other empirical analysis based on CMAG data, measurement error is a paramount source of concern. To partially address this problem, we compute the average ad price using information on ad cost from local and presidential races. The correlation

[3] We have obtained that measure from the Swing State Project, whose data are available at http://www.swingstateproject.com/diary/4161/.

between this measure and the average cost computed using house races is .80. Table D.4 replicates the last three columns of Table 4 using this alternative measure. The fact that the coefficients maintain sign and statistical significance, and are overall similar in magnitude, is further evidence against strong biases arising from measurement problems in the ad cost.

Alternative set of district-specific covariates The 2000 Census allows us to employ a larger set of covariates than the 2005 ACS (13 variables instead of 4). While redistricting increases noise, these variables can explain a larger share of variation of the ad cost, as documented in Table D.6 . Table D.5 describes these 13 variables in detail. Due to the combined effect of the higher noise and the loss of degrees of freedom, we choose to limit our set to three ACS variables plus the urbanization rate (which we included due to its importance in previous research and the strong impact of this variable on the cost of ads, as documented in Table D.6) in our baseline specification. Nevertheless, we believe it is important to see to what extent the basic message from the last three columns of Table 4 survives the inclusion of this larger set of covariates. The first column of Table D.9 essentially shows the effect of including only the extended set of district specific variables. The last two columns mirror the last two columns of Table 4, with the alterative set of census variables replacing the ACS variables. The magnitudes and signs of the coefficients are consistent with our baseline estimates, and the ad cost also remains significant.

Controlling for key determinants of TV ad cost Table D.6 shows the results of a linear regression of *ln_cost* on our sets of district-specific covariates. In the first four columns we employ the more parsimonious set of four ACS covariates. In the last column, we use the expanded set of 13 covariates from the 2000 Census (described in detail in Table D.5). The results show that these covariates are able to explain a significant share of the observed variance in ad cost.

Alternative cutoffs for missing political ad cost data As explained in the main body of the paper, the WiscAds data does not cover all the 210 DMAs. As a result, for some congressional districts, we can only observe the ad cost for a fraction of the population (or, in some cases, none). In our baseline specification, we only employ observations for which we are able to observe the ad cost for more than 90% of the district population. Table D.7 shows the same specifications in the last three columns of Table 4 using different cutoffs (data on TV ads referring to House races covering 75% of the district population in the first three columns, and data on TV ads referring to any race covering 75% of the district population in the last three columns). Our estimated coefficients are robust to the adoption of alternative cutoffs.

Alternative definition of the dependent variable In the baseline specification, our dependent variable is constructed by averaging federal outlays over the two fiscal years for which House members of the 109*th* Congress were responsible. Table D.8 shows estimates of the last three columns of Table 4 suing outlays from each of the two fiscal years (2006 and 2007) separately as dependent variable (that is, $ln\_outlays05$ in the first three columns and $ln\_outlays06$ in the last three).

Alternative definitions of partisan imbalance In our baseline specification, partisan imbalance is based on the 2004 Presidential Elections. Table D.10 displays estimates of the same equations in the last three columns of Table 4, where we replace $ln\_imbal04$, the variable measuring imbalance, with $ln\_imbal00$, which is based on the 2000 Presidential Elections and constructed analogously to $ln\_imbal04$.

Including DMA fixed effects Table D.11 shows how the estimates in the last three columns of Table 4 change when one adds DMA-specific fixed effects. Since the number of fixed effects for which multiple observations are available is fairly low (about a hundred), our main goal is to verify whether the estimates maintain their magnitude despite the drastic reduction in the degrees of freedom. As Table D.11 shows, the answer is yes.

Table D.1: Interaction Effects with trailing dummy

	(1)	(2)	(3)
Ad Cost	-2.141**	-2.415**	-2.649
	(-2.69)	(-2.16)	(-1.62)
Imbalance	-3.965**	-4.247*	-4.498
	(-2.27)	(-1.82)	(-1.28)
Disadvant	3.931	1.262	2.316
	(0.56)	(0.15)	(0.18)
Ad Cost × Imbalance	0.588**	0.612*	0.645
	(2.43)	(1.84)	(1.27)
Disadvant × Imbalance	-1.051	-0.823	-1.330
	(-0.35)	(-0.24)	(-0.29)
Disadvant × Ad Cost	-0.513	-0.182	-0.322
	(-0.52)	(-0.15)	(-0.17)
Disadvant × Ad Cost × Imbalance	0.146	0.137	0.209
	(0.33)	(0.27)	(0.31)
Observations	295	295	295
Congressman and District Covariates		✓	✓
State Fixed Effects			✓

t statistics in parentheses (standard errors clustered at state level).
*significant at 10%, **significant at 5%, ***significant at 1%
Congressman and District covariates include median income, population, minority, urban population, party dummy, leadership dummy, freshman dummy, chair dummies, ranking dummies, and committee membership dummies

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Table D.2: Positive spending and federal outlays

	(1)	(2)	(3)	(4)	(5)	(6)
Positive spending	0.486**	0.711**	0.596	0.453**	0.592**	0.545*
	(2.11)	(2.53)	(1.61)	(2.27)	(2.62)	(1.90)
Previous election margin		✓	✓		✓	✓
District Covariates		✓	✓		✓	✓
State FE			✓			✓
Observations	295	295	295	355	355	355
Coverage	90%, House	90%, House	90%, House	75% Any	75% Any	75% Any

t statistics in parentheses (standard errors clustered at state level).
*significant at 10%, **significant at 5%, ***significant at 1%
District Covariates include median income, population, minority, urban population

Table D.3: Federal outlays and estimated total expenditure

	(1)	(2)	(3)	(4)	(5)	(6)
Expenditure	-0.653*	-0.951**	-0.252	-0.624**	-0.707**	-0.101
	(-1.87)	(-2.66)	(-0.35)	(-2.04)	(-2.67)	(-0.18)
Imbalance	-1.991	-4.113**	-0.482	-1.763	-2.793**	0.334
	(-1.24)	(-2.55)	(-0.14)	(-1.31)	(-2.35)	(0.13)
Expenditure × Imbalance	0.147	0.300**	0.0203	0.127	0.196**	-0.0431
	(1.21)	(2.54)	(0.08)	(1.22)	(2.10)	(-0.21)
Congressman and District Covariates		✓	✓		✓	✓
State FE			✓			✓
Observations	109	109	109	129	129	129
Coverage	90%, House	90%, House	90%, House	75% Any	75% Any	75% Any

t statistics in parentheses (standard errors clustered at state level)
*significant at 10%, **significant at 5%, ***significant at 1%
Congressman and District covariates include median income, population, minority, urban population, party dummy, leadership dummy, freshman dummy, chair dummies, ranking dummies, and committee membership dummies

Table D.4: Estimating TV ad cost from House, Senate and Gubernatorial races

	(1)	(2)	(3)
Ad Cost	-1.914***	-1.928***	-2.156***
	(-5.95)	(-4.73)	(-4.09)
Imbalance	-3.368***	-2.662**	-2.586*
	(-3.52)	(-2.70)	(-1.92)
Imbalance × Ad Cost	0.484***	0.371***	0.360*
	(3.82)	(2.83)	(2.02)
Congressman and District Covariates		✓	✓
State FE			✓
Observations	295	295	295

t statistics in parentheses (standard errors clustered at state level)
*significant at 10%, **significant at 5%, ***significant at 1%
Congressman and District covariates include median income, population, minority, urban population, party dummy, leadership dummy, freshman dummy, chair dummies, ranking dummies, and committee membership dummies

Table D.5: The extended set of district-specific controls

Variable	Source	Description
Population	2000 Census	Log of district population.
Median Income	2000 Census	Log of median household income.
% Pop. above 65	2000 Census	Percentage of population above 65.
% Pop. Black	2000 Census	Percentage of blacks in the population.
% Pop. in Construction	2000 Census	Percentage of population employed in construction.
% Pop. in Public Schools	2000 Census	Percentage of population enrolled in public schools.
% Pop. in Farming	2000 Census	Percentage of population employed in farming.
% Pop. Foreign	2000 Census	Percentage of population foreign born.
% Pop. in Military	2000 Census	Percentage of population employed in military.
% Pop. in Rural Area	2000 Census	Percentage of population living in rural area.
% Pop. Unemployed	2000 Census	Percentage of population unemployed.
% Urban Pop.	2000 Census	Percentage of population living in an urban area.
Land Area	2000 Census	Log of district area (in square miles).

Table D.6: Determinants of ad cost

	(1)	(2)	(3)	(4)	(5)
Imbalance	0.063	0.063	-0.016	-0.017	-0.040
	(0.96)	(0.98)	(-0.32)	(-0.33)	(-0.91)
Median Income (ACS)	0.826***	0.804***	0.394	0.413	
	(3.37)	(3.05)	(1.43)	(1.50)	
Population (ACS)		0.265	0.513	0.206	
		(0.51)	(1.07)	(0.42)	
% Pop. Minority (ACS)			0.246	0.266	
			(0.61)	(0.63)	
% Urban Pop.			1.636***	1.741***	0.791**
			(5.29)	(5.70)	(2.37)
Population					-0.455
					(-1.61)
Median Income					0.770**
					(2.61)
% Pop. above 65					1.743
					(1.34)
% Pop. Black					-0.0168
					(-0.06)
% Pop. in Construction					22.80***
					(4.30)
% Pop. in Public School					3.369*
					(1.73)
% Pop. in Farming					-87.79***
					(-2.72)
% Pop. Foreign					-0.0962
					(-0.12)
% Pop. in Military					-11.48**
					(-2.15)
& Pop. in Rural Area					14.56*
					(1.97)
% Pop. Unemployed					15.40*
					(1.99)
Land Area					-0.135***
					(-2.77)
Constant	-2.359	-5.667	-5.769	-1.963	3.133***
	(-0.86)	(-0.94)	(-0.96)	(-0.32)	(2.95)
Observations	346	346	346	295	346
Adjusted R^2	0.104	0.103	0.316	0.299	0.428

t statistics in parentheses (standard errors clustered at state level)
*significant at 10%, **significant at 5%, ***significant at 1%

Table D.7: Alternative cutoffs for ad cost data

	(1)	(2)	(3)	(4)	(5)	(6)
Ad Cost	-2.177***	-2.178***	-2.353***	-2.236***	-2.167***	-2.433***
	(-5.57)	(-4.16)	(-3.41)	(-5.67)	(-3.98)	(-3.61)
Imbalance	-4.041***	-3.817***	-3.697**	-4.127***	-3.749***	-3.599**
	(-4.10)	(-3.54)	(-2.59)	(-4.25)	(-3.44)	(-2.59)
Imbalance × Ad Cost	0.588***	0.550***	0.536**	0.600***	0.537***	0.516**
	(4.27)	(3.58)	(2.61)	(4.41)	(3.45)	(2.57)
Congressman and District Covariates		✓	✓		✓	✓
State FE			✓			✓
Observations	333	333	333	346	346	346
Coverage	75%, House	75%, House	75%, House	75% Any	75% Any	75% Any

t statistics in parentheses (standard errors clustered at state level)

*significant at 10%, **significant at 5%, ***significant at 1%

Congressman and District covariates include median income, population, minority, urban population, party dummy, leadership dummy, freshman dummy, chair dummies, ranking dummies, and committee membership dummies

Table D.8: Year-by-year analysis

Dep. Variable	Outlays in 2006			Outlays in 2007		
	(1)	(2)	(3)	(4)	(5)	(6)
Ad Cost	-1.205***	-1.167***	-1.286***	-1.269***	-1.266***	-1.428***
	(-5.91)	(-4.41)	(-3.25)	(-4.95)	(-3.54)	(-3.54)
ln Imbalance	-2.302***	-2.012***	-2.270**	-2.423***	-2.333***	-2.455***
	(-4.18)	(-3.43)	(-2.61)	(-3.75)	(-2.99)	(-2.82)
Imbalance × Ad Cost	0.339***	0.289***	0.322**	0.348***	0.334***	0.350***
	(4.43)	(3.52)	(2.64)	(3.86)	(3.07)	(2.79)
Congressman and District Covariates		✓	✓		✓	✓
State FE			✓			✓
Observations	295	295	295	295	295	295

t statistics in parentheses (standard errors clustered at state level)
*significant at 10%, **significant at 5%, ***significant at 1%
Congressman and District covariates include median income, population, minority, urban population, party dummy, leadership dummy, freshman dummy, chair dummies, ranking dummies, and committee membership dummies

Table D.9: A larger set of district covariates (2000 Census)

	(1)	(2)	(3)
Ad Cost	-1.780***	-1.410**	-1.626***
	(-4.11)	(-2.59)	(-3.10)
Imbalance	-2.937**	-2.574**	-2.650*
	(-2.54)	(-2.16)	(-1.94)
Imbalance × Ad Cost	0.403**	0.346*	0.342*
	(2.49)	(2.01)	(1.75)
Observations	295	295	295
Congressman Covariates		✓	✓
Census Covariates	✓	✓	✓
State Fixed Effects			✓

t statistics in parentheses

*significant at 10%, **significant at 5%, ***significant at 1%

Congressman covariates include party dummy, leadership dummy, freshman dummy, chair dummies, ranking dummies, and committee membership dummies

Census covariates include % Urban Pop., Population, Median Income, % Pop. above 65, % Pop. Black,, % Pop. in Construction, % Pop. in Public School, % Pop. in Farming,, % Pop. Foreign, % Pop. in Military, & Pop. in Rural Area, % Pop. Unemployed, Land Area

Table D.10: Alternative definitions of partisan imbalance

	(1)	(2)	(3)
Ad Cost	-1.800***	-1.670***	-1.957**
	(-3.59)	(-2.71)	(-2.08)
Imbalance	-3.086**	-2.559*	-2.676
	(-2.29)	(-1.88)	(-1.35)
Imbalance × Ad Cost	0.458**	0.357*	0.375
	(2.45)	(1.88)	(1.37)
Congressman and District Covariates		✓	✓
State FE			✓
Observations	295	295	295

t statistics in parentheses (standard errors clustered at state level)
*significant at 10%, **significant at 5%, ***significant at 1%
Congressman and District covariates include median income, population, minority, urban population, party dummy, leadership dummy, freshman dummy, chair dummies, ranking dummies, and committee membership dummies

Table D.11: DMA fixed effects

	(1)	(2)	(3)
Ad Cost	-1.099	-1.382	-2.035*
	(-1.11)	(-1.43)	(-1.91)
Imbalance	-1.904	-1.378	-2.443
	(-0.97)	(-0.70)	(-1.14)
Imbalance × Ad Cost	0.333	0.230	0.370
	(1.21)	(0.83)	(1.22)
Observations	295	295	295
District Covariates		✓	✓
Congressman Covariates			✓
DMA Fixed Effects	✓	✓	✓

t statistics in parentheses

*significant at 10%, **significant at 5%, ***significant at 1%

District covariates include median income, population, minority, urban population

Congressman covariates include party dummy, leadership dummy, freshman dummy, chair dummies, ranking dummies, and committee membership dummies

Table D.12: Excluding low-imbalance districts

Excluded sample	Lowest 5% of Imbalance			Lowest 10% of Imbalance		
	(1)	(2)	(3)	(4)	(5)	(6)
Ad Cost	-2.305***	-2.343***	-2.512**	-2.029***	-1.979*	-2.520
	(-4.51)	(-3.61)	(-2.49)	(-2.78)	(-1.99)	(-1.60)
Imbalance	-4.276***	-4.149***	-4.258*	-3.707**	-3.387	-4.487
	(-3.15)	(-3.00)	(-2.01)	(-2.15)	(-1.67)	(-1.39)
Imbalance × Ad Cost	0.633***	0.598***	0.608*	0.551**	0.491	0.627
	(3.36)	(3.04)	(1.97)	(2.32)	(1.68)	(1.36)
Congressman and District Covariates		✓	✓		✓	✓
State FE			✓			✓
Observations	284	284	284	268	268	268

t statistics in parentheses (standard errors clustered at state level)

*significant at 10%, **significant at 5%, ***significant at 1%

Congressman and District covariates include median income, population, minority, urban population, party dummy, leadership dummy, freshman dummy, chair dummies, ranking dummies, and committee membership dummies