Campaign Spending and Hidden Policy Intentions

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February 2, 2017

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Motivation

Two ideas animate public concern about money in politics:

- Spending is effective
- Spending distorts policy outcomes

Motivation

It seems contradictory that spending works if it also distorts.

If well-funded candidates have been “bought” by special interests, shouldn’t high spending repel voters?

We could just conclude voters are irrational

Implications of a rational electorate

Apparently hardest for the popular story to hold up if voters are Bayesian updaters.

- High spending signals special-interest influence
- Spending restrictions deprive voters of information

But we should account for candidate incentives too.

- Raising money is costly
- Candidates want to win
- No one would spend if it meant losing votes

Tasks of the paper

1. Model campaign as a costly effort competition in which effort sends a signal
    - Effort improves candidate quality
    - Cost of exerting effort differs across candidates
    - These differences related to another dimension voters care about (i.e., policy)
2. Solve for equilibrium effort and electoral responses
3. Connect results to popular ideas about money in politics
    - Takes spending as form of effort
4. Investigate electoral effect of policy interventions
    - Focus on representativeness of eventual victor

Related literature

- Campaign finance and special-interest influence
  (Prat 2002, Coate 2004, Ashworth 2006)
- Implications of voter rationality
  (Ashworth and Bueno de Mesquita 2014)
- Endogenous valence
  (Meirowitz 2008, Ashworth and Bueno de Mesquita 2009)
- Signaling policy intentions
  (Banks 1990, Callander and Wilkie 2007)

Basic ingredients

1. Candidates receive private information
    - Marginal cost of effort
    - Policy intentions
    - Unobserved by electorate and other candidate
2. Candidates exert effort
    - Is costly
    - Signals policy intentions
    - Goal is to win
3. Voters observe effort, update beliefs, and vote
    - Care about effort and policy intentions

Who to have in mind

In the model:

- Candidates are *ex ante* identical
- No candidate-specific priors about policy intentions
- Effort/spending is only campaign instrument

High-profile national races are probably not a great fit.

Information environment

- Candidates $i \in \{1, 2\}$
- Types $t_i \in \{A, D\}$ (Advantaged, Disadvantaged)
  - Independent, identical across candidates
  - $\Pr(t_i = A) = p_A$
  - $\Pr(t_i = D) = 1 - p_A = p_D$
- Marginal costs of effort c_{t_i}, where $0 < c_A < c_D$
- Policy intentions x_{t_i}, where $\{x_A, x_D\} \subseteq \mathbb{R}$
  - But candidates are office-motivated

Candidate strategies and payoffs

- Each chooses $s_i \geq 0$
- Symmetric mixed strategy profile $\sigma = (\sigma_A, \sigma_D)$
    - Probability measures on $\mathbb{R}_+$
    - Support denoted $\operatorname{supp} \sigma_t$
    - Associated CDFs F_A, F_D
- Value of office normalized to 1
- Expected utility, informally:

$$Eu_i(s_i \mid t_i) = \Pr(i \text{ wins} \mid s_i) - c_{t_i} s_i$$

Voter strategies and beliefs

- Median voter m with ideal policy $x_m = 0$
- Chooses winner $v \in \{1, 2\}$
- Payoff from election:

$$u_m(s_1, s_2, v) = s_v - \beta \underbrace{|x_m - x_v|}_{=|x_v|},$$

where $\beta > 0$ is policy weight

Full motivation

Voter beliefs

- Belief system $\mu(s) = \Pr(t_i = A \mid s_i = s)$
    - By symmetry, same across candidates
- Normalized expected utility from electing candidate who spends s:
$$Eu_m(s) = s - \mu(s)\alpha,$$
where $\alpha = \beta(|x_A| - |x_D|)$
- $\alpha \leq 0 \Leftrightarrow |x_A| \leq |x_D|$: Advantaged type "in the majority"
- $\alpha > 0 \Leftrightarrow |x_A| > |x_D|$: Advantaged type "in the minority"

Probability of victory

Given strategy profile σ, probability of victory as function of effort is

$$\lambda(s) = p_A \int \xi(s, s')\, d\sigma_A(s') + p_D \int \xi(s, s')\, d\sigma_D(s')$$

where $\xi(s, s')$ is probability median voter chooses candidate who spends s against one who spends s'.

Candidate best responses

In equilibrium, strategy of each $t \in \{A, D\}$ maximizes

$$Eu_t(s) = \lambda(s) - c_t s$$

Ex ante expected utility of type t:

$$U_t = \int Eu_t(s) \, d\sigma_t(s)$$

Solution concept

Analogue of PBE for infinite game:

1. Median voter's strategy is best response, given beliefs
2. Candidate mixed strategies are mutual best responses, given median voter's strategy
3. Beliefs consistent with Bayes' rule when possible
    - At mass points, $\mu(s) = \dfrac{p_A \sigma_A(\{s\})}{p_A \sigma_A(\{s\}) + p_D \sigma_D(\{s\})}$
    - Where densities exist, $\mu(s) = \dfrac{p_A F'_A(s)}{p_A F'_A(s) + p_D F'_D(s)}$
4. Off-path beliefs survive D1 (Cho and Kreps 1987)

Plan of action

1. Derive some general properties of equilibria
2. Solve for equilibrium under D1
3. Take comparative statics

Spending is positively correlated with winning

Remark 1

On the equilibrium path, greater spending is associated with a greater probability of victory. ▸ Formal statement

Proof:

- Spending is costly
- Profitable to deviate if could get same chance of winning for less effort

But note—may not apply to counterfactuals.

Advantaged candidates are weakly better off

Remark 2

In equilibrium, $U_A \geq U_D$.

Proof: Since $c_A < c_D$,

$$U_A = \max_{s \in \mathbb{R}_+} [\lambda(s) - c_A s] \geq \max_{s \in \mathbb{R}_+} [\lambda(s) - c_D s] = U_D$$

Holds regardless of policy difference—A always has option to mimic D.

Beliefs under D1

Lemma 6 (Appendix)

Let
$$\hat{s} = \frac{U_A - U_D}{c_D - c_A}.$$
An equilibrium survives D1 if and only if
$$\begin{aligned} s < \hat{s} \qquad &\Rightarrow \qquad \mu(s) = 0, \\ s > \hat{s} \qquad &\Rightarrow \qquad \mu(s) = 1 \end{aligned}$$
for all off-the-path $s \leq \max_{t \in \{A,D\}} \{(1 - U_t)/c_t\}$.

Beliefs under D1

Proof: Let $q_t(s)$ be victory probability that would weakly induce type t to deviate to s.

$$q_A(s) = U_A + c_A s$$
$$q_D(s) = U_D + c_D s$$

If $s > \max_{t \in \{A,D\}}\{(1 - U_t)/c_t\}$, then $q_A(s) > 1$ and $q_D(s) > 1$, so no restriction under D1.

Otherwise, D1 requires $\mu(s) = 1$ if "easier" to get A to deviate:

$$q_A(s) < q_D(s) \qquad \Leftrightarrow \qquad s > \frac{U_A - U_D}{c_D - c_A} = \hat{s}$$

Advantaged candidates spend weakly more

Remark 3

In equilibrium,

$$\max \operatorname{supp} \sigma_D \leq \underbrace{\frac{U_A - U_D}{c_D - c_A}}_{\hat{s}} \leq \min \operatorname{supp} \sigma_A.$$

Intuition why A never spends less than D:

- If D spends s, then $Eu_D(s) \geq Eu_D(s')$ for all $s' < s$
- Since $c_A < c_D$, this implies $Eu_A(s) > Eu_A(s')$ for all $s' < s$

Full proof is by algebra. ▸ The algebra

Advantaged candidates are weakly more likely to win

Remark 4

In equilibrium, Advantaged candidates have a weakly greater interim chance of victory:

$$\int \lambda(s)\, d\sigma_A(s) \geq \int \lambda(s)\, d\sigma_D(s)$$

Proof:

- Advantaged candidates spend weakly more (Remark 3)
- Greater spending implies greater chance of winning (Remark 1)

Initial conclusion

Fundraising advantage $\Rightarrow$ (weak) electoral advantage.

- Not because voters are irrational
- Always possible to conceal advantage
- Not possible to reveal disadvantage (when you'd want to)

Next: When do Advantaged candidates conceal their type?
How does reform shape who gets elected?

Equilibrium analysis

Two major cases:

1. Advantaged candidates in the majority (easier)
2. Advantaged candidates in the minority (more interesting)

Solve for essentially unique equilibrium under D1.

Comparative statics on:

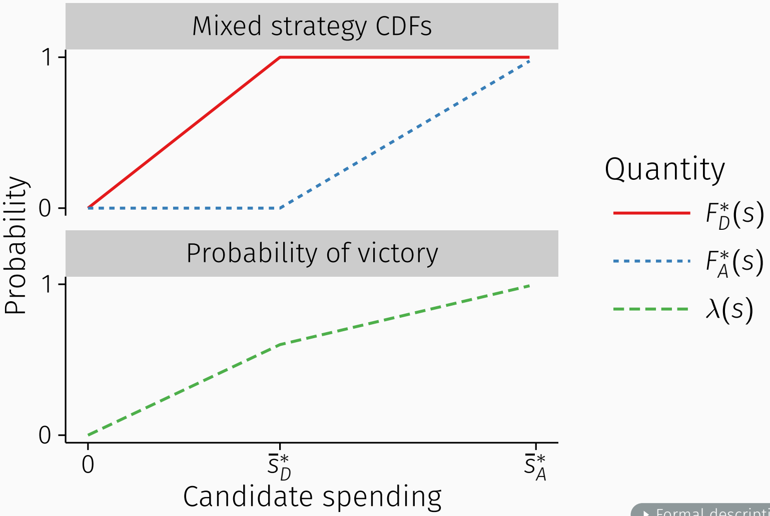
- α: relative policy distance from median (or electorate's weight on policy)
- c_A: marginal cost of effort for Advantaged type

Advantaged in the majority

Good things go together when Advantaged types in majority.

- High spending is costly signal of centrist intentions
- Fully separating equilibrium
- Mixed strategies (per symmetry + auction logic)

Advantaged in the majority: equilibrium (Prop. 1)



Formal description

Advantaged in the majority: comparative statics

Relative policy distance α:

- No marginal effect on equilibrium behavior

Marginal cost c_A:

- Does not affect probability of electing A
- Increases in c_A decreases A's effort

Advantaged in the minority

When $\alpha > 0$, high effort sends an undesirable signal to the median voter.

Advantaged candidates have effectively two choices:

1. Conceal type by not spending, tie the election
2. Spend enough to make up for bad signal and win

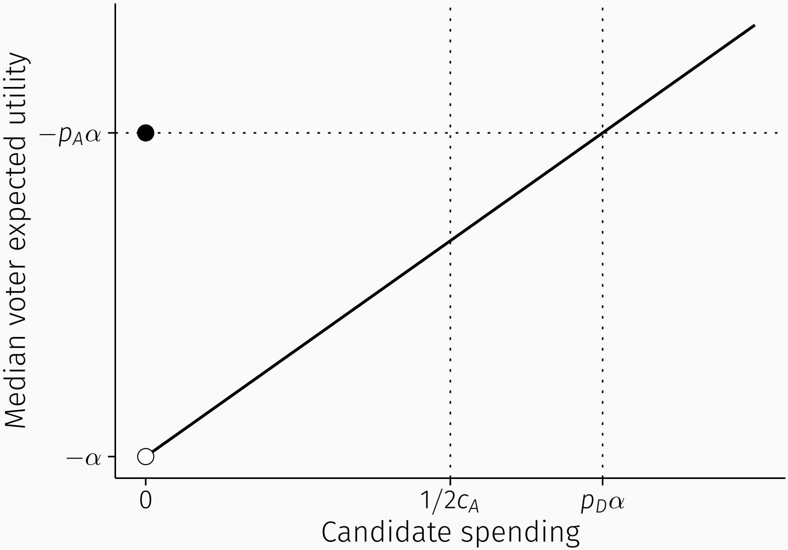
Advantaged in the minority: total concealment (Prop. 2)

Full pooling on $s = 0$ if

- High relative policy distance α
- High marginal cost of effort c_A

(formally: $c_A\alpha \geq 1/2p_D$)

Advantaged in the minority: total concealment

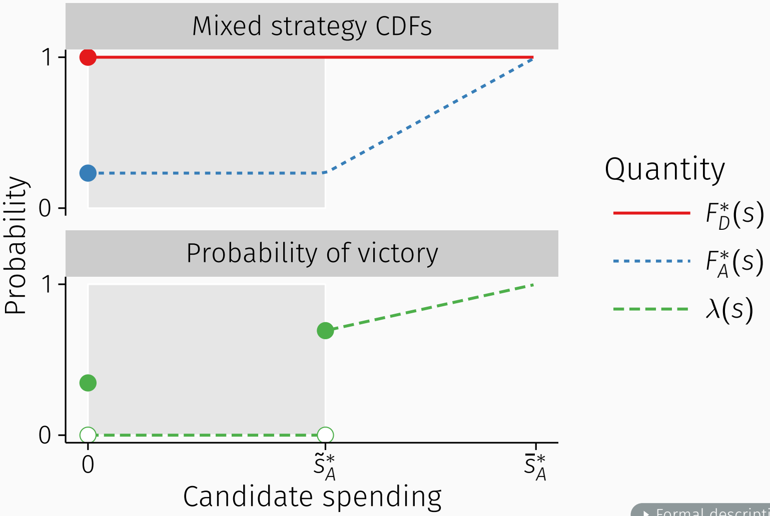


Advantaged in the minority: partial concealment (Prop. 3)

In a middle range of the key parameters ($p_D/2 < c_A\alpha < 1/2p_D$), equilibrium is partially separating.

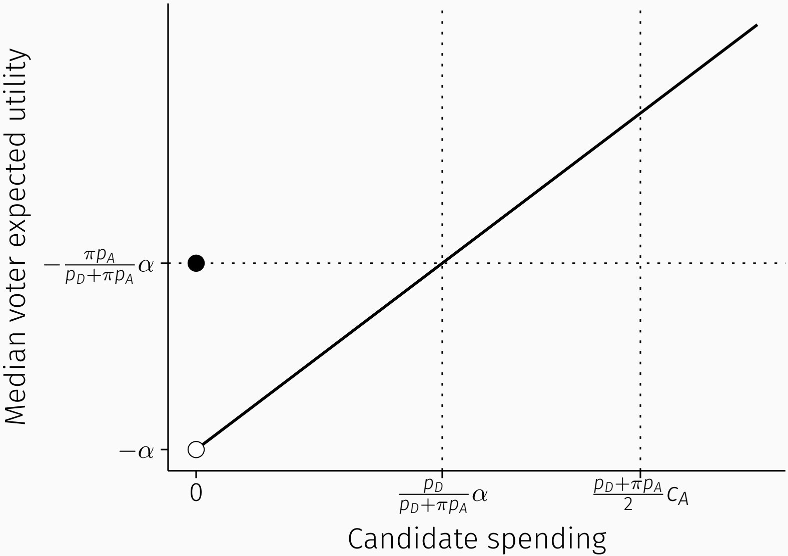
- D spends 0 for sure
- A spends 0 with probability $\pi^* > 0$

Advantaged in the minority: partial concealment (Prop. 3)

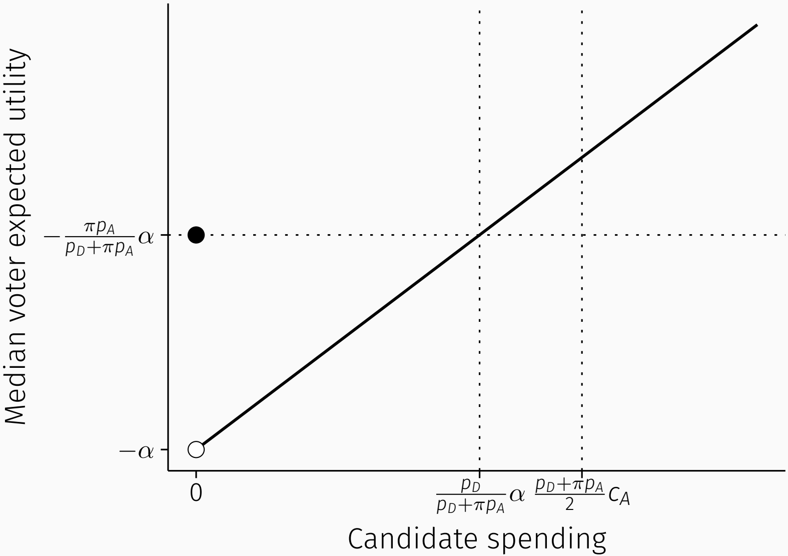


▸ Formal description

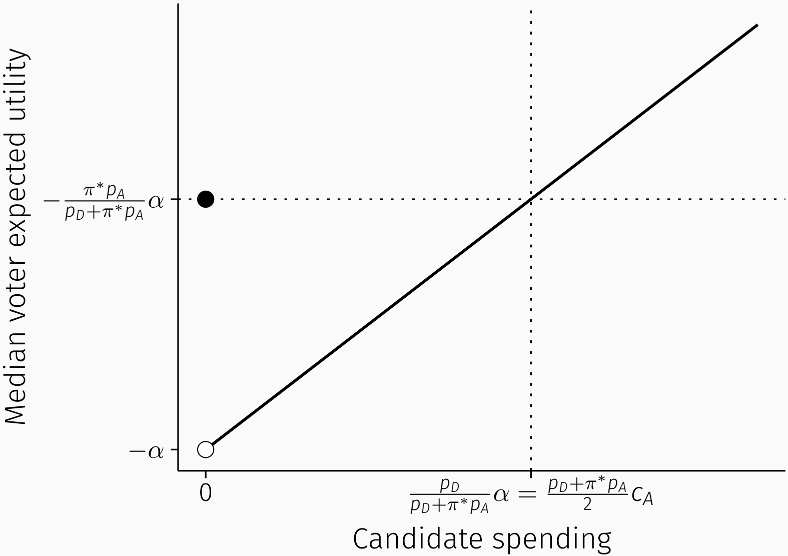
Advantaged in the minority: partial concealment (Prop. 3)



Advantaged in the minority: partial concealment (Prop. 3)



Advantaged in the minority: partial concealment (Prop. 3)



Partial concealment: comparative statics

Probability A spends nothing

- Increases with relative policy distance α
- Increases with marginal cost c_A

More concealment $\Rightarrow$ policy outcomes closer to median.

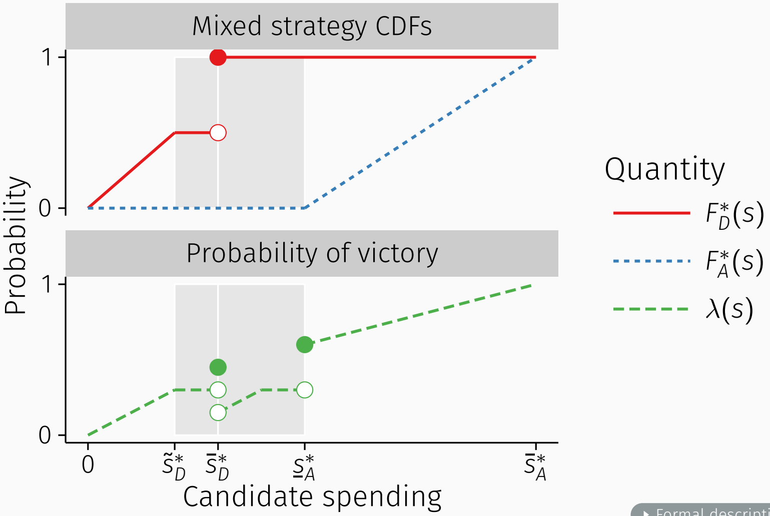
Advantaged in the minority: full separation (Prop. 4)

If key parameters small enough ($c_A \alpha \leq p_D/2$), full separation in equilibrium, and positive effort almost surely.

Not a mirror image of when Advantaged in the majority![1]

[1]Though it converges as $\alpha \to 0$.

Advantaged in the minority: full separation (Prop. 4)



▸ Formal description

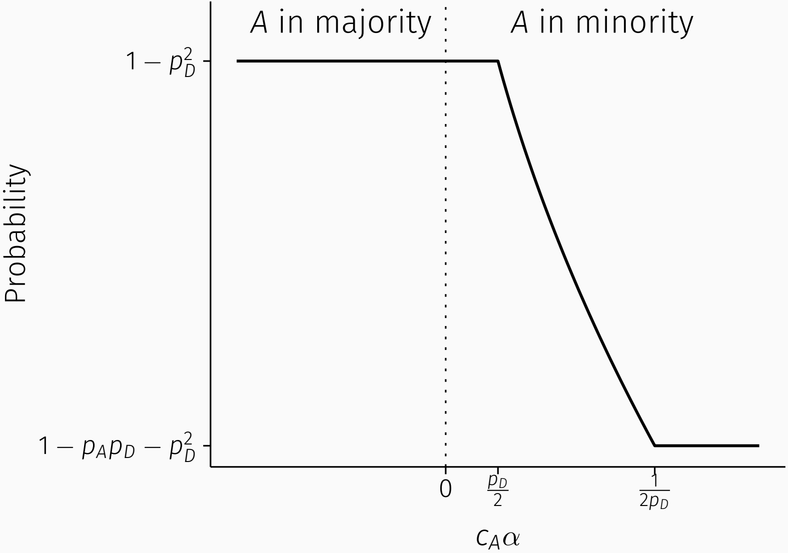
Equalizing reform

Imagine a reform that raises the marginal cost of effort for Advantaged types.

- Advantaged in minority:
    - Increases (weakly) probability of concealment
    - Decreases (weakly) probability of victory
- Advantaged in majority: no effect

So this reform *never* decreases chance of electing the type closer to the median voter.

Ex ante probability an Advantaged candidate wins



Extension: public financing

- Each candidate can forego fundraising to spend $\ell > 0$ at no personal cost
- Choice to do so is public, after learning types

Upshot of results:

- If ℓ large enough, pooling on public finance is equilibrium
- When A in minority, conditions for total concealment become strictly weaker for any ℓ
- When A in majority, original equilibrium still holds up with sufficiently small ℓ

Extension: correlated types

Imagine that A is relatively likely to draw D as opponent, and vice versa.

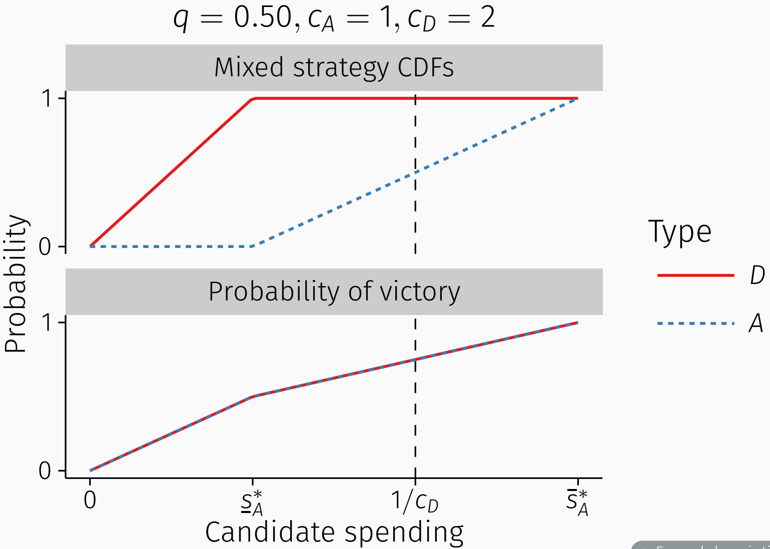
Joint distribution of types

	$t_2 = A$	$t_2 = D$
$t_1 = A$	$q/2$	$(1-q)/2$
$t_1 = D$	$(1-q)/2$	$q/2$

where $0 < q < 1/2$.

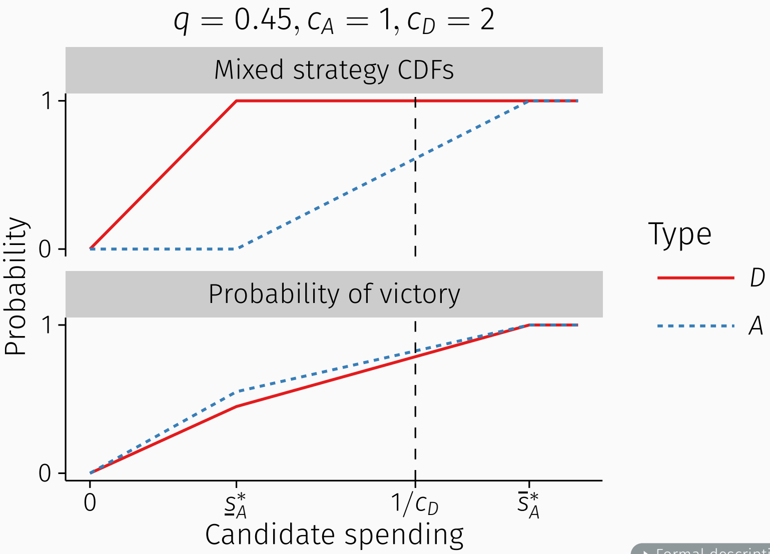
Does an Advantaged candidate still always defeat a Disadvantaged opponent when $\alpha \leq 0$?

Correlated types: equilibrium (Prop. 7–8)



▸ Formal description

Correlated types: equilibrium (Prop. 7–8)



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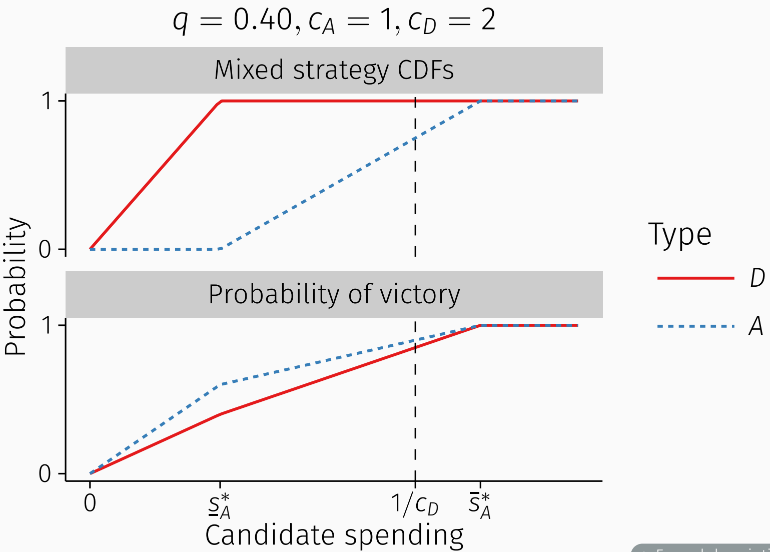

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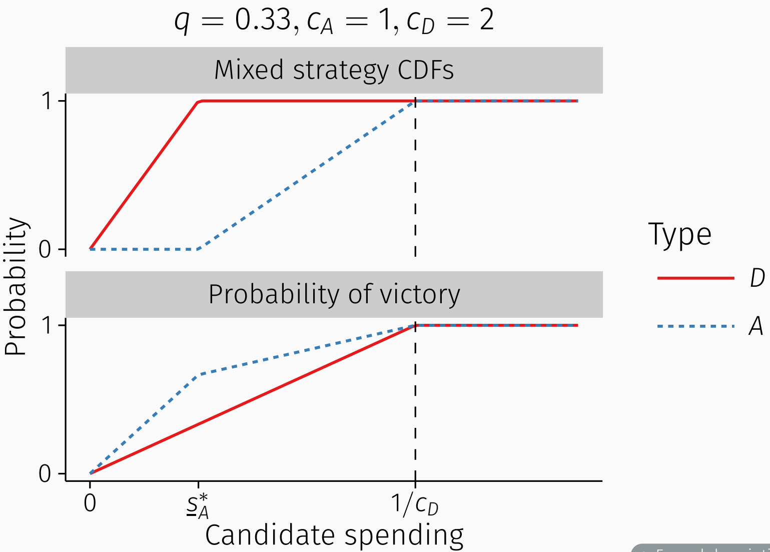

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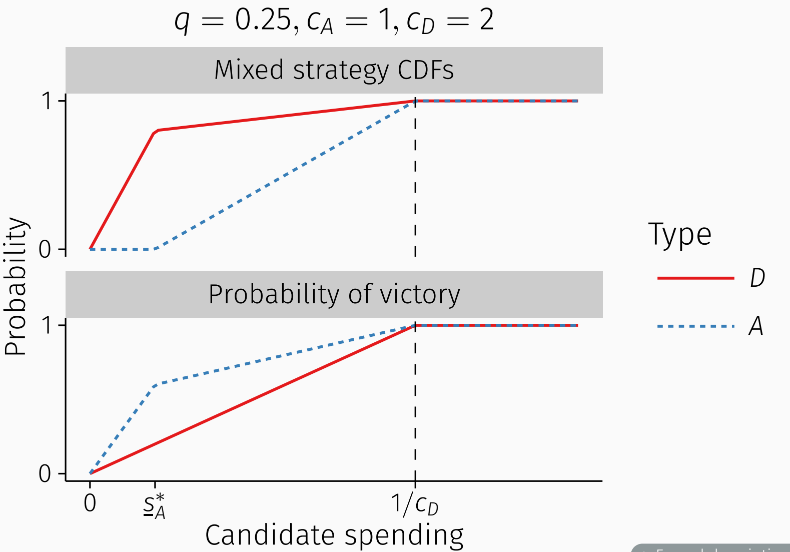

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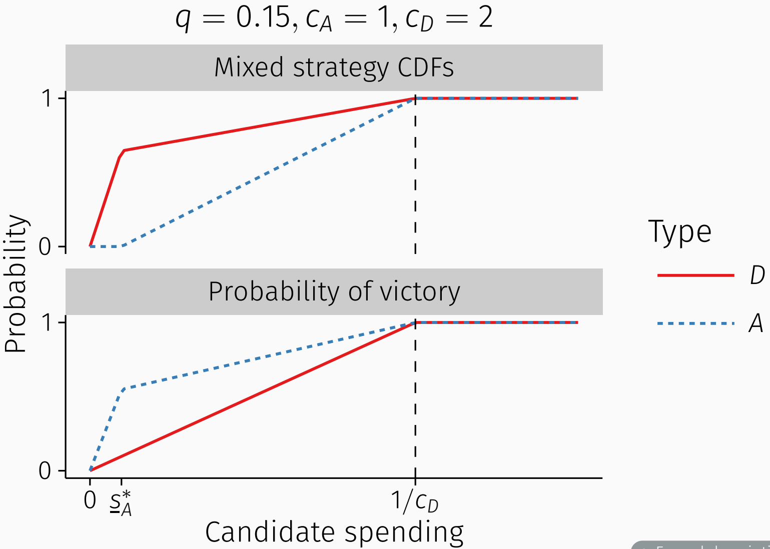
Correlated types: equilibrium (Prop. 7–8)



▸ Formal description

Conclusions

- Some support for popular “money in politics” narrative
  - Fundraising advantage gives electoral advantage (though sometimes weak)
  - Equalizing reforms improve representativeness (with caveat in case of high interdependence)
- Information and electoral outcomes
  - Electoral outcomes are most representative when the voters don’t learn the candidates’ types
  - Key problem is inability to credibly signal one’s disadvantage
- Effort contests with signaling look much different than those without

Voter strategies and payoffs

- Voters $j \in \{1, \ldots, N\}$ (odd)
- Each chooses $v_j \in \{1, 2\}$ (majority rule)
- Distinct ideal points $x_j \in \mathbb{R}$
  - Median m
  - $x_m = 0$ (WLOG)
- Payoff from election:

$$u_j(s_1, s_2, v_1, \ldots, v_N) = \begin{cases} s_1 - \beta|x_j - x_1| & \text{if 1 wins,} \\ s_2 - \beta|x_j - x_2| & \text{if 2 wins.} \end{cases}$$

- In equilibrium, if no voter uses weakly dominated strategy, median's preference always wins

◂ Abbreviated motivation

Remark 1: formal statement

Remark 1

In equilibrium, for each $t \in \{A, D\}$, for σ_t-almost all s, if $s' < s$, then $\lambda(s') < \lambda(s)$.

◂ Informal statement

Remark 3: algebra

If $s > \hat{s}$,

$$
\begin{aligned}
Eu_D(s) &= \lambda(s) - c_D s \\
&= \lambda(s) - c_A s - (c_D - c_A)s \\
&\leq U_A - (c_D - c_A)s \\
&< U_A - (c_D - c_A)\hat{s} \\
&= U_A - (U_A - U_D) \\
&= U_D.
\end{aligned}
$$

Since $Eu_D(s) < U_D$ for all $s > \hat{s}$, we have $\operatorname{supp} \sigma_D \cap (\hat{s}, \infty) = \emptyset$.

◂ Remark 3

Proposition 1: formal description

Condition: $\alpha \leq 0$.

$$
F_D^*(s) = \begin{cases} 0 & s < 0, \\ c_D s / p_D & 0 \leq s \leq \bar{s}_D^*, \\ 1 & s > \bar{s}_D^*, \end{cases}
$$

$$
F_A^*(s) = \begin{cases} 0 & s < \bar{s}_D^*, \\ c_A (s - \bar{s}_D^*) / p_A & \bar{s}_D^* \leq s \leq \bar{s}_A^*, \\ 1 & s > \bar{s}_A^*, \end{cases}
$$

$$
\bar{s}_D^* = \frac{p_D}{c_D},
$$

$$
\bar{s}_A^* = \bar{s}_D^* + \frac{p_A}{c_A}.
$$

◂ Figure

Proposition 3: formal description

Condition: $p_D/2c_A < \alpha < 1/2c_A p_D$.

$$F_D^*(s) = \begin{cases} 0 & s < 0, \\ 1 & s \geq 0, \end{cases}$$

$$F_A^*(s) = \begin{cases} 0 & s < 0, \\ \pi^* & 0 \leq s < \tilde{s}_A^*, \\ \pi^* + c_A(s - \tilde{s}_A^*)/p_A & \tilde{s}_A^* \leq s \leq \bar{s}_A^*, \\ 1 & s > \bar{s}_A^*, \end{cases}$$

$$\pi^* = \frac{\sqrt{2\alpha c_A p_D} - p_D}{p_A},$$

$$\tilde{s}_A^* = \frac{\pi^* p_A + p_D}{2c_A},$$

$$\bar{s}_A^* = \tilde{s}_A^* + \frac{(1 - \pi^*)p_A}{c_A}.$$

◂ Figure

Proposition 4: formal description

Condition: $\alpha \le p_D/2c_A$

$$F_D^*(s) = \begin{cases} 0 & s < 0, \\ c_D s/p_D & 0 \le s \le \tilde{s}_D^*, \\ 1 - \rho^* & \tilde{s}_D^* < s < \bar{s}_D^* \\ 1 & s \ge \bar{s}_D^*, \end{cases}$$

$$F_A^*(s) = \begin{cases} 0 & s < \underline{s}_A^*, \\ c_A(s - \underline{s}_A^*)/p_A & \underline{s}_A^* \le s \le \bar{s}_A^*, \\ 1 & s > \bar{s}_A^*, \end{cases}$$

$$\rho^* = \frac{2c_A\alpha}{p_D}, \qquad \underline{s}_A^* = \bar{s}_D^* + \alpha,$$

$$\tilde{s}_D^* = \frac{p_D - 2c_A\alpha}{c_D}, \qquad \bar{s}_A^* = \underline{s}_A^* + \frac{p_A}{c_A}.$$

$$\bar{s}_D^* = \frac{p_D - c_A\alpha}{c_D},$$

◂ Figure

Proposition 7: formal description

Condition: correlated types, $\alpha \leq 0$, $q \geq c_A/(c_A + c_D)$.

$$F_D^*(s) = \begin{cases} 0 & s < 0, \\ c_D s/q & 0 \leq s \leq \underline{s}_A^*, \\ 1 & s > \underline{s}_A^*, \end{cases}$$

$$F_A^*(s) = \begin{cases} 0 & s < \underline{s}_A^*, \\ c_A(s - \underline{s}_A^*)/q & \underline{s}_A^* \leq s \leq \bar{s}_A^* \\ 1 & s > \bar{s}_A^*, \end{cases}$$

$$\underline{s}_A^* = \frac{q}{c_D},$$

$$\bar{s}_A^* = \underline{s}_A^* + \frac{q}{c_A}.$$

◂ Figure

Proposition 8: formal description

Condition: correlated types, $\alpha \leq 0$, $q < c_A/(c_A + c_D)$.

$$F_D^*(s) = \begin{cases} 0 & s < 0, \\ c_D s/q & 0 \leq s \leq \underline{s}_A^*, \\ c_D \underline{s}_A^*/q + k_D(s - \underline{s}_A^*) & \underline{s}_A^* \leq s \leq 1/c_D, \\ 1 & s > 1/c_D, \end{cases}$$

$$F_A^*(s) = \begin{cases} 0 & s < \underline{s}_A^*, \\ k_A(s - \underline{s}_A^*) & \underline{s}_A^* \leq s \leq 1/c_D, \\ 1 & s > 1/c_D, \end{cases}$$

$$\underline{s}_A^* = \frac{1 - c_A/c_D}{(1-q)c_D/q - c_A},$$

$$k_D = \frac{(1-q)c_A - qc_D}{1-2q}, \qquad k_A = \frac{(1-q)c_D - qc_A}{1-2q}.$$

◂ Figure