Lecture 3: The differentiated candidates model

Mattias Polborn (Illinois)

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Mattias Polborn (Illinois)

June 10, 2010

Today's program

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So far, we have seen:

- Models without fixed characteristics
- Model with a special form of fixed characteristics
  - Spatial model with valence
  - Probabilistic voting model
  - Binary policy model

What is special about the existing models with fixed characteristics?

- Voter preferences on policy dimension are independent of fixed characteristics (fits beauty, but maybe not competence)
- Valence models as a model of competence
  - If equilibrium convergence: All voters unanimously vote for one of the candidates
  - Randomization (e.g., Aragones and Palfrey) $\Rightarrow$ sometimes extremely conservative voters vote for the Democrat, extremely liberal voters for the Republican

The model – actions and timing

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- Two candidates, $j = 0, 1$
- Candidates are office-motivated: They receive utility 1 if elected, and utility 0 otherwise
- Candidate j has fixed characteristics $c_j \in C$, which we also call his *type*
- Candidate j chooses which policy position $a_j \in A$ to propose (simultaneous proposals from both candidates)
- Each citizen votes for his preferred candidate, or abstains when he is indifferent
- Candidate j wins the election if he receives more votes than his opponent. In case of a tie between the candidates, each wins with probability $1/2$.

The model – voter preferences and uncertainty

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- Uncertainty about voter preferences is described by a probability space $(\Omega, \mathfrak{O}, \mu)$
- The preferences of voter $\ell \in \mathfrak{L} = \{1, \ldots, L\}$ in state $\omega \in \Omega$ are $\succeq_\omega^\ell \in P_r$, where P_r: set of preferences on $C \times A$
- Often, we denote a voter's type by θ, and we write $u_\theta(c, a)$ for the voter's utility function

Role of uncertainty:

- For a given distribution of voter preferences, one candidate can usually force a win
- $\Rightarrow$ The loser can do anything in equilibrium
- The winner can usually win with several different policy proposals
- Uncertainty about voter preferences can serve as a refinement (forces both candidates to take their choices serious)

Policy convergence: Identical candidates

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Theorem (Theorem 1)

Suppose that $c_0 = c_1$.

1. *If there exists a pure strategy Nash equilibrium (a_0, a_1) with $a_0 \neq a_1$, then (a_0, a_0) and (a_1, a_1) are also pure strategy Nash equilibria.*
2. *If there exists a strict Nash equilibrium (a_0, a_1) then $a_0 = a_1$ and this strict Nash equilibrium is the unique Nash equilibrium (pure or mixed).*

- Holds for general preferences and probability distributions over voter preferences
- Divergence is possible, but only in weak form
- Whenever there is an equilibrium with divergence, there is also one with convergence

Uniform candidate ranking

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Definition (UCR)

Preferences $\succeq_\omega$ on $C \times A$ allow for a **uniform candidate ranking (UCR)** if, in any state ω, the following holds:

$$(c_0, a) \succeq_\omega (c_1, a) \text{ if and only if } (c_0, a') \succeq_\omega (c_1, a'), \qquad (1)$$

for all $c_0, c_1 \in C$ and all $a, a' \in A$.

Uniform candidate ranking

Theorem (Theorem 2)

Let A and C be subsets of an Euclidean space. The following statements are equivalent:

1. *Rational (i.e., complete and transitive) and continuous preferences $\succeq_\theta$ on $C \times A$ satisfy UCR.*
2. *The preferences $\succeq_\theta$ can be described by a continuous utility function $u(c, a, \theta) = g(f(c), a, \theta)$ where $f : C \to Y \subset \mathbb{R}$ is continuous, and $g : Y \times A \times \Theta \to \mathbb{R}$ is continuous and strictly monotone in $y \in Y$.*

UCR is weaker than separability

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Example

2 issues, 2 positions:
Candidate 0: $(0, x)$
Candidate 1: $(1, y)$
Voter preference ranking: $(0,0) \succ (0,1) \succ (1,1) \succ (1,0)$.

- Preferences satisfy UCR: Candidate 0 is always preferred to Candidate 1.
- However, these preferences cannot be represented by an additively separable utility function.

Complementarity violates UCR

Example

Issue 1: "Has served in the military"; Issue 2: "Continue a war"

Candidate 0: $(0, x)$

Candidate 1: $(1, y)$

C0 is better in peacetime, C1 is better in war

Plausible preference profiles:

A: $(0,0) \succ (1,1) \succ (1,0) \succ (0,1)$;

B: $(0,0) \succ (1,1) \succ (0,1) \succ (1,0)$;

C: $(1,1) \succ (0,0) \succ (0,1) \succ (1,0)$;

D: $(1,1) \succ (0,0) \succ (1,0) \succ (0,1)$;

E: $(0,0) \succ (1,0) \succ (1,1) \succ (0,1)$;

F: $(1,1) \succ (0,1) \succ (0,0) \succ (1,0)$.

Policy convergence in any strict NE under UCR

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Theorem (Theorem 3)

Suppose that all voters have UCR preferences in all states ω. Then

1. *There is policy convergence in any strict Nash equilibrium (a^0, a^1), i.e., $a_i^0 = a_i^1$ for all $i \notin F$.*
2. *If there exists a strict Nash equilibrium then it is the unique Nash equilibrium (pure or mixed).*

Intuition for Theorem 3

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- Suppose both candidates choose the same policy a. Since voters have UCR preferences, the winning probabilities do not change if both candidates switch to a'.
- $\Rightarrow$ Entries on the diagonal of the payoff matrix (i.e., where $a_0 = a_1$) are identical, though not necessarily equal to $1/2$.
- $\Rightarrow$ Strict Nash equilibria can never be off the diagonal
- There cannot be multiple strict Nash equilibria on the diagonal

"Necessity" of UCR for policy convergence

A condition on each individual voter's preferences cannot really be expected to be necessary for convergence (Cf. "single-peaked preferences" for existence of a CW), but ...

Theorem (Theorem 4)

Let $\succeq$ be some arbitrary non-UCR preferences on $C \times A$. Then there exists a voting game with the following property:

1. *One citizen has preferences $\succeq$ and all other citizens have UCR preferences.*
2. *There exists a strict Nash equilibrium with policy divergence. Further, this is the unique Nash equilibrium (pure or mixed).*

The specialized candidates model

Two office-motivated candidates, $j = 0, 1$
Policy platform $a^j \rightarrow$

$$x_0 = G_0^j(\gamma_0^j, a^j) = \gamma_0^j a^j \tag{2}$$

$$x_1 = G_1^j(\gamma_1^j, a^j) = \gamma_1^j(1 - a^j), \tag{3}$$

Assume: $\gamma_0^0 > \gamma_0^1$ and $\gamma_1^1 > \gamma_1^0$
(C0 has an advantage in providing good 0, and C1 has an advantage in providing good 1.)

The model — candidates

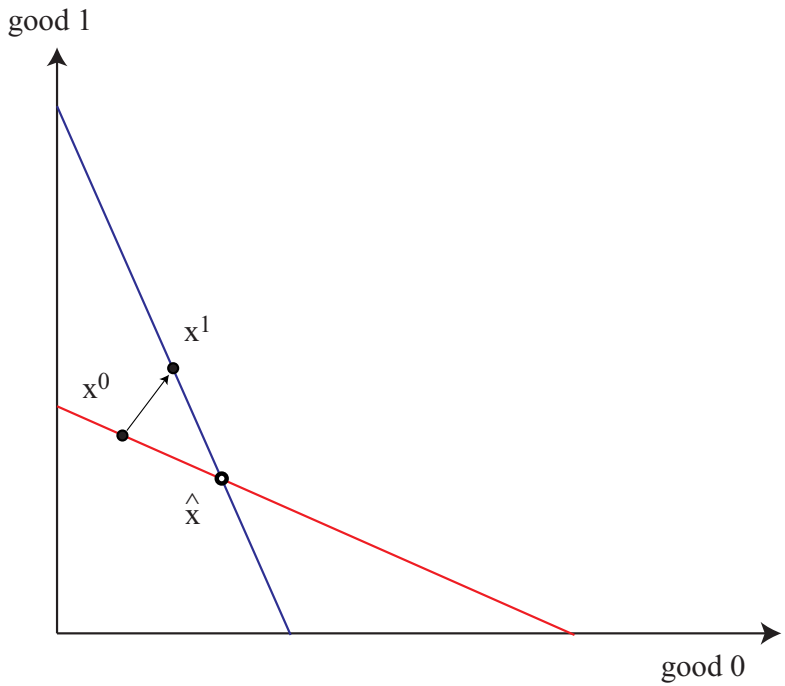

Figure: Candidates' PPFs

The model — voters

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- Voter t's utility function:

$$v(x_0, x_1, t) = (1-t)v_0(x_0) + tv_1(x_1)$$

Higher $t \Rightarrow$ Good 1 is more important $\Rightarrow$ Flatter indifference curves

$$\frac{dx_1}{dx_0} = -\frac{1-t}{t}\frac{v_0'(x_0)}{v_1'(x_1)}$$

The model — voters

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Higher $t \Rightarrow$ Good 1 is more important $\Rightarrow$ Flatter indifference curves

$$\frac{dx_1}{dx_0} = -\frac{1-t}{t}\frac{v_0'(x_0)}{v_1'(x_1)}$$

- Uncertainty about the distribution of voters: $t_m(\omega) \sim F(\cdot)$
  - Uncertainty about voter preferences quite realistic
  - Equivalence of maximizing probability of winning and vote share

Model – timing

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Stage 1 Candidates $j = 0, 1$ simultaneously announce policies $a^j \in [0, 1]$.

Stage 2 Each citizen votes for his preferred candidate (abstains when indifferent).
The candidate with a majority of votes wins, collects taxes and provides the public goods.

Causes and consequences of heterogeneous candidate abilities

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Why do candidates have different production possibilities?

- Candidates with different background
- Self-sorting of citizens: Those more interested in good 0 are presumably better in good 0 provision and assemble in party 0
- Incumbent may have acquired specific knowledge

Differences between production functions do not need to be "large"

- Focus on valence issues (Stokes 1963)
- We assume that dominance is not uniform.

Production possibility sets and non-equilibrium choices

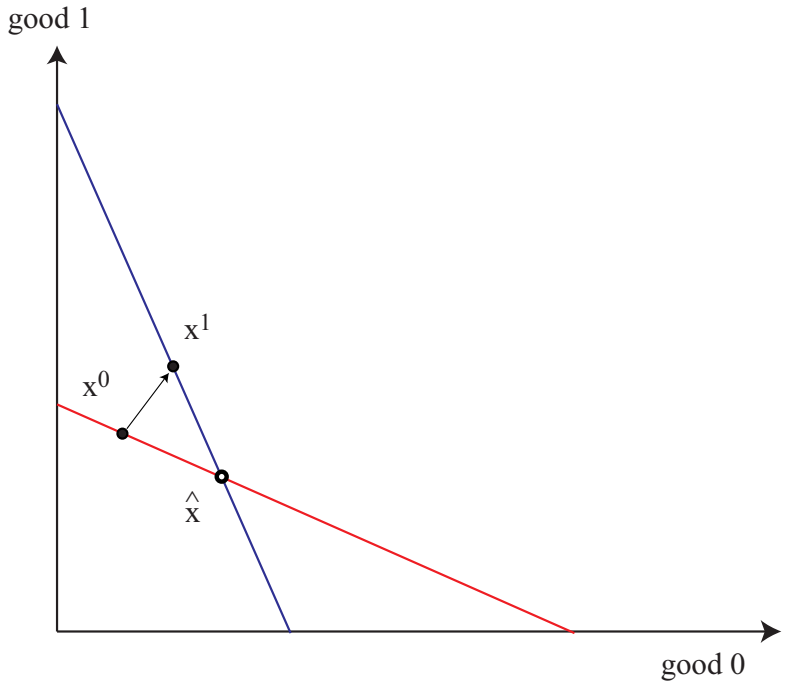

Figure: Candidates' PPFs; no equilibrium platform in inefficient region

Production possibility sets and non-equilibrium choices

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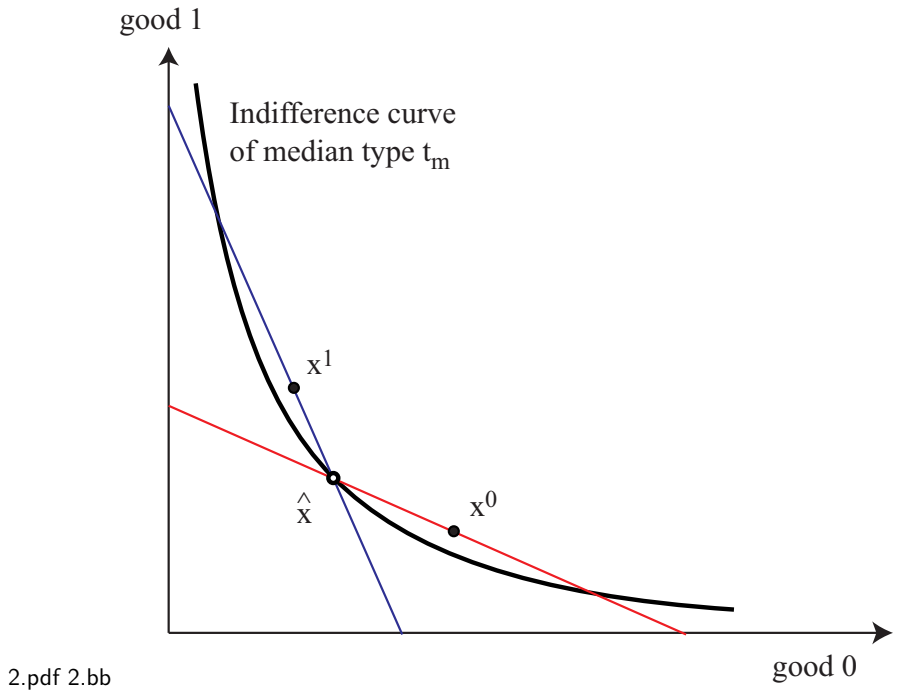

Figure: Candidates' PPFs; no equilibrium platform at the intersection

Production possibility sets and non-equilibrium choices

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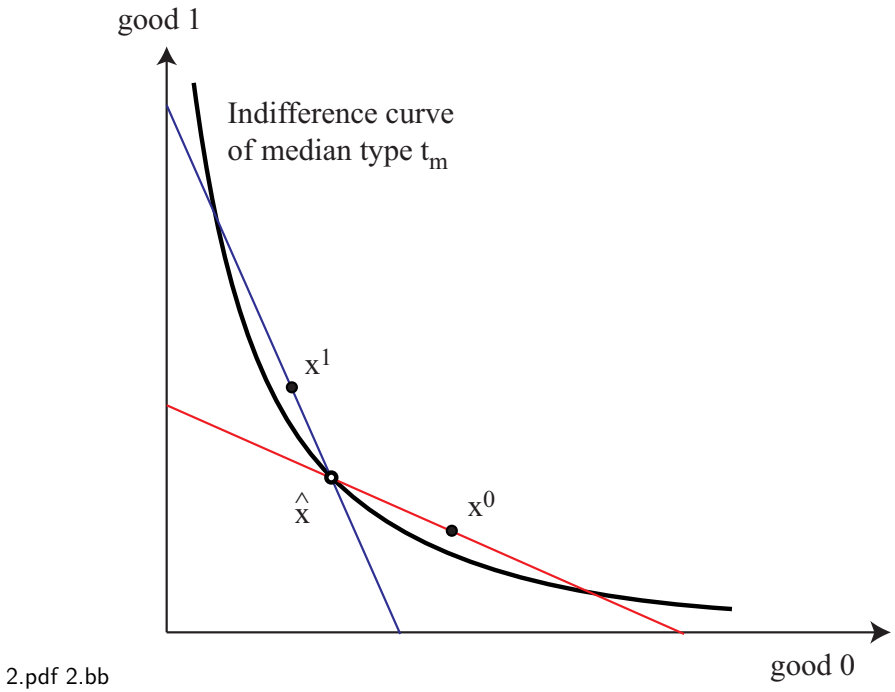

Figure: Candidates' PPFs; no equilibrium platform at the intersection

$\Rightarrow$ Candidates will choose differentiated x
and generally (though not always) differentiated a

Equilibrium

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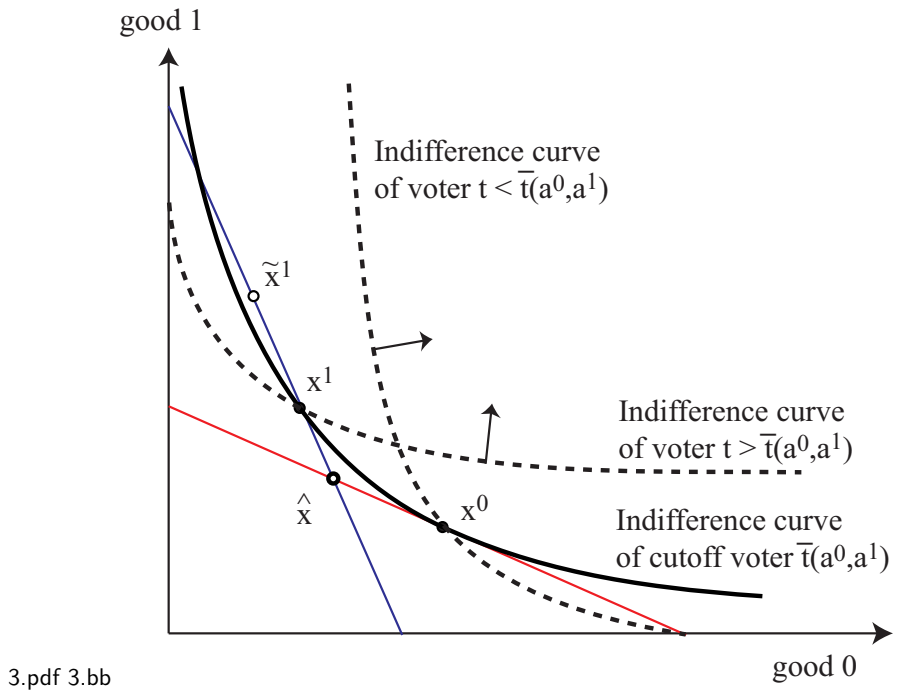

Figure: Specialized platforms and voter preferences

Equilibrium

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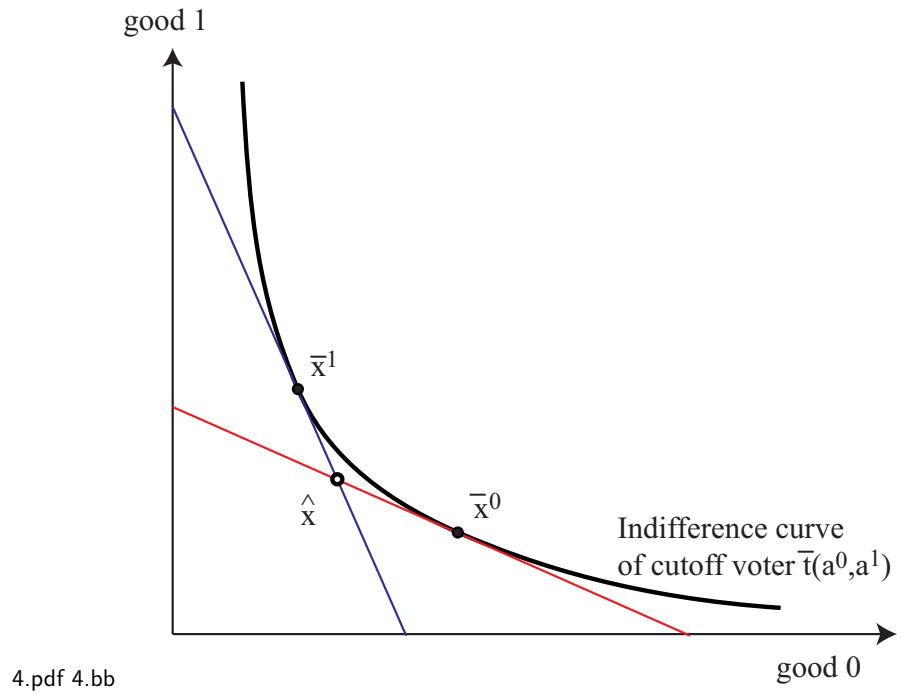

Figure: Equilibrium (necessary condition)

Characterization of Equilibrium

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Proposition

Let $(\bar{a}^0, \bar{a}^1, \bar{t})$ denote the (existing and unique) solution of the following equation system.

$$v(\gamma_0^0 a^0, \gamma_1^0(1-a^0), \bar{t}) - v(\gamma_0^1 a^1, \gamma_1^1(1-a^1), \bar{t}) = 0$$

$$\gamma_0^0 \frac{\partial v(\gamma_0^0 a^0, \gamma_1^0(1-a^0), \bar{t})}{\partial x_0} - \gamma_1^0 \frac{\partial v(\gamma_0^0 a^0, \gamma_1^0(1-a^0), \bar{t})}{\partial x_1} = 0$$

$$\gamma_0^1 \frac{\partial v(\gamma_0^1 a^1, \gamma_1^1(1-a^1), \bar{t})}{\partial x_0} - \gamma_1^1 \frac{\partial v(\gamma_0^1 a^1, \gamma_1^1(1-a^1), \bar{t})}{\partial x_1} = 0$$

- *If a pure strategy Nash equilibrium exists, it is $(\bar{a}^0, \bar{a}^1)$. All voters with types $t < \bar{t}$ vote for Candidate 0, and all voters with types $t > \bar{t}$ vote for Candidate 1.*
- *The strategy pair (a^{0*}, a^{1*}) is (at least) a local equilibrium.*

Comparison with the equilibrium in standard models

- In a standard one-dimensional policy model, appealing to the preferences of the (median) median voter makes *all* voters indifferent between candidates.
  Here, only the cutoff types are indifferent.

Comparison with the equilibrium in standard models

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  Here, only the cutoff types are indifferent.
- In a standard model, becoming more similar to the opponent's position increases the winning probability. (Candidates may not converge completely, either because they cannot, or there are some costs to convergence.)
  Here, further convergence strictly decrease a candidate's winning probability

Comparison with the equilibrium in standard models

- In a standard one-dimensional policy model, appealing to the preferences of the (median) median voter makes *all* voters indifferent between candidates.
  Here, only the cutoff types are indifferent.
- In a standard model, becoming more similar to the opponent's position increases the winning probability. (Candidates may not converge completely, either because they cannot, or there are some costs to convergence.)
  Here, further convergence strictly decrease a candidate's winning probability
- *People prefer to vote for "the original"* ("issue ownership")
  Candidates focus campaign efforts on issues that are advantageous to them, and voters who are more concerned about Democratic issues will vote Democratic.
  Key objective of a campaign: move t

Large policy deviations

- For any arbitrary pair of platforms, supporter sets are intervals, characterized by a cutoff
- In the local equilibrium, Candidate 1 maximizes his supporter set over all supporter sets in which he receives the support of high types
- $\Rightarrow$ Only deviation that may potentially be beneficial: Attract low types
- Such a deviation needs at least to attract type $t = 0$.
- (Analogous for Candidate 0)

Large policy deviations

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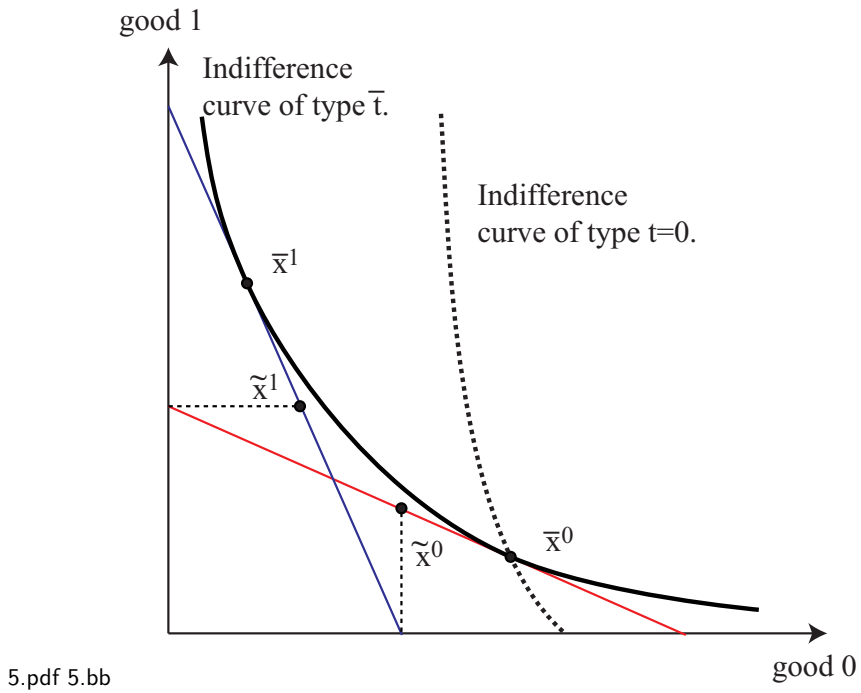

Figure: No large deviation possible

Large policy deviations

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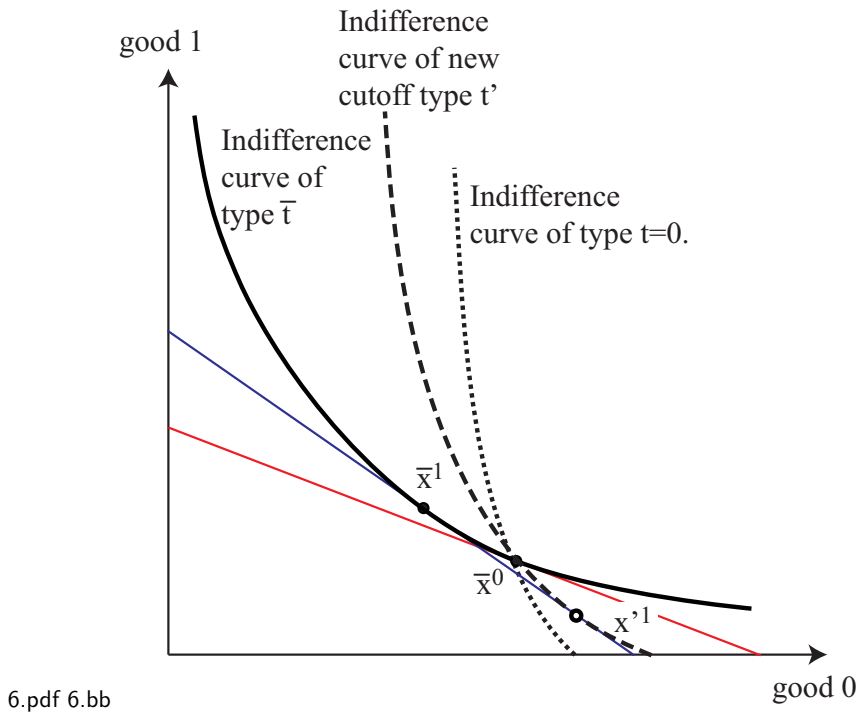

Figure: Optimal outflanking deviation

Characterization of Equilibrium

Proposition

Let $(\bar{a}^0, \bar{a}^1, \bar{t})$ denote the strategy configuration characterized in Proposition 1.

- *A deviation is always strictly detrimental for a candidate whose winning probability is at least $1/2$.*
- *There exists $\varepsilon > 0$ such that, if $F(\bar{t}) \in (0.5 - \varepsilon, 0.5 + \varepsilon)$, a deviation is always strictly detrimental for both candidates.*

Difference between production functions

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What if candidates have "more-or-less" the same production functions?

Difference between production functions

What if candidates have "more-or-less" the same production functions?

- Production functions are unobservable even if output is observable (one choice by one candidate)
- It is hard to gauge what "realistic" differences between candidate production functions are.
- Depending on preferences, small differences between production functions may lead to large differences in equilibrium policies
- Even in the limit of very similar production functions, the equilibrium differs from the equilibrium of the standard model (convergence, but at a different point; and winning probabilities are different)

Uncertainty and disagreement about the production process of public goods

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Alternative interpretation of the model:

- There is only one final good that both candidates provide ("National security")
- Uncertain production process
- Candidates provide two intermediate goods ("International goodwill" and "military power"), using money and their personal characteristics
- Voters disagree on how much "National security" is produced by given quantities of "International goodwill" and "military power"
- Voter indifference curves (in the basic model) $\Leftrightarrow$ Voter-conjectured isoquants

Ideology/policy-motivation as an alternative model

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Do candidates not diverge because they have different ideologies?

Ideology/policy-motivation as an alternative model

Do candidates not diverge because they have different ideologies?

- Candidates indeed have different ideologies
- But: we do not know to which extent this determines their platform choice
- Do we really believe that professional politicians endanger their livelihood because of ideological convictions?
- Our model provides a possible causation chain how ideology of party members may generate significant policy divergence even if candidates are mainly office-motivated

Welfare criteria

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Under certainty:

- Majority-efficiency: Is it possible for a candidate to make a majority of voters better off? (Krasa and Polborn, Binary Policy Model, JET 2010)

Under uncertainty:

- Ex-ante majority-efficiency: Is it possible for a candidate to make a majority of voters better off (more often than lowering the utility of a majority?)
- Competition-efficiency: Could a social planner who can choose both candidates' positions increase the utility of a majority (more often than decrease it)?

Welfare criteria — examples

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- Standard spatial voting model with certain voter preference distribution:
  - Convergence at the median
  - Majority-efficient
- Standard spatial voting model with uncertainty about the median:
  - Convergence at the "median median"
  - Ex-ante majority-efficient
  - Not competition-efficient

Welfare criteria — specialized candidates model

- Candidates cater to the cutoff voter, who is generally different from the expected median
- In general not ex-ante majority-efficient
- Not competition-efficient (even if ex-ante majority-efficient)

Proposition

Suppose that (a^0, a^1) is an equilibrium in which both candidates have a strictly positive winning probability, and that $t_m(\omega)$ has a strictly positive density. Then, with probability 1:

1. *If Candidate 0 wins, then there exists $a^{0\prime} > a^0$ such that, ex-post, a majority of voters would strictly prefer $a^{0\prime}$ to a^0.*
2. *If Candidate 1 wins, then there exists $a^{1\prime} < a^1$ such that, ex-post, a majority of voters would strictly prefer $a^{1\prime}$ to a^1.*

Welfare — specialized candidates model — interpretation

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- The candidate who wins is elected because a majority of voters cares more about his strong issue than about his opponent's strong issue
- A majority even likes the winner to focus more on his strong issue
- Relation to Broderism ("the worship of bipartisanship for its own sake")

Endogenous candidate selection

Would parties interested in winning choose identical or differentiated candidates?
Benchmark case: Nomination in a standard framework

- Voters ideal points in $[0,1]$; median median located at 0.5
- Parties choose "citizen-candidates" (who cannot commit)
- Liberal party can select a candidate $\theta_L \in [0, 0.5]$, while the conservative party can select a candidate $\theta_R \in [0.5, 1]$
- If the parties only care about winning, then it is optimal for them to choose identical candidates, i.e., $\theta_L = \theta_R = 0.5$.
- Differentiated candidates will only be chosen if parties care about policy ($\sim$ Calvert (1985))
- $\Rightarrow$ Satisfying the policy objectives of a party's rank and file members and maximizing the winning probability of the party's candidate are conflicting objectives.

Endogenous candidate selection

Would parties interested in winning choose identical or differentiated candidates?
Nomination in our framework:

- Completely symmetric setup to the one we just discussed
- Party 0 is composed of individuals more keen on good 0 than the median median (i.e., $t < t_m$ for party 0 supporters), while party 1 consists of individuals that care more about good 1 ($t > t_m$)
- Each party must choose between a "balanced candidate" and another candidate, who is better in providing the good party members like, but worse in producing the other good.
- After candidates are nominated, they choose which combination of goods to propose from their budget set.

Endogenous candidate selection

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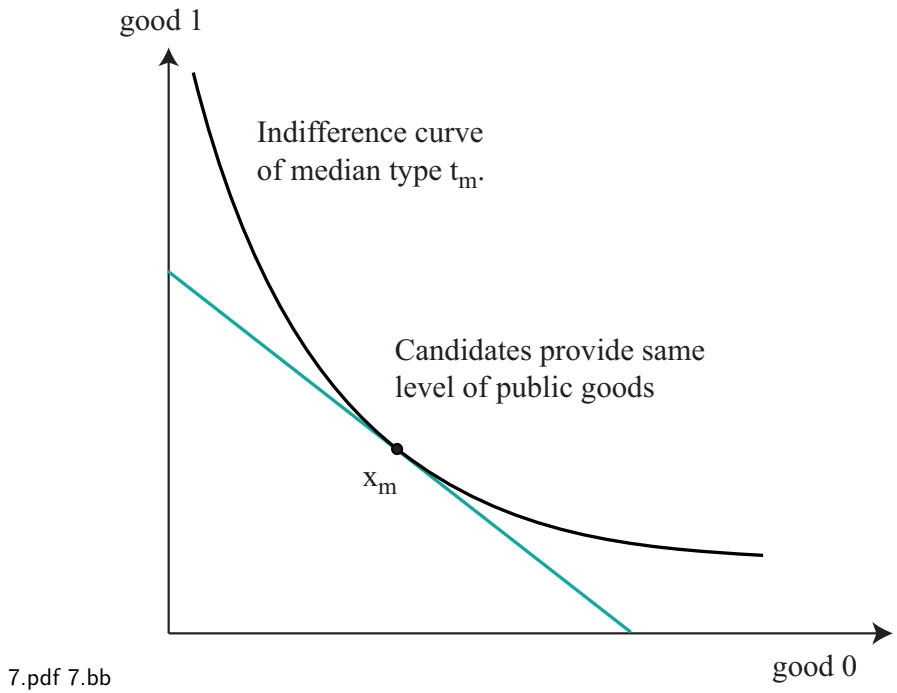

Figure: Equilibrium when both parties choose a balanced candidate

Endogenous candidate selection

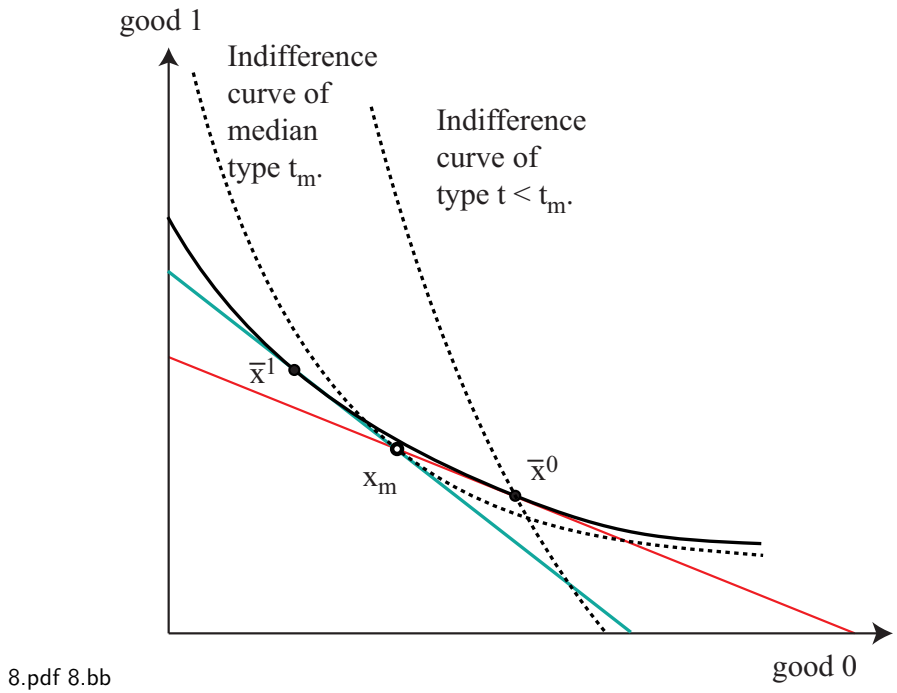

Figure: Party 0 chooses a specialized candidate

Endogenous candidate selection (sketch)

- Ideology may *create* differentiated candidates
- Potential candidates aiming for the nomination by the party keen on good 0 specialize in good 0 production and vice versa
- Specialization as an effective means of commitment
- Transmission of ideology to office-motivated candidates
- Ex-post, a candidate is "stuck" at his position even if new information indicates that a majority might prefer more of the good where his opponent has an advantage (hard to explain in the standard model)

Endogenous taxation

Voter utility

$$\ln(c) + v(x_0, x_1, t),$$

where v is homogeneous of degree $k > 0$ in (x_0, x_1).
Candidates choose tax rates and allocation to the two goods.
Equilibrium: Candidates choose the same tax rate; allocation decision as in the basic model.

Endogenous taxation

- Somewhat surprising: Tax rates are identical even if the candidates' productivities are asymmetric.
- Example: $\gamma_0^0 = 12, \gamma_1^0 = 10, \gamma_0^1 = 10, \gamma_1^1 = 11$.
  (Candidate 0 "on average more productive")
  Shouldn't Candidate 0 propose a higher tax rate in order to capitalize on his higher average productivity?
  Argument would be true if the cutoff voter were $t = 1/2$.
  However, C0's advantage shifts the cutoff voter to $\bar{t} > 1/2$ $\Rightarrow$ cares more for good 1 than for good 0 $\Rightarrow$ C 0's production advantage is not as important for $\bar{t}$ as for type $t = 1/2$, and C 1 is better at providing good 1.
- At $\bar{t}$, the relative advantages of both candidates balance each other exactly such that the benefit (or costs) of increasing taxes are identical for both candidates.