Week 6
Spatial Models of Vote Choice

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Rational Theories of Voter Turnout

General definition of rationality

An individual does what she believes is in her best interest given what she knows at the time of making a choice.

Technical definition of rationality

An actor is rational if she possesses a complete and transitive preference ordering over a set of outcomes.

Individuals have preferences and beliefs.

Preferences refer to *individual wants*, inspired by different motivations and sources (e.g., goods, services, policies, happiness, satisfaction, utilities, etc.).

Beliefs are individual's probability statements concerning the efficacy of a given instrument or behavior for achieving something he or she wants.

Beliefs than, connect instruments to outcomes. Acting in accord both with one's preferences and one's beliefs is called instrumental rationality.

The two main properties of rationality are:
comparability and transitivity.

Property 1: Comparability (Completeness)

Alternatives are said to be *comparable* in terms of preference (and the preference relation *complete*) if, for any two possible alternatives (say, x and y), either xP_iy, yP_ix, or xI_iy.

That is, the alternatives are comparable if, for any pair of them, individual i either prefers (P) the first to the second, the second to the first, or is indifferent (I) between them.

Property 2: Transitivity.

The strict preference relation is said to be *transitive* if, for any three possible alternatives (say, x, y, and z), if xP_iy and yP_iz then xP_iz.

That is, if an individual i strictly prefers x to y and y to z, then she strictly prefers x to z.

Likewise, the indifference relation is transitive if xI_iy and yI_iz imply xI_iz (if i is indifferent between x and y and between y and z, then he is indifferent between x and z, too).

If i's preferences satisfy *comparability* and *transitivity*, then i is said to possess a preference ordering.

In other words, it must be possible for all of individual i's available alternatives to be rank-ordered.

The rational choice is the alternative at the top of the preference ordering.

The existence of a top to a preference ordering, and individuals with sufficient sense to choose it if given the chance, makes *instrumental rationality* as consisting of maximizing behavior.

What are the possible instruments to achieve the outcomes below and extract the maximum utility from them?

- Outcome desired:
  - Grade A in class.

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  - Be an athlete.

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  - Be an athlete.
  - Become a guitar player.

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- Outcome desired:
  - Grade A in class.
  - Be an athlete.
  - Become a guitar player.
  - Get elected for a political office.

If an individual is highly confident that she knows what will happen if she takes a particular action, then she is operating under conditions of certainty.

If, in the mind of the individual, the relationship between actions and outcomes is highly imprecise (as it is usually the case), the individual is operating under conditions of uncertainty.

When there is *certainty*, rational behavior is pretty apparent: Simply pick the action or instrument that leads to your highest-ranked alternative.

When beliefs about action-outcome relationships are *uncertain*, the principle of rational behavior requires "quantifying" the preferences and choose the action that maximizes expected utility.

We "quantify" preferences by assigning a numerical value to each outcome, called a utility number.

The utilities derived from outcomes x, y, and z, respectively, can be written as $u(x)$, $u(y)$, and $u(z)$; they reflect the relative value individual i associates with each outcome.

If i likes x a whole lot better than y and z, and there is not much difference between the latter two in your mind, then $u(x)$ will be a much larger number than $u(y)$ and $u(z)$, and the latter two numbers will be close in magnitude.
For example, $u(x) = 1$, $u(y) = 0.2$, $u(z) = 0$.

These are called ordinal utilities because they simply tell us how the individual orders her preferences.

To calculate the expected utility of each action, we need to "quantify" *beliefs* as well: for each action or instrument, we can write down the probability that it will lead to one of the final outcomes.

Consider the following outcome probabilities from each action A, B, and C:

A: $Pr_A(x) = 1/2, \quad Pr_A(y) = 0, \quad Pr_A(z) = 1/2.$

B: $Pr_B(x) = 1/2, \quad Pr_B(y) = 1/2, \quad Pr_B(z) = 0.$

C: $Pr_C(x) = 0, \quad Pr_C(y) = 1/2, \quad Pr_C(z) = 1/2.$

The procedure to make a rational decision under uncertainty is to find a single number to each action-outcome possibility and then choosing the one with the largest number (largest expected utility).

The expected utility (EU) of an action is the sum of the utilities of all the outcomes that could result from that action, weighted by the likelihood that each outcome will happen.

Formally, for action A in the above example we have:

$$EU(A) = Pr_A(x) \times u(x) + Pr_A(y) \times u(y) + Pr_A(z) \times u(z)$$

Given that the likelihood of each outcome from each action taken by individual i are:

$A = (1/2\ \ x, 0\ \ y, 1/2\ \ z)$

$B = (1/2\ \ x, 1/2\ \ y, 0\ \ z)$

$C = (0\ \ x, 1/2\ \ y, 1/2\ \ z)$

and that the utilities derived from each of the outcomes are:

$u(x) = 1,\ \ u(y) = 0.2,\ \ u(z) = 0$

What would be the rational choice (i.e., the action that maximizes the expected utility) of individual i?

Remember:

$EU(A) = Pr_A(x) \times u(x) + Pr_A(y) \times u(y) + Pr_A(z) \times u(z)$

The six assumptions of the rational choice theory:

1. Rational action involves *utility maximization*;
2. Certain consistency requirements must be part of the definition of rationality (i.e., *comparability* and *transitivity*);
3. Each individual maximizes the *expected utility* provided by a particular outcome, given the probability of the outcome happening as a consequence of the chosen action;
4. The relevant maximizing agents are *individuals*;
5. Preferences are *endogenously given* and stable over time;
6. Under the same preferences, beliefs, and rules, the results should be *universal* (apply equally to all individuals).

The task for rational choice theorists, then, is to explain political phenomena by reference to the utility maximizing actions of individuals.

Downs, Anthony. 1957. *An economic theory of democracy.* New York: Harper Collins.

Political Party

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Political parties perform the essential task of simplifying choices for voters, who cannot possibly be familiar with all candidates for every office and their positions on all public issues.

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Why not?

Because acquiring information is often time-consuming and costly.

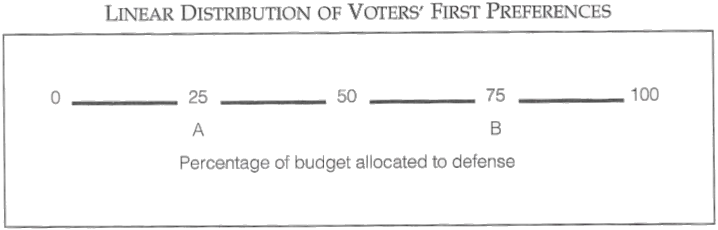
Downs (1957) illustrated the rational behavior of political parties by representing political ideology on a linear scale.

Political Ideology

Public statement about a party's general proposals for action if elected (e.g., party platform).

Party ideologies can be represented on a linear scale running, for example, from 0 to 100; the extreme left-wing would be represented by 0, and the extreme right-wing would be represented by 100.

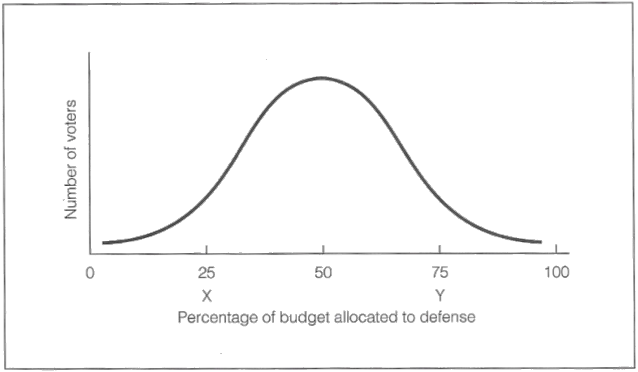
The first preferences of voters can also be depicted (located) in a linear scale:



Downs (1957) uses linear scale as an analytical device for understanding political parties' behavior and the effects voter preferences have on the number and stability of political parties.

Consider that there are one million voters whose distribution of first preferences is shown in the Figure below. Further assume that each voter would vote for the party that came closest to espousing his or her preferences.

NORMAL DISTRIBUTION OF VOTERS' FIRST PREFERENCES
INITIAL POSITIONS OF PARTIES X AND Y



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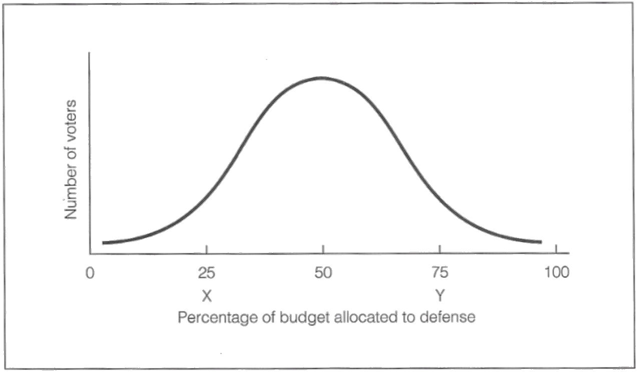
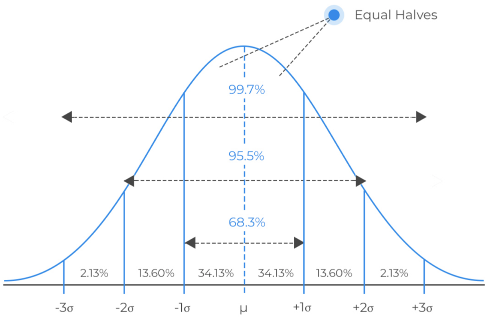


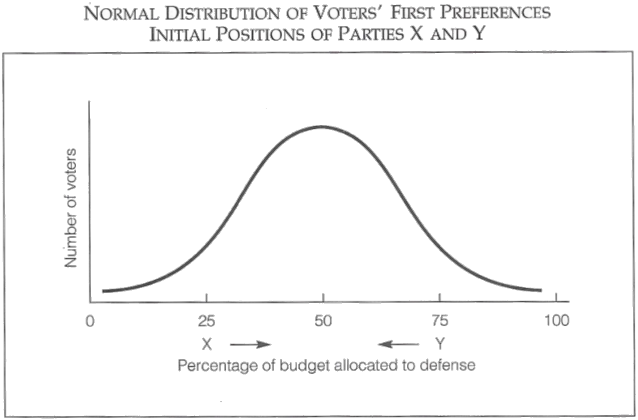
This is a normal statistical distribution with a mean (median and mode) of 50.

A normal distribution has certain properties that make it a useful analytical tool to understand party behavior and competition.



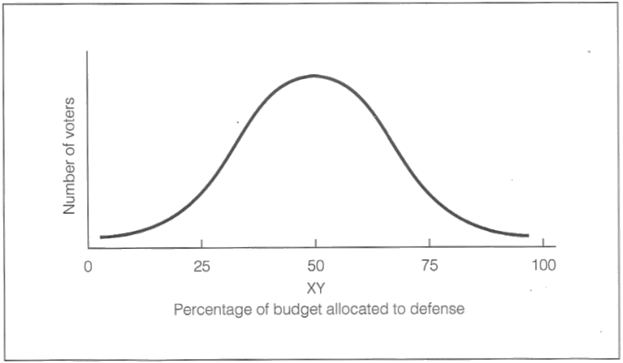
- Its shorthand notation is $X \sim N(\mu, \sigma^2)$, i.e., "the random variable X has a normal distribution with mean μ and variance σ^2."
- It has a symmetric shape: it can be cut into two halves that are mirror images of each other; as such, skewness $= 0$.
- The mean, mode, and median are all equal and lie directly in the middle of the distribution.
- About 68% of the total values lie within 1 standard deviation of the mean. In addition, 95% of the values lie within 2 standard deviations of the mean. Lastly, about 99.7% lie within 3 standard deviations of the mean.

What should political parties do if the distribution of voters' preferences follows a normal distribution?



They should adjust their positions moving to the center of the scale.

NORMAL DISTRIBUTION OF VOTER'S FIRST PREFERENCES
POSITIONS OF PARTIES AFTER ADJUSTMENT



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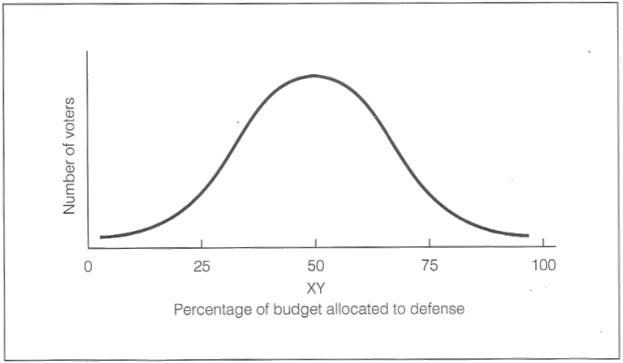


This movement highlights the importance of the median voter theorem.

The median voter theorem states that if voters and policies are distributed along a one-dimensional scale, with voters rank-ordering their preferences in order of proximity, then a voting method, such as a majority vote between two political parties, will elect the candidate closest to the median voter.

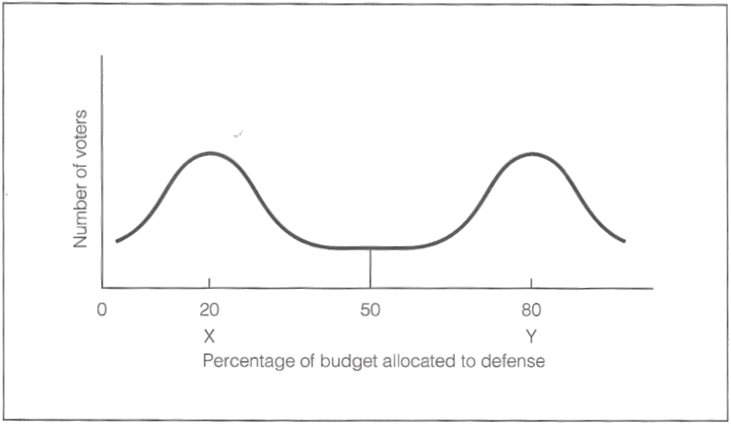
According to the *median voter theorem*:

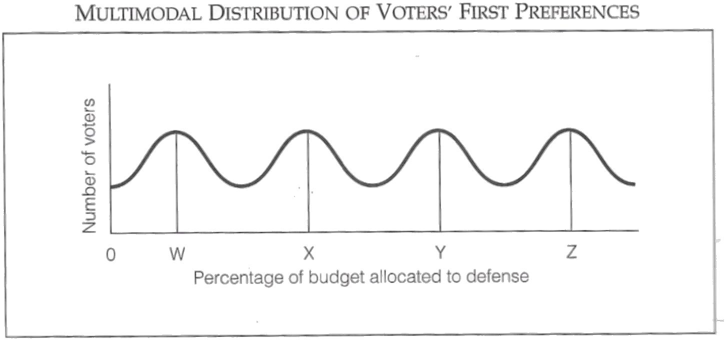
- The median voter holds the dominant position in the political spectrum;
- Political parties will maximize their votes by staking out a position held by the median voter;
- If the median voter moves to the left or right, the political parties will follow;
- The median voter determines policy in a democracy.

The *median voter theorem* operates well when the distribution of voters is normal, when voters don't abstain in protest, and when new parties cannot enter the political market easily.

When the distribution is not normal, then the story might be different and complex.

BIMODAL DISTRIBUTION OF VOTERS' FIRST PREFERENCES




MULTIMODAL DISTRIBUTION OF VOTERS' FIRST PREFERENCES
Number of voters
0
W
X
Y
Z
Percentage of budget allocated to defense

Preferences defined over a multidimensional policy space (several policy issues) result in the *McKelvey–Schofield chaos theorem*:

- The median voter theorem does not hold;
- The majority rule is in general unstable;
- There is no voting equilibrium;
- Anything can happen.

Why vote?

According to Downs (1957), the voter makes her choice based on the expected benefits (measured on utilities) she might obtain.

Each individual in the Downsian “calculus of voting” model (1957) votes for the party she believes will provide her with a higher utility (benefits) than any other party.

Which party is this?

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Which party is this?

She compares benefits (B) she believes she would receive were each party A or B in office. In a two-party system, this comparison can be set up as a simple subtraction depicting the *expected party differential*:

$$B = E(U_A) - E(U_B)$$

The "calculus of voting" was later extended by Riker and Ordeshook (1968), considering a decision-making scenario represented in the formula:

$$R = P(B) - C$$

Where,

- R stands for "rewards," i.e., the utility derived from the act of voting, being a function of:
  - B, the benefit received by the voter, derived from the *expected party differential*;
  - P, the probability of the vote being decisive, and;
  - C, the cost of voting (e.g., transportation, registration, standing in line, etc.)

Figure 1. Decision Table for Rational Choice Models of Turnout

Actions:	States of the World — Preferred Candidate is: (1) Winning by More than One Vote	(2) Winning by Exactly One Vote	(3) Tied	(4) Losing by Exactly One Vote	(5) Losing by More than One Vote
(1) Vote for Preferred Candidate	$1 - C$[a]	$1 - C$	$1 - C$	$1/2 - C$	$0 - C$
(2) Vote for Other Candidate	$1 - C$	$1/2 - C$	$0 - C$	$0 - C$	$0 - C$
(3) Abstain from Voting	1	1	1/2	0	0

[a]Entry is payoff in utiles to decision maker. It is assumed that $0 < C < 1/2$, where C is costs of voting. A tie is assumed to be broken by the flip of a fair coin. Utiles are normalized, so that the value of the preferred candidate winning is 1; the value of the opponent winning is 0.

$$R = P(B) - C$$

According to the calculus of voting:

- If $P(B) > C$, then $R > 0$, and the voter should vote.
- If $P(B) < C$, then $R \leq 0$, and the voter should abstain.

The key variable determining the choice between "to vote" or "to abstain" is the term P.

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The key variable determining the choice between "to vote" or "to abstain" is the term P.

The utility the voter should expect from the act of voting in an election is close to zero, because the probability of a single vote (your vote) being decisive (or pivotal) is infinitesimal.

Why?

$$P = \frac{1}{\text{voting population}}$$

According to the Australian Electoral Commission (AEC), 16.4 million people were enrolled to vote in the 2019 Federal Election.

Therefore, in the Australian Federal Election of 2019 the probability of casting a decisive vote is calculated as:

$$P = \frac{1}{16400000} = 0.00000006$$

In other words, a rational individual should abstain from voting. But people vote...

Riker and Odershook (1968) add a new term to the calculus of voting: The civic duty, or simply D.

The new calculus is depicted as:

$$R = P(B) - C + D$$

Now,

- If $P(B) + D > C$, then $R > 0$, and the voter should vote.
- If $P(B) + D < C$, then $R \leq 0$, and the voter should abstain.

Does term D solve the paradox?

Aldrich (1993):

- Turnout is a low-cost, low-benefit action;
- Small changes in costs and benefits alter the turnout decision for many citizens;
- Game-theoretical model (not formalized in the article).

- The Minimax Regret Model
  (Ferejohn and Fiorina 1974, 1975)
- Group Rationality
  (Morton 1991; Grossman and Helpman 2001)
- Expressive voting
  (Brennan and Lomasky 1997)
- Altruism theory of voting
  (Kaplan 2007; Edlin, Gelman, and Kaplan 2007)

Please complete the *mid-semester course feedback* on *Wattle*.

- **Thursday, 21 April.**

  Week 7. Economic Voting

Compulsory readings:

– Duch, Raymond M. and Stevenson, Randolph T. 2008. *The Economic Vote: How Political and Economic Institutions Condition Election Results*. New York: Cambridge University Press. Chapters 2 and 3. Pages: 39–61.

– Powell, Jr., G. Bingham and Whitten, Guy D. 1993. “A Cross-National Analysis of Economic Voting: Taking Account of the Political Context.” *American Journal of Political Science* 37(2): 391–414.