Political Economy of Social Choice - Voting

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Outline

Social Choice - Provision of Public Good
  Public Good Contribution Problem - Lindahl Pricing

Social Choice - Aggregating Preferences
  Majority Rule
  Median Voter Theorem
Reference Chapters

- *Voting* ([Hindriks and Myles, 2013] chapter 10)
Lindahl Pricing 1

The government could provide public goods through \textit{unanimous (supported by everyone) consent} of its citizens. \textit{Lindahl pricing} is a system where individuals report their willingness-to-pay for each quantity of the public good, and the government aggregates preferences to form a measure of the social benefit.

- First, the government announces tax prices for the public good, that is, the share of the cost that each individual must bear.
  - Each person announces how much of the public good he or she wants at those tax prices.
  - If the individual announcements differ, the government raises the tax price for the person who wants more of the good, and lowers it for the person who wants less.
- When a tax price is arrived at where both individuals want the same amount of the public good, the government has reached \textit{Lindahl equilibrium}.
- The government produces the public good at that level, and finances it by charging each person their tax price.
Lindahl Pricing 2

Example:

\[ P_{Banu} = 3 - \frac{3}{100}q, \text{ and } P_{Ahmet} = 1 - \frac{1}{100}q \]

\[ P_{Public} = 4 - \frac{4}{100}q \] which gives the optimal public good level

If the price of public good is \( p = 1 \) then \( q = 75 \)
Lindahl pricing corresponds to the concept of **benefit taxation**, which occurs when individuals are being taxed for a public good according to their valuation of the benefit they receive.

With Lindahl pricing, the government does not need to know the utility functions of individual voters: it gets the voters to *reveal their preferences* by stating their willingness to pay for different levels of the public good.
Problems with Lindahl Pricing

- *Preference revelation problem*: Individuals may behave strategically, and pretend their willingness to pay is low in order to get others to bear a larger cost of the public good.

- *Preference knowledge problem*: It is hard for people to properly value goods they do not shop for on a regular basis.

- *Preference aggregation problem*: Aggregating millions of voters’ preferences is difficult in reality.
Voting is the most commonly employed method of resolving a diversity of views or eliciting expressions of preference. There are two major properties to look for in a good method.

- First is the success or failure of the method in achieving a clear-cut decision.
- Second is the issue of whether voting always produces an outcome that is efficient.

- **Stability**: Unstable preferences and cycling
- **Impossibility of Aggregation Individual Preferences**: Social choice takes a given set of individual preferences and tries to aggregate them into a social preference. The central result of the theory of social choice, Arrow’s Impossibility Theorem, says that there is no way to devise a collective decision-making process that satisfies a few commonsense requirements and works in all circumstances. If there are only two options, majority voting works just fine, but with more than two we can get into trouble.
Condorcet Paradox

Now suppose that we use majority rule to select one of these options. We see that two out of three voters prefer $a$ to $b$, while two out of three prefer $b$ to $c$, and two out of three prefer $c$ to $a$. At the collective level there is a cycle in preference and no decision is possible. We say that such collective preferences are intransitive, meaning that the preference for $a$ over $b$ and for $b$ over $c$ does not imply $a$ is preferred to $c$.

As the example shows, intransitivity of group preferences can arise even when individual preferences are transitive. This generation of social intransitivity from individual transitivity is called the **Condorcet paradox**. Condorcet was the first person, as far as we know, to discover the problem of *cycling*, the possibility when using the simple majority rule.
Arrow’s Impossibility Theorem

The general problem addressed by K. Arrow in 1951 was to seek to avoid the Condorcet paradox. Arrow’s approach was to start from a set of requirements that a collective ranking must satisfy.

▶ **Condition I (Independence of irrelevant alternatives)** Adding new options should not affect the initial ranking of the old options, so the collective ranking over the old options should be unchanged.

▶ **Condition N (Nondictatorship)** The collective preference should not be determined by the preferences of one individual.

▶ **Condition P (Pareto criterion)** If everybody agrees on the ranking of all the possible options, so should the group; the collective ranking should coincide with the common individual ranking.

▶ **Condition U (Unrestricted domain)** The collective choice method should accommodate any possible individual ranking of options.

▶ **Condition T (Transitivity)** If the group prefers $A$ to $B$ and $B$ to $C$, then the group cannot prefer $C$ to $A$.

Kenneth Arrow’s Impossibility Theorem

When choosing among more than two options, there exists no collective decision-making process that satisfies the conditions I, N, P, U, T.
Majority Rule

- A widely held view is that democracy should treat all the voters in the same way. This symmetry requirement is called Anonymity.
- Collective decision-making process should treat all possible options alike. No apparent bias in favor of one option should be introduced. This symmetric treatment of the various options is called Neutrality.
- Decisiveness (the social decision rule must pick a winner)
- Positive Responsiveness (increasing the vote for the winning option should not lead to the declaration of another option the winner. Example: An alternative option which is rejected by a majority becomes a winner)

Kenneth May’s theorem

When choosing among only two options, there is only one collective decision-making process that satisfies the requirements of Anonymity, Neutrality, Decisiveness, and Positive Responsiveness. This process is majority rule.
Condorcet Method

- For example, one simple binary agenda for choosing among the three options (a, b, c) in the Condorcet paradox is as follows. First, there is a vote on a against b. Then, the winner of this first vote is opposed to c. The winner of this second vote is the chosen option. The most famous pairwise voting method is the Condorcet method.

- The option that defeats all others in pairwise majority voting is called a Condorcet winner, after Condorcet suggested that such an option should be declared the winner.

- The problem is that the existence of a Condorcet winner requires very special configurations of individual preferences. For instance, with the preferences given in the Condorcet paradox, there is no Condorcet winner.
Condorcet Winner

A common mechanism used to aggregate individual votes into a social decision is majority voting, in which individual policy options are put to a vote, and the option that receives the majority of votes is chosen.

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<thead>
<tr>
<th>Preference rankings</th>
<th>Types of voters</th>
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<td>Parents</td>
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<td>First</td>
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Median Voter Theorems

When the policy space is one-dimensional, sufficient (but not necessary) conditions for the existence of a Condorcet winner are given by the Median Voter Theorems. One version of these theorems refers to single-peaked preferences, while the other version refers to single-crossing preferences. The two conditions of single-peaked and single-crossing preferences are logically independent, but both conditions give the same conclusion that the median position is a Condorcet winner.

\[ \begin{array}{cccccccc}
1 & 2 & 3 & 4 & \cdots & n-3 & n-2 & n-1 & n \\
\end{array} \]

Location of households
Median Voter Theorem I: Single-peaked version

Suppose that there is an odd number of voters and that the policy space is one-dimensional (so that the options can be put in a transitive order). If the voters have single-peaked preferences, then the median of the distribution of voters’ preferred options is a Condorcet winner.
Median Voter Theorems 3

Median Voter Theorem II: Single-crossing version

Suppose that there is an odd number of voters and that the policy space is one-dimensional (so that the options can be put in a transitive order). If the preferences of the set of voters satisfy the single-crossing property, then the preferred option of the median voter is a Condorcet winner.
Vote-Maximizing Politicians

The public good in question is education; the key question is what fraction of the budget (0% to 50%) should be spent on education? Voters are uniformly distributed on this continuum. Two politicians, Banu and Ahmet, are running for office and competing to maximize their votes.
Assumptions of the Median Voter Model

The median voter model is a powerful tool, but relies on a number of assumptions worth mentioning:

▶ Single-dimensional voting: Voters only care about one issue.
▶ Only two candidates: With a 3rd candidate, there is no stable equilibrium.
▶ No ideology or influence: Assumes politicians only care about votes, not ideological positions.
▶ No selective voting: All citizens actually vote. No lower voter turnout.
▶ No money as a tool of influence. No vote buying.
▶ Perfect information along three dimensions: voter knowledge of the issues, politician knowledge of the issues, and politician knowledge of voter preferences.
Potential Inefficiency of the Median Voter Outcome

Inefficient outcomes

- For example, imagine that there are 1,001 voters in a town, who are considering building a monument that costs $40,040 ($40/person).

- Assume all 1,001 voters have single-peaked preferences, so the median voter will determine the outcome.

- If 500 citizens value the monument at $100 each, and the other 501 value it at $0, then the social marginal benefit is $50,000, far greater than the cost. However, the monument doesn’t get built.

Lobbying

- *Lobbying* is the expending of resources by certain individuals or groups in an attempt to influence a politician.

- The problem with *lobbying* arises when an issue benefits a small group and imposes small costs on a larger (perhaps even a majority) group.

- The key point to remember is that large groups of people with small individual interest on an issue suffer from a free rider problem in trying to organize politically.

- *Small groups* with large interest overcome the free-rider problem.
Agenda Manipulation

In a situation in which there is no Condorcet winner, the door is opened to agenda manipulation. This is because changing the agenda, meaning the order in which the votes over pairs of alternatives are taken, can change the voting outcome. Thus the agenda-setter may have substantial power to influence the voting outcome. To determine the degree of the agenda-setter’s power, we must find the set of outcomes that can be achieved through agenda manipulation.
Even if one considers the principle of majority rule to be attractive, the failure to select the Condorcet winner when one exists may be regarded as a serious weakness of majority rule as a voting procedure. This is especially relevant because many of the most popular alternatives to majority rule also do not always choose the Condorcet winner when one does exist, although they always pick a winner even when a Condorcet winner does not exist.

This is the case for all the scoring rule methods, such as Plurality voting and Borda voting.

Each scoring rule method selects as a winner the option with the highest aggregate score. The difference is in the score voters can give to each option. Under plurality voting, voters give 1 point to their first choice and 0 points to all other options. Thus only information on each voter’s most preferred option is used. Under Borda voting, voters give the highest possible score to their first choice, and then progressively lower scores to worse choices.
Alternatives to Majority Rule

- **Borda Voting**: there is no Condorcet winner but \( a \) the Borda winner with 15 points (while \( b \) gets 14 points and \( c \) gets 13 points).

- Adding an alternative such as \( d \). Now \( d \) will be the Borda winner with 22 points.

- This reversal of the ranking shows that the Borda rule violates the independence of irrelevant alternatives and should be unacceptable in a voting procedure.

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<thead>
<tr>
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<th>Independence of irrelevant alternatives</th>
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<tbody>
<tr>
<td>(3)</td>
<td>(2)</td>
</tr>
<tr>
<td>( a )</td>
<td>( c )</td>
</tr>
<tr>
<td>( b )</td>
<td>( a )</td>
</tr>
<tr>
<td>( c )</td>
<td>( b )</td>
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| (3) | (2) | (2) |
| \( d \) | \( c \) | \( b \) |
| \( a \) | \( d \) | \( c \) |
| \( b \) | \( a \) | \( d \) |
| \( c \) | \( b \) | \( a \) |

- **Plurality Voting**: The example illustrates the problem that the plurality rule fails to select the Condorcet winner, which in this case is \( a \) (\( a \) beats both \( b \) and \( c \) with majority votes).

<table>
<thead>
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<tr>
<td>(2)</td>
</tr>
<tr>
<td>( a )</td>
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<tr>
<td>( b )</td>
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<tr>
<td>( c )</td>
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Public Choice Theory

- The analysis in most of this course assumes a benign government intent on maximizing social welfare.

- **Public choice theory** questions this assumption by noting that governments often do not behave in an ideal manner, so that traditional assumption of a benevolent social-welfare maximizing government may be inappropriate.

- **Government failure** is the inability or unwillingness of the government to act primarily in the interest of its citizens. Reasons include:

  - **Size maximizing bureaucracy**: Niskanen (1971) developed a model of the budget maximizing bureaucrat. In this model, the bureaucrat runs an agency that has a monopoly on the government provision of some good or service.

  - **Leviathan theory**: Leviathan theory sees individual bureaucrats and the larger government as one monopolist that simply tries to maximize the size of the public sector.

  - **Corruption**: corruption is where government officials abuse their power in order to maximize their own personal wealth or that of their associates.
Condorcet’s jury theorem

If each member of a jury has an equal and independent chance better than random, but worse than perfect, of making a correct judgment on whether a defendant is guilty (or on some other factual proposition), the majority of jurors is more likely to be correct than each individual juror, and the probability of a correct majority judgment approaches 1 as the jury size increases. Thus, under certain conditions, majority rule is good at tracking the truth.

Marquis de Condorcet (1785) Essai sur l’application de l’analyse à la probabilité des décisions rendues à la pluralité des voix.
Voters turnout

Votes cast in OECD countries’ most recent national elections as a ...