Principles of Microeconomics-II
L4: Public Goods

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Types of Goods

1. Private Goods: Excludable & Rival. *For e.g., a car.*
2. Club Goods: Excludable & Non-Rival. *For e.g., a cinema screen.*
3. Common Resources: Non-excludable & Rival. *For e.g., a grazing pasture.*
4. Public Goods: Non-excludable & Non-Rival. *For e.g., basic research.*

Efficient Provision of Public Goods

- Efficient outcomes are given by equating marginal benefit to marginal cost.
- There is a cost of providing a public good, often born by the community or the State.
- The benefits of the public good are borne by *everyone* in the community.
- Benthamite social planner.

$$\text{Optimal Choice: MSB} = \text{MC} \implies \sum_i MB_i = MC$$

Efficient Provision of Public Goods

Vertical summation of individual marginal benefit curves!

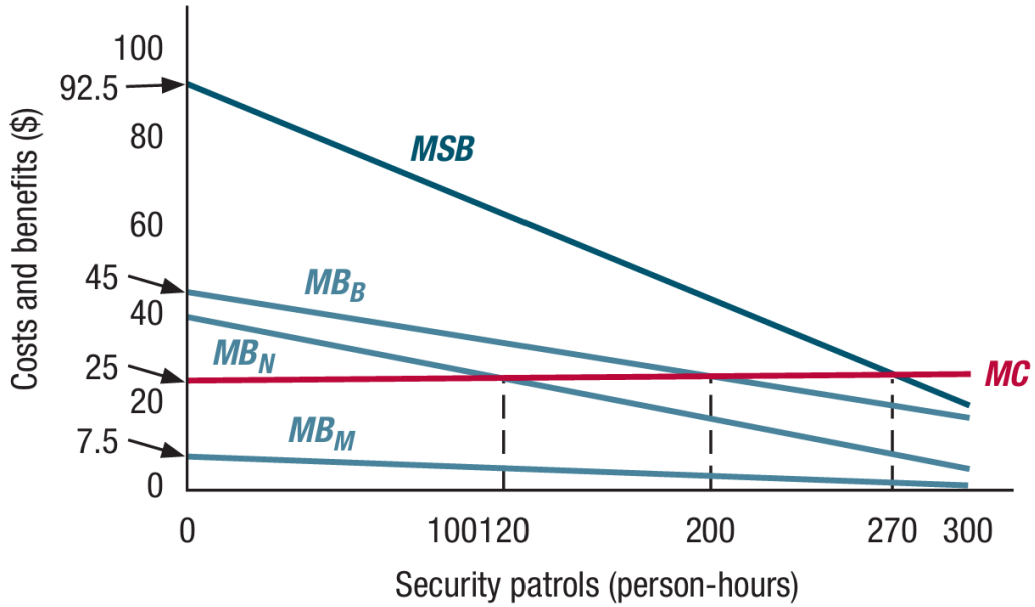

Figure: Efficient Provision of Public Goods. *Source:* Figure 20.14, Bernheim & Whinston (2009)

Efficient Provision of Public Goods

Given:

A market has 5 stores, and hours of street-patrolling (denoted by S) is a public good that protects them. Each firm's Marginal Benefit from patrolling is given by $\frac{100}{1+S}$.

If the Marginal Cost of providing an additional hour of patrolling is \$20, what is the socially efficient level of street-patrolling hours?

What if there are 10 stores?

Considerations regarding Market Failure

- Public goods entail non-excludability along with positive externalities $\implies \sum_{-i} MB_i$ is not internalised. Free-rider problem!
- The private market with voluntary contributions will not/under-provide a public good. A case for government provision.
- Social justice.
- Drawing a distinction between *production* and *provision* of public goods.

Government Provision of Public Goods

We will focus on government-provided public goods, irrespective of their production.

- How to determine efficient provision? Need information on $MB_i \ \forall \ i$.
- Incentive to misreport MB (which is the willingness to pay for each additional unit of public good provision).
- If have to pay, may under-report valuations. If don't have to pay, may over-report valuations.
- Truth-telling mechanisms!

Mechanism Design

- The "engineering" side of economic theory.
- Identify an outcome, then design a mechanism to attain the the outcome: reverse engineering on the basis of preferences.
- Incentive compatibility.

Mechanism Design

Erik Maskin (2007). Mechanism Design: How to implement social goals. Nobel Prize Lecture.

> *Now, in the public framework, if the government knows at the outset which choice of public goods is optimal, then there is a simple – indeed, trivial – mechanism for achieving the optimum: the government has only to pass a law mandating this outcome. [...] The basic difficulty – which gives the subject of mechanism design its theoretical interest – is that the government or auctioneer will typically not have this information. After all, the net surplus-maximizing choice of public goods depends on citizens' preferences for such goods, and there is no particular reason why the government should know these preferences.*

The Groves Mechanism

- Suppose the government is deciding whether or not to provide a park
- Based on voluntary contributions.
- Provide if Total Benefits $>$ Costs; else don't provide.
- Each person has a true benefit/valuation for the public good. IPV: Independent Private Valuations.
- If everyone reported true benefit i.e. truth-telling $\implies$ optimal provision.
- Need a mechanism to elicit truthful marginal benefit information from each citizen.

The Groves Mechanism

The Mechanism

Each person's contributions are equal to the cost imposed by this person on everyone else's benefit when she does not participate. This contribution is called the Clark Tax.

The Groves Mechanism (aka the Vickrey-Clark-Groves mechanism) thereby internalises the externality imposed by each person's contributions towards the public good.

The Groves Mechanism

1. Step 1: Ask each citizen to report the total benefit she would receive from different levels of public good provision.
2. Step 2: Calculate the reported marginal benefit (RMB) for each citizen.
3. Step 3: Vertically add up everyone's RMB to get RMB^{total}.
4. Step 4: The intersection of RMB^{total} and MC is denoted by Q^{total}.
5. Step 5: What happens when individual i's contribution is taken away? Call this RMB^{others}.
6. Step 6: What is the cost that individual i imposes on everyone else by not participating? The Clark Tax.

The Groves Mechanism

...is **Incentive Compatible**! Given everyone else's contributions (RMB^{others}):

- Let the true valuation of person i be MB^i.
- Let the reported valuation of person i be RMB^i.
- Suppose this person decides to over-report i.e. $RMB^i > MB^i$.
- $\implies$ more public good ($\uparrow$ benefit) + greater contribution amount ($\downarrow$ benefit).
- Loss from mis-reporting true valuation.

In practice, social planners elicit information about each person's total benefit via sealed-bid auctions.

The Groves Mechanism

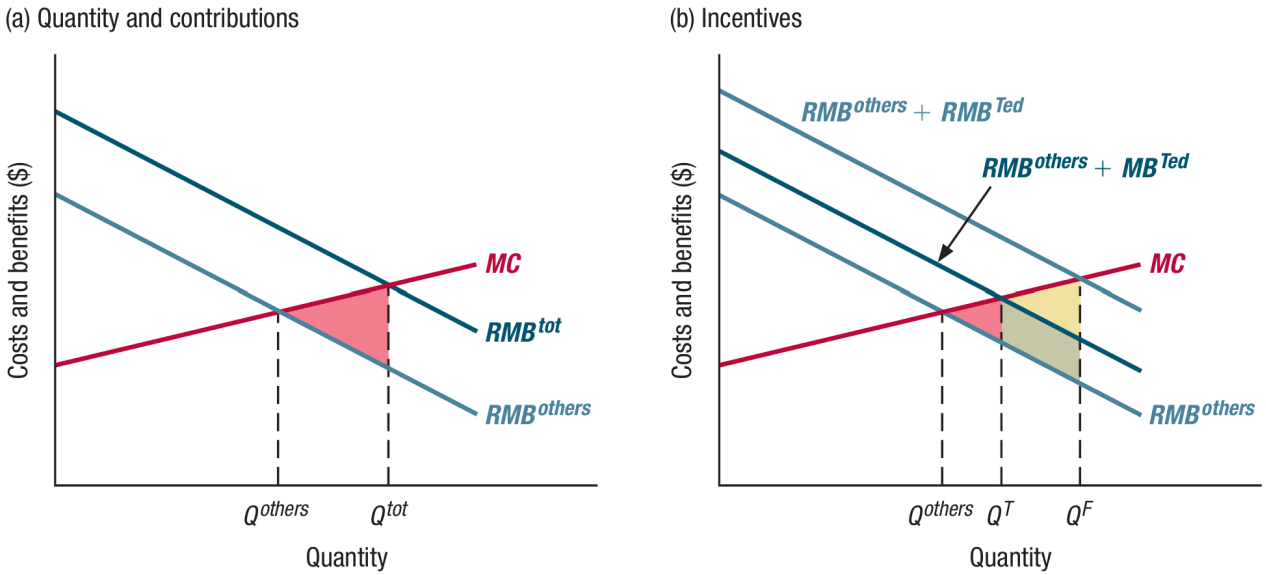

Figure: Groves Mechanism. *Source:* Figure 20.15, Bernheim & Whinston (2009)

How do governments make socially optimal decisions?

- How does the state interact with citizens and their preferences within democratic institutions?
- Voting is a way of preference aggregation!
- Indirect Democracy: Citizens vote for representatives, representatives vote over policies. *For e.g., the Indian electoral system.*
- Direct Democracy: Citizens vote directly over policies. *For e.g., Referendums in the US place legislation on ballot.*

Single-Peaked Preferences

Attributed to Duncan Black and Kenneth Arrow.

- Individuals have preferences over different outcomes.
- Each individual has a best outcome that maximises her utility.
- As she moves away from this outcome in any direction, her utility falls.

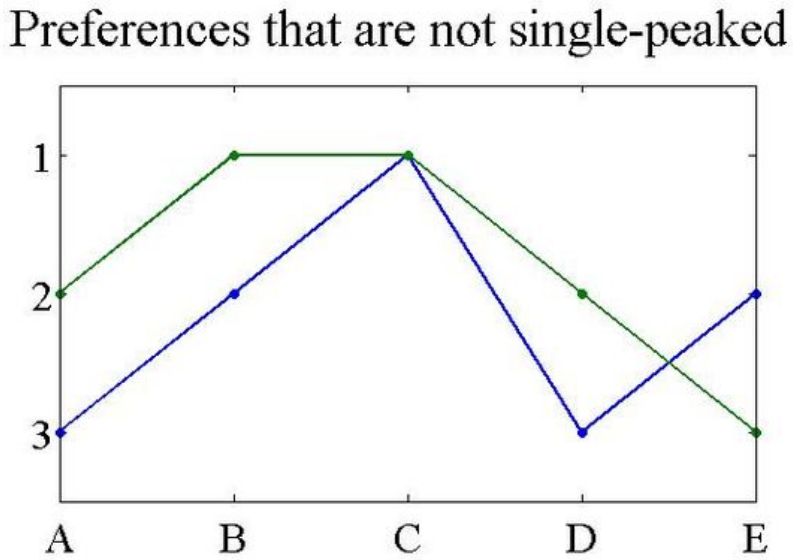

Figure: Not Single Peaked Preferences

Majority Voting

Assume single-peaked preferences.

Majority Voting Rule

A majority voting rule is one where the winner defeats *every* other outcome in a pair-wise vote.

Table: Majority/Condorcet Voting

# Voters	A	B	C
1	1	2	3
2	2	1	3
1	2	3	1
1	3	2	1

Who is the Condorcet winner?

Median Voter Theorem

Theorem

If voters have single peaked preferences over a single-dimensional axis, a majority voting rule will choose the outcome preferred by the median voter.

The median outcome may not be the socially optimal outcome.