

Lecture 8: Preference Revelation Schemes for Public Goods

Tideman, T. Nicolaus and Gordon Tullock, "A New and Superior Process for Making Social Choices," *Journal of Political Economy*, 84, 1976, 1145-1159.

1. *Introduction*

Our discussion of public goods, specifically public goods that are non-excludible, suggests that an efficient provision of these public goods is problematic because of "free-rider" problems. Specifically, the non-excludibility precludes the existence of a market in which valuation by individuals is revealed based on their preferences. How, then, in the absence of any method of revealing preferences can an efficient outcome hoped to be achieved?

Tideman and Tullock (1972) among others demonstrate a "mechanism" that can reveal preferences (valuations) of public goods or jointly consumed goods or projects. We briefly outline a simple example and then discuss generalizations.

2. *An Example*

In this simple example let there be:

- 3 (public) mutually exclusive projects: A, B, C
- 3 voters: 1, 2, 3

Let each of the voters have a valuation (benefit) of each project given in *Table 1*.

<i>Table 1</i>					
	Project				
(1)	(2)	(3)	(4)	(5)	(6)
Voter	A	B	C	Tax	NB
1	50	20	0	20	30
2	0	60	20	0	0
3	40	0	50	30	10
Total	90	80	70	50	
Totals without 1	50	60	70		
Totals without 2	90	20	50		
Totals without 3	50	80	20		

Assume there is no cost associated with any of the projects. Then the project with the highest total benefit, A, is the most efficient.

How can we get the voters to reveal their benefits?

A. Consider the following "Clarke" tax:

1. Consider all the pairwise contests between projects (A versus B; B versus C; A versus C)
2. Each individual "states" a preference for each project -- this is a stated benefits received under the two projects.
3. An individual is only taxed if eliminating his or her stated (revealed) preference between the two projects changes the outcome -- that is if eliminating the individual's state preference changes the project with the highest dollar votes. If eliminating his or her vote changes the outcome the tax is the difference.
4. The project with highest revealed preferences is chosen.

B. Taxes with Truthful Revelation.

Suppose that everyone truthfully reveals preferences. Then Project A is chosen. What are the taxes? These taxes are listed in column (5) of *Table 1*.

- Tax on 1. If everyone truthfully reveals stating total benefits for A and B are 90 and 80 respectively. Then if we eliminate 1's votes we have new totals of 40 for A and 60 for B. This changes the outcome -- B is now the winner with benefits of 60 versus 40 for A. Then by our tax rule the tax on 1 should be $60 - 40 = 20$.
- Tax on 2. Since 2 has no value on A and 60 on B, eliminating 2's vote does not change the outcome -- the totals without 2 are 90 for A and 0 for B -- A still wins.
- Tax on 3. Eliminating 3's vote will change the benefits to 50 for A and B's will remain at 80. Since this changed the outcome the tax on 3 is the difference in benefits of the two projects, \$30.

C. Do Individuals have the Incentive to Lie?

We showed the taxes and outcome when everyone truthfully reveals. But do they have an incentive to strategically misrepresent their valuation of the goods? Can they lower their tax bill and increase net benefits?

Column (6) gives the net benefits based on truthful revelation. It is the benefits from project A - the tax.

- For 1 truthful revelation gives net benefit of 10 for getting A instead of B. Clearly overstating her valuation of A will not increase her benefit as it will not affect the outcome and therefore not the tax. Should 1 understate her valuation of A to reduce taxes? If she cuts her valuation of A from 50 to anything above 40 it will have not

affect the outcome so there is again no change in her true benefits. If she reduces to 39 then project B is now revealed the winner with benefits of 80 compared to A's total of 79. Based on 1's revealed preference of 39 for A and 20 for B her tax would be $60 - 40 = 20$. Then benefit for 1 from lying and getting B instead of A are $20 - 20 = 0$, less than the \$10 with truthful revelation. A similar argument applies for 3.

- Should 2 lie to get B chosen? To get B to win given everyone else truthfully reveals means that 2 would have to state a preference for B of over 70, let's say 71. Then with 2 stating 71 for B we have B winning by 91 to 90. Eliminating 2's vote would give project A's total of 90 and B a total of 20, so 2's tax would be $90 - 20 = 70$. Then his true benefit when stating 71 would be $60 - 70 = -10$ worse than the \$0 with truthful revelation.

D. Why does it work?

Given the other individuals tell the truth your best strategy is to tell the truth -- but why? The general problem with truthful revelation of preferences for a public good is that your tax is based on your valuation -- Lindahl taxation for example. The key here is that the "Clarke" tax is based on other individual's preferences -- your preference revelation will not affect your tax without affecting the outcome. You can not misreveal to lower tax without changing the winning project.

A final note -- this tax is not for purposes of collecting revenue. Note that in this example cost was zero and revenue was 50. It could have been the case that revenue was less than cost (if cost were 60). The tax is for revealing preferences and not as a source of revenue.