

McPeak  
Lecture 13  
PAI 723

Public Goods.

Go back to the idea of goods being categorized by: rivalry and exclusion.

	Exclusion	No Exclusion
Rivalry	Private Good	Open Access
No Rivalry	Club Good	Public Good

Private good – candy bar.

Open access good – fish in the ocean.

Club good – concert, movie, country club.

Public good - national defense, clean air, city park.

Public Good. A commodity or service for which the consumption by one person does not preclude others from consuming the commodity or service, and for which it is not feasible to exclude any one individual from access to this commodity or service.

Provision of a public good creates positive externalities. The value of the benefits is not reflected in a market.

It does help some to think through the supply and demand for a public good.

The social demand curve for a public good is derived by the vertical summation of the individual consumers' willingness to pay for the good in question for all consumers.

Recall that a private good had the horizontal summation for each consumer. Horizontal summation over  $q$  for a given  $p$ .

For a price of \$2, I want 3 Whoppers, you want 1, a total of 4 is demanded. You and I are the only people, and if one of us consumes it, the other can not.

Now consider a public good.

Vertical summation of willingness to pay for all people for a given (shared) unit of  $q$ .

The free rider problem leads to underprovision of public goods.

In the extreme, no provision of the public good.

There is an incentive to benefit from a positive externality without paying the cost of public good provision.

There are two stores side by side, but one entrance to the two stores. Each store is deciding whether to hire a guard to sit by the main door. Two guards are no more effective than one guard.

Costs \$10 to hire, Benefit of a guard at the main door is \$8 to each store. Baseline is no guard, no benefits (0).

	Hire	Don't hire
Hire	-2   -2	-2   8
Don't Hire	8   -2	0   0

Say we consider cooperating and splitting the cost.

Costs \$10 to hire, Benefit is \$8 to each store.

	Hire	Don't hire
Hire	3   3	-2   8
Don't Hire	8   -2	0   0

Still don't hire.

Show on graph. The societal demand curve is arrived at by vertical summation by all who will benefit from the public good.

There are three people who live in a town. We are considering the demand for the number of hectares of public parkland, where  $q$  is the hectares of park area accessible to all three people.

Dora's demand is defined by  $90 - q$ .

Isa's is defined by  $30 - 3q$ .

Benny's is defined by  $150 - q$ .

Draw.

Ways to deal with the free rider problem.

- 1) Social pressure.
- 2) Mergers
- 3) Privatization
- 4) Compulsory provision

Voting and public goods.

Finding everyone's valuation is difficult if not impossible.

Even if you knew, practical issues arise about charging different people different rates.

Usually, we end up charging a uniform rate.

Median voter theorem. A project will pass if the median voter's valuation is greater than or equal to the cost to that voter.

Project is a traffic light. Total cost of light installation is \$300. There are 3 voters here who get benefits and pay the costs. Assume they split the costs evenly, so each one pays \$100 per light installed.

Three corners are being voted on, and the following represents the voters WTP.

	Fred	Barney	Wilma	TOTAL WTP
Corner A	50	100	150	300
Corner B	50	75	250	375
Corner C	50	100	110	260

Which ones will pass if we vote and people vote yes if their WTP-cost is greater than or equal to zero?

	Fred	Barney	Wilma	PASS?
Corner A	Y N	Y N	Y N	Y N
Corner B	Y N	Y N	Y N	Y N
Corner C	Y N	Y N	Y N	Y N

Yes – no voting ignores intensity of preferences.

If the valuation of the median voter is greater than or equal to the cost to that voter, it will pass a vote with a majority.

Condorcet in France in the 18<sup>th</sup> century discovered that in a set of pair-wise votes, majority votes can disobey the properties of transitivity for a group.

Budget.

Low – low cost budget

Medium – same as the area norm

High – with fancy high cost stuff

Three groups in society:

Moderates, who prefer Medium, to High, to Low (45% of the population)

Fiscal Conservatives, who prefer Low, to Medium, to High (35% of the population)

Liberals, who prefer High, to Low, to Medium (20% of the population)

	Preferences over Budget Levels			Percent of the vote
	First Choice	Second Choice	Third Choice	
Moderates	Medium	High	Low	45%
Fiscal Conservatives	Low	Medium	High	35%
Liberals	High	Low	Medium	20%

Two rounds of voting, pair-wise voting.

***Agenda A: Compare High to Low, then winner takes on Medium***

Round 1: High versus Low. High wins 45% moderates, 20% liberals = 65%

Round 2: High versus Medium. Medium wins 45% of moderates, 35% of fiscal conservatives=80%

**RESULT of Agenda A: Medium**

***Agenda B: Compare Medium versus Low, winner takes on High***

Round 1: Medium versus Low. Low wins 35% of conservatives, 20% of liberals = 55%

Round 2: Low versus High. High wins 45% moderates, 20% liberals = 65%

**RESULT of Agenda B: High**

***Agenda C: Compare High versus Medium, winner takes on Low***

Round 1: High versus Medium, Medium wins 45% of moderates, 35% of fiscal conservatives=80%

Round 2: Medium versus Low. Low wins 35% of conservatives, 20% of liberals = 55%

**RESULT of agenda C: Low**



As compared to the perfectly competitive market that leads at least in theory to the socially optimal outcome, there is no parallel theory of democracy that suggests voting leads to the socially optimal outcome.

How do we figure out WTP for public goods?

Some Methods.

1) Hedonic Methods.

Information on public good demand is embedded in price and consumption levels for private goods.

Consider the case of environmental quality. It is an implicit characteristic of a good you can buy in the private market.

We can disaggregate the observed selling price into its component parts.

We need to have some measure of the public good in question along with observed selling prices and observed characteristics of the commodity sold.

Price is a function of characteristics.

House purchaser maximizes utility subject to a budget constraint by selecting a house with a given set of characteristics and price.

Examples:

Houses next to parks.

Houses closer to interstate on-ramps.

The debate over SU putting up fences and lights in the Hookway tract.

Case One: Lakefront footage requirement on northern lakes in Wisconsin.

The county extension agent came to us with a question. Counties in northern WI were considering raising the minimum frontage requirement from 100 feet to 200 feet. There was debate about whether this was a good thing or a bad thing.

Externalities from zoning:

- 1) Positive externality. You look across the lake and see fewer houses. If part of your enjoyment of your lakefront house is some kind of wilderness view, this helps you. "Amenity effect"
- 2) Negative externality. You can't develop your property in the way you could before the law changed. The value of your property in development has been reduced. "Development effect"

What is the net impact?

892 transactions for undeveloped properties between January 1986 and December 1995.

- The amenity effect is significant and positive.
- The development effect is not significant (but is negative).
- The 200 foot rule increases property values by \$15.82 per foot (12.3%).
- Also, an increase in the percent of lakefront that is held as public lands significantly increases the value of a property.

## Case Two: Permits to Graze on Public Lands in New Mexico.

Ranchers are allowed to graze on BLM, Forest Service, and New Mexico State land.

Permits are not bought or sold. They have no explicit price. They are transferred to the purchaser of a ranch when the ranch is sold.

A policy goal is to charge fair market value for the use of public lands. There is a grazing fee associated with the use of a permit. Fair market value in this case would be to set the fee so that there is no value to a permit (positive or negative).

Permits are in terms of animal unit months.

452 ranch sales between January 1979 and December 1988.

Regress price on characteristics (including permit).

Implicit value of a permit is significantly different (larger) than zero in five out of 10 years for BLM permits, 8 out of 10 years for forest service permits, and 7 out of 10 years for state permits.

Also, by investigating how permit value changes in response to grazing fees, we find that if fees increase, permit value decreases.

## 2) Travel Cost methods.

If there is a site specific public good, you can look at the implicit cost of travel to the site as an implicit price of access to the site.

The individual's utility depends on the total time spent at the site, the quality of the site, the individual's opportunity cost of time, and other "stuff". The individual maximizes utility subject to monetary and time constraints.

### Case One: Lake Michigan Anglers.

97 anglers followed from May to September 1996 and 1997. We called every two weeks and recorded trip information. At the end of the study, we collected background demographic information including their income levels.

Mostly Milwaukee-Racine area anglers.

Estimated seasonal value of fishing: \$500 to \$700 dollars.

Current catch rates are on the order of  $\frac{1}{2}$  to 2 fish per hour (depending on the day / season / year).

What is the expected benefit of increasing this rate by 1 fish per hour?

Findings suggest somewhere in the \$1000-\$2000 range.

Most of the fish these people are fishing for are raised in hatcheries.

What is the amount that should be spent on providing the public good of swimming “easter eggs” so that a higher rate per hour catch is possible?

3) Private expenditures on a substitute in the absence of a public good.

Not as common in the literature, but interesting results can be obtained.

The question here is how much do people pay privately in the absence of public good expenditure?

We each hire private security firms in the absence of public security.

We buy bottled water in the absence of a clean municipal water supply – or – how much do we spend per year boiling municipal water since it is not safe to drink unboiled.

We buy kerosene to fuel our lamps since there is no electricity.

Can you provide a public good that substitutes for what people are already paying for at a lower price than they are currently paying?

Do people have faith that if money is diverted from private expenditure to support public provision, the public good will actually be provided?

Is there status to private consumption – bottled water?

#### 4) Contingent Valuation.

Used to estimate values for environmental amenities and other non-market goods and services.

Surveys are designed to elicit monetary values for non-market goods contingent upon creation of a market or other means of payment.

The transactions are hypothetical.

What are you willing to pay for a specified change (or to prevent a specified change from happening)? The response is a direct measure of the individual's valuation of the non-market good or service.



## Case One: Nonpoint Source Pollution and Present Values. Lake Mendota.

Wisconsin DNR is worried about phosphorus loading in Lake Mendota. The biomass in the lake responds to phosphorus through sudden and massive algal blooms. These stink, are ugly, and take a lot of work to clean up. Also, there is an environmental impact through decreased dissolved oxygen content of the lake, harming fish species and plant species in the lake.

Runoff from dairy farms.

Runoff from crop fields.

Runoff from yards and golf courses.

Increased pavement increasing runoff.

Proposal: a program to reduce the number of blooms in the summer from one out of every two days to one out of every five days. The proposal outlined specific measures that would reduce phosphorus runoff.

Spectrum of choices: Would you vote yes or no if it cost \$0, yes or no if \$5, yes or no if \$10,...over \$300 each year for each of the next three years.

Mean willingness to pay is \$353 per year.

Case Two: Willingness to pay for wind power.

Madison Gas and Electric was considering implementing a wind power program. They were going to build some windmills. If you signed up, you would voluntarily pay more to help meet the costs of the windmill, and decrease the use of coal to generate electricity.

We took this opportunity to compare actual willingness to pay with hypothetical willingness to pay.

We told one sub-sample they could sign up for \$24 per year, another at \$48 per year,...up to \$288 per year. They said yes or no. The hypothetical group had the same intervals, but it was phrased “if we were to offer this, and it would cost you \_\_, would you agree to pay, yes or no”

How many actually signed up? 24%.

How many said they would hypothetically? 43%

How much did people sign up to purchase on average? \$59.

How much did they agree in the hypothetical case to purchase on average? \$101.

We asked a follow up question about how certain they were about their answer in the hypothetical case. For those who were more certain, the actual and the hypothetical converged.