Public Budgeting and Common Pool Resources

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LSE

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Introduction

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   Motivation:
   - ▶ One explanation for (much-discussed) government overspending, with implications for budgeting processes, federalism/decentralization
   - ▶ An application of ideas about "market failure" from microeconomics to the problem of "government failure"

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Common feature of social dilemmas: existence of strategy profile that *Pareto dominates* the equilibrium i.e. that is weakly better for all players.

What are we doing? (2)

Another social dilemma with a possible Pareto improvement:

Scenario 4: **Open rule**
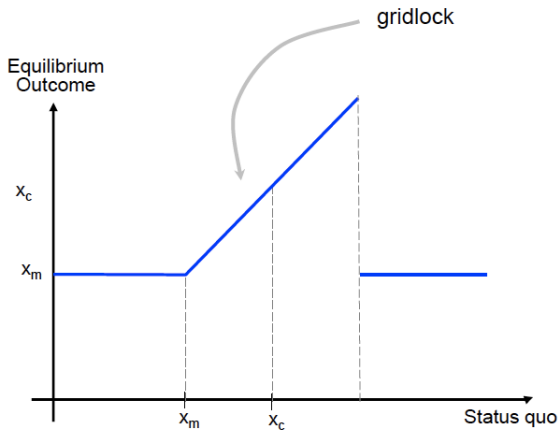
Why game theory?

We use game theory because thinking abstractly about social and political situations will help you **diagnose problems** and **suggest solutions**.

- ▶ Game theory is a highly structured way of reducing complexity and thus thinking abstractly.
- ▶ By reducing complexity we notice similarities between apparently diverse phenomena: "legislators spending tax money are like cattle farmers using a common grazing area"
- ▶ Analogies suggest solutions

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- ▶ By reducing complexity we notice similarities between apparently diverse phenomena: "legislators spending tax money are like cattle farmers using a common grazing area"
- ▶ Analogies suggest solutions – we address situation A with solution X; situation B is like situation A, etc.

Why social dilemmas?

We focus on the classic social dilemmas because they resemble a variety of real political and social problems, but also because

- ▶ They are interesting games
- ▶ They avoid many intractable philosophical dilemmas
- ▶ They suggest potentially implementable solutions to those problems

Why social dilemmas? (1)

Because they are interesting games (i.e. they have non-obvious features).
Some boring games:
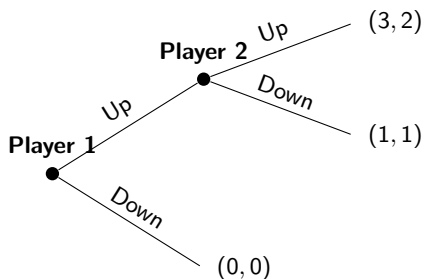
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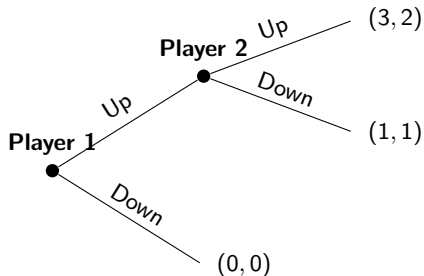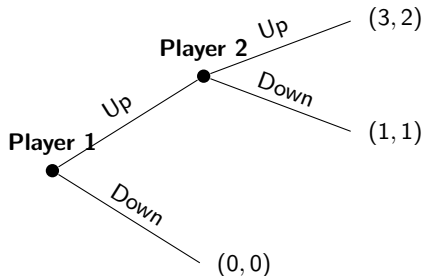**What makes a game interesting?** Pareto subobtimality (but also multiple equilibria,
lack of information about actions or payoffs, etc)

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We avoid intractable debates by

- ▶ Reducing payoffs to one ordinal dimension → no conflict between values, e.g. freedom and economic well-being
- ▶ Emphasizing situations of Pareto suboptimality → no interpersonal utility calculations necessary

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Pareto improvements are supported by everyone. If you as government official, activist, consultant can identify a way of changing the game such that a Pareto-improving strategy profile is the new equilibrium, everyone should support it.

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- ▶ Even as we focus on social dilemmas, let us not forget that much of the world is zero-sum and/or complicated.

A request: Instead of "Phenomenon X can't be addressed with game theory", try to say "Model Y is not a good representation of phenomenon X because it is missing features a, b, and c."

Common pool resources in terms of excludability and rivalrousness

	Excludable	Non-excludable
Rivalrous	**Private goods**: food, bicycle, laptop	**Common pool resources**: "commons", fish populations
Non-rivalrous	**Club goods**: lecture, satellite TV	**Public goods**: Defense, GPS

Common pool resources in terms of externalities

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Externality is ...	Consumption	Production
... positive	Immunizations, education	Public goods, (common pool resources)
... negative	Cigarettes, gas/petrol, common pool resources	Electric power, meat

Analyzing externalities (1)

Negative consumption externality: e.g. driving
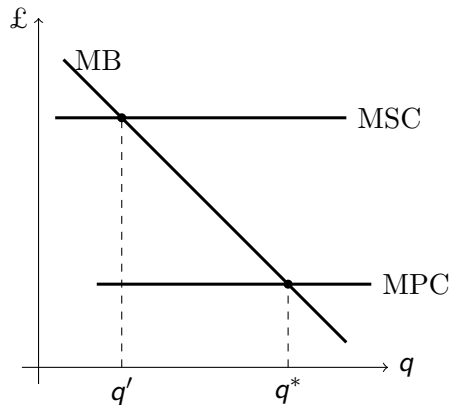
Where

- $MB =$ marginal benefit to the driver, and to society
- $MPC =$ marg. private cost to the driver
- $MSC =$ marg. social cost
- $q^* =$ privately optimal amount
- $q' =$ socially optimal amount

Analyzing externalities (2)

Positive production externality: e.g. research
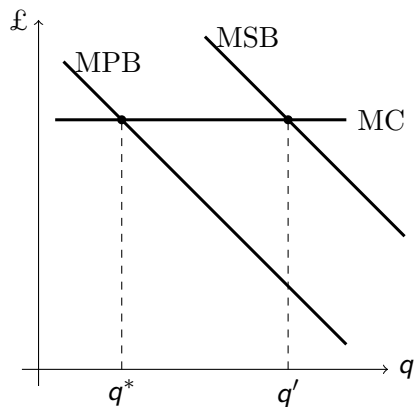
Where

- ▶ MC = marginal cost to the researcher, and to society
- ▶ MPB = marg. private benefit to the researcher
- ▶ MSB = marg. social benefit
- ▶ q^* = privately optimal amount
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Externality in game theory terms (1)

Neighbor

Firm	Don't pollute	2,2
	Pollute	3,0

Externality in game theory terms (2)

		Player 1	
		Cooperate	Defect
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The prisoner's dilemma is a symmetric game in which each player imposes an externality on the other by defecting; that externality is so large that the equilibrium is Pareto suboptimal.

"Tragedy of the commons" in game theory terms

		All other fishermen	
		Fish a little	Fish a lot
Fisherman 1	Fish a little	2,2	$0, 1 + \epsilon$
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The tragedy of the commons can be seen as a multilateral prisoner's dilemma.

Government responses to externalities

Tools: taxes, subsidies (consumption and production), regulation of consumption and production practices, access restrictions, property rights creation, government provision

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Non-profit sector as a response to externalities

Tax benefits in many countries for organizations pursuing "charitable purposes."

UK Charities Act, 2006, "charitable purpose":
"(a) the prevention or relief of poverty; (b) the advancement of education; (c) the advancement of religion; (d) the advancement of health or the saving of lives, . . ."

US IRS code section 501(c)3, "charitable purpose":
"relief of the poor, the distressed, or the underprivileged; advancement of religion; advancement of education or science; erecting or maintaining public buildings, monuments, or works; . . ."

Japan NPO Law, "specified nonprofit activities":
"1. Activities to promote health, medical care, or welfare; 2. Activities to promote social education; 3. Activities to promote community development; 4. Activities to promote culture, the arts, or sports . . ."

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Coase Theorem: efficient outcome regardless of who has legal liability (i.e. allocation of rights) if

- costless transactions (i.e. bargaining, collective action)
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- ▶ rights are secure (e.g. if I have a right to clean air, you cannot unilaterally pollute)

$\rightarrow$ Under these ideal conditions, if there is a Pareto improvement it will be arrived at by negotiations.

Government failure?

The government appears in two forms in a (caricatured) intro micro-econ course:

- ▶ A nuisance imposing distortions on well-functioning markets
- ▶ A solution to market failure (caused by e.g. divergence between private and social costs and benefits of private actions)

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But why should we expect the government to solve market failures? What about **government failures** (caused by e.g. divergence between private and social costs and benefits of **government** actions)? (See Shepsle reading.)

Two kinds of externalities in policymaking

▶ Principal-agent problems: policymaker's private costs and benefits of policymaking differ from those of his constituents. (**Vertical externality.**)

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- ▶ Principal-agent problems: policymaker's private costs and benefits of policymaking differ from those of his constituents. (**Vertical externality.**)

- ▶ Common pool problems: one group does not internalize costs and benefits of policymaking on other groups. (**Horizontal externality.**)

Von Hagen & Harden model includes both externalities; today we focus on the second only.

Simplified budgeting model (1)

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1. n policymakers, each with own identical "domain" (e.g. electoral districts, ministries)

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For policymaker considering amount of "local" spending:

▶ Assumptions 2 and 3 $\rightarrow \mathrm{MPB} = \mathrm{MSB}$.
▶ Assumption 4 $\rightarrow \mathrm{MPC} = \frac{1}{n}\mathrm{MSC}$.

Budgeting model in terms of externalities
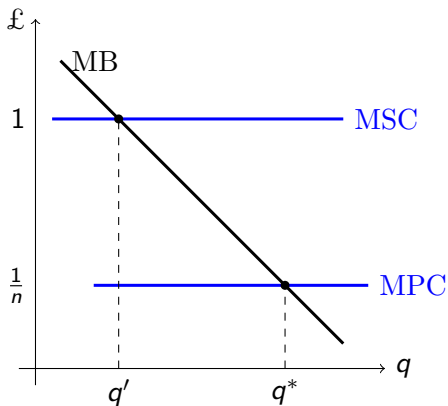
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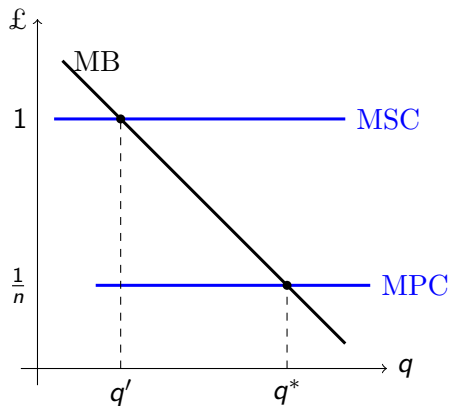
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What is desired level of "non-local" spending?

Budgeting model in terms of game theory: special case

Suppose $n = 2$. Then:

		Policymaker 2	
		q'	q^*
Policymaker 1	q'	$b(q') - q',$ $b(q') - q'$	$b(q') - \frac{q^*+q'}{2},$ $b(q^*) - \frac{q^*+q'}{2}$
	q^*	$b(q^*) - \frac{q^*+q'}{2},$ $b(q') - \frac{q^*+q'}{2}$	$b(q^*) - q^*,$ $b(q^*) - q^*$

where

- q^* is the privately optimal level of local spending and
- q' is the socially optimal level of local spending.

Playing q^* is a dominant strategy, based on the definition of q^*. This is a prisoner's dilemma if $b(q^*) - q^* < b(q') - q'$.

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5. Spending rule with one policymaker acting as budget director and accepting bribes for "top-ups"
   Hint: What bribe would make budget director accept a marginal increase in "non-local" spending? What then is marginal cost of "local" spending including bribe?

Two main insights

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Paradoxical? What would the prisoner's in the prisoners dilemma vote for?

The fiscal illusion in math(s)

Model based on a combination of von Hagen and Harden (1995) and Weingast Shepsle & Johnsen (1981).

Budget is vector of spending levels
$\mathbf{x} = \{x_1, x_2, \ldots, x_i, \ldots, x_n\}$.

Legislator i's utility as a function of the budget $\mathbf{x}$ can be written:

$$U_i(x_i) = b(x_i) - \frac{1}{n} \sum_{j=1}^{n} x_j,$$

where $b(x_i)$ is a well-behaved concave function capturing the benefits to i's constituents from spending level x_i, $\sum_{j=1}^{n} x_j$ is the total amount of spending and $\frac{1}{n}$ measures the share paid by legislator i's constituents.

The privately optimal amount of local spending for policymaker i, x_i^*, is the value of x_i that maximizes $U_i(x_i)$:

$$b'(x_i^*) = \frac{1}{n}$$

The efficient level x_i' is obtained by solving

$$\max_{\mathbf{x}} V = \sum_{j=1}^{n} b(x_j) - \sum_{j=1}^{n} x_j.$$

Solution occurs where marginal benefit and marginal cost are equal for each component of $\mathbf{x}$, i.e. where

$$b'(x_i') = 1.$$

Now suppose all domains must spend the same amount $\overline{x}$. The optimal $\overline{x}$ for policymaker i is found by solving

$$\max_{\overline{x}} U_i(\overline{x}) = b(\overline{x}) - \frac{1}{n} \sum_{j=1}^{n} \overline{x},$$

which is found where

$$b'(\overline{x}^*) = 1.$$

Note that $x_i^* > x_i' = \overline{x}^*$.

Evidence on deficits and centralization of budget process

Evidence from Latin America, in Alesina, Hausmann, Hommes, and Stein (1999):

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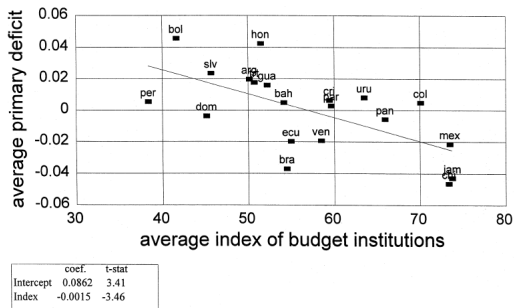|	coef.	t-stat
Intercept	0.0862	3.41
Index	-0.0015	-3.46

Fig. 4. Budget institutions and fiscal outcomes (1980–1992).

Application to earmarks in U.S. Congress

Excerpt from 2005 transportation bill:

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    (1) DESIGNATED PROJECTS.—
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    of the fiscal years 2006 through 2009, all but
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    in subsection (e). Such $100,000,000 shall be
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Questions:

▶ Which of the budgetary procedures considered above does this remind you of?

▶ Would eliminating earmarking privileges affect the amount of spending?

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$100,000,000 shall be apportioned as provided
in subsection (e). Such $100,000,000 shall be
available as follows:
(i) $12,500,000 per fiscal year for the Gold-
en Gate Bridge.
(ii) $18,750,000 per fiscal year for the con-
struction of a bridge joining the Island of
Gravina to the community of Ketchikan in
Alaska.
(iii) $12,500,000 per fiscal year to the
State of Nevada for construction of a re-

Questions:

▶ Which of the budgetary procedures
considered above does this remind you
of?

▶ Would eliminating earmarking
privileges affect the amount of
spending?

▶ Reform ideas?

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Next time: Collective action problems and policymaking.

Feedback

Please take out a sheet of paper and write down 3 things:

1. What, if anything, did you find particularly difficult or confusing?
2. What, if anything, did you find particularly interesting or helpful?
3. Any suggestions or comments about the pace, content, presentation?

Thank you!