CHAPTER 2: GLOBAL INTERDEPENDENCIES: BASICS

I. INTRODUCTION

A. free rider problem: NO example at individual level, strategic aspects of a survey instrument.

(1) If you think that you will pay, you will underestimate.
(2) If you think that you won’t pay, you will overestimate.

B. Purposes here

(1) in-depth study of problems involved with market failures and their evaluations
(2) give requisite background concepts
(3) introduce some simple game theory

C. Individual rationality or pursuit of self-interest does not typically result in an efficient outcome for some collective action problems - e.g., consider OPEC. Incentive to cheat leads to everyone cheating and earning less. Each OPEC member exceeded quotas in an attempt to increase profits.

Strategic behavior: your choice depends on that of others. Interactive choices that cause agents’ payoffs to be interdependent are known as strategic. Also involves recognition of the interdependency.

II. THE PRISONERS’ DILEMMA

A. Storyline: two individuals in vicinity of an armed robbery. DA has insufficient evidence to convict them of armed robbery (9 years sentence), but has enough to convict them of possessing handgun (1 year sentence). Deal: if you alone turn states evidence, your sentence is 2 months. If both confess, each get 5 years.

B. Present Figure 2.1

C. Dominant Strategy: A strategy that provides a greater payoff regardless of the other players’ action.

D. Nash Equilibrium: neither play would unilaterally alter his or her strategy if the opportunity. Demonstrate

E. Ordinal representation: Figure 2.2

F. Arms Race Scenario: Figure 2.3 - limit or escalate arms. Indicate four strategy combinations. Another example - espionage activities, treaty to retaliate against state sponsors of terrorism.
G. n-person Prisoners’ Dilemma. Pollution example

Strategies: Cut pollution by 10%
Don’t cut pollution by 10%

Payoffs: curtailment costs 5 in profits
provides a benefit of 3 to each and every nation.

Figure 2.4

Nash equilibrium-) no one cuts for a payoffs of 0s. Dominant strategy is the top row.

Enforcer comes with a penalty of 3 - any punishment greater than 2 = (c - b) will work. Problem of first-and second-level free riding.

This is problem of many international agreements or protocols ) no enforcement mechanism. Enforcement is a public good and, as such, implies its own Prisoners’ Dilemma.

Society’s conventions to circumvent Prisoners’ Dilemmas.

H. Importance of repeated interactions: weigh short-run gains from noncooperation against long-run losses.

III. OTHER GAMES AND THEIR APPLICABILITY

A. Assurance Game: Figure 2.5

Contribute one or no units of the public good.

Both players must contribute a unit of the public good before the players receive a benefit of 6 from each unit contributed; that is, a minimal cumulative effort of two units must be achieved. Cost per unit of 8.

Assurance also applies to weakest-link

E.g., a viral invasion in which both must fend off the disease.

No dominant strategy, two Nash equilibria, contracts are self-enforcing. A focus equilibrium at mutual cooperation.

The right underlying game may be very conducive to cooperation.

B. Classic Chicken game - Figure 2.6
Do storyline. Ordinal payoffs.
Two Nash equilibria - one swerver
No dominant strategy

Trademark matrix for Chicken is Figure 2.6

C. Chicken Game for Public Good Provision - Figure 2.7.
No action - gives -5 in payoff
per unit benefit of 6 at a cost of 8

Many international scenarios fit this pattern - insidious pollutants, diseases, natural disaster, and contagious revolutions.

Unequal: change the -5 to -1 for nation A. Country A now has a dominant strategy to free ride.

IV. EXTERNAL EFFECTS: FURTHER CONSIDERATIONS

A. Cost or benefit is not taken into account by the market price.

B. Remedies

(1) Impose taxes on harmful external effects and subsidies on beneficial external effects. Logic is to make polluter account for his/her externally imposed costs or benefits. tax = MEC

(2) Government determines ideal level of the activity and then provides permits that can be traded. Rely on markets to get permits into the hands of those who value the activity the highest.

(3) Government set limits or quotas on an activity.

(4) Courts can assign the rights to an externality-free environment to the potential recipient and allow the externality generator to bribe this recipient. Or the externality generator can be granted the right.

(5) Government does nothing.

C. Remedies’ problems

(1) Information
(2) Transaction costs in the large numbers case
(3) At supranational level, there doesn’t exist the infrastructure to achieve many of these remedies
D. Type of externalities: unidirectional external effects, reciprocal external effects - leverage exists for reciprocal externalities.

(1) small numbers versus large numbers
(2) intergenerational externalities (unidirectional)

V. PUBLIC GOODS

A. Examples: a thinning ozone shield, removal of pollution, elimination of diseases, the accumulation of knowledge, provision of security, and the forecasting of disasters.

B. Public good provision can pose a Prisoners’ Dilemma see Figure 2.4 if benefits per unit is less than the costs per unit.

C. Figure 2.7 indicates that provision can be associated with other game forms.

D. Types of public goods

(1) Club good - possesses partially rival benefits that can be excluded at a sufficiently small cost to permit visits to be monitored and charged a toll. Examples: Commando units, the Internet. Rivalry in the form of crowding. These goods can be allocated efficiently without the need of a government because of the exclusion mechanism.

(2) Preserve a nation’s autonomy.

E. Figure 2.8: Incentive-compatible public good.

(1) each unit provided gives 6 in benefits to each player at a per-unit cost of 4
(2) dominant strategy is to contribute
(3) examine CFCs limits in the USA

VI. PUBLIC GOODS WITH SELECTIVE INCENTIVES

A. Some public goods provide more than one type of benefit that can differ in terms of their nonrivalry and nonexcludable aspects.

(1) Development of knowledge - scientific breakthrough. Benefit to humankind and specific knowledge to the developer. The private benefits can make contributing a dominant strategy.
(2) Why individuals lead revolutions.
(3) These selective incentives must be fostered at supranational level.

VII. PUBLIC SUPPLY AGGREGATION CONSIDERATIONS
A. Game form and aggregation of public good benefits.

B. **Technology of public supply**: the association between individual contributions and the total quantity of the public good.

C. Types

   (1) Summation \( \sum_{i} q^{i} = Q \) perfect substitutability

   (2) Best shot: \( Q = \max\{q^{1},...,q^{n}\} \)

   (3) Weakest link: \( Q = \min\{q^{1},...,q^{n}\} \) (Prophylactic measures)

D. Summation yields a Prisoners’ Dilemma or Chicken. Undersupply and exploitation

E. Weakest link and Assurance game. A matching behavior results. Use Fig. 2.5. Each must contribute a unit to get benefit of 6. Per-unit cost is 8. Redistribution of income that furthers equality can raise overall level of provision. (spread of diseases and revolutions)

F. **Best Shot Coordination Game - largest individual contribution**

   (1) Figure 2.9

   (2) First unit contributed gives 6 in benefits to each player at a cost per-unit of 4. Additional units give nothing in benefits

   (3) Two Nash equilibria

   (4) E.g., neutralizing a rogue nation, intelligence gathering

   (5) Unequal payoffs. Let A receives 8 from the public good at a cost of 4

G. Weaker-link, better-shot, and weighted sum.
Player A needs greater assurance that B will contribute for player A to shirk its role as contributor. If private benefits from contributing, then more incentive to contribute.

Action is less ambiguous and more likely if the players' payoffs are unequal. This can occur if demand increases with income.