

*Common-Pool Resources:
Over Extraction and Allocation
Mechanisms*

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Fundamentals from Economics

- Opportunity Costs imply the need for appropriation rules and allocation mechanisms that guide resource units to their most highly valued uses.
- Lack of effective property rights often lead to overuse and resource degradation.
- Policy changes, without careful thought to responses, often have unintended consequences

The nature of goods and their allocation

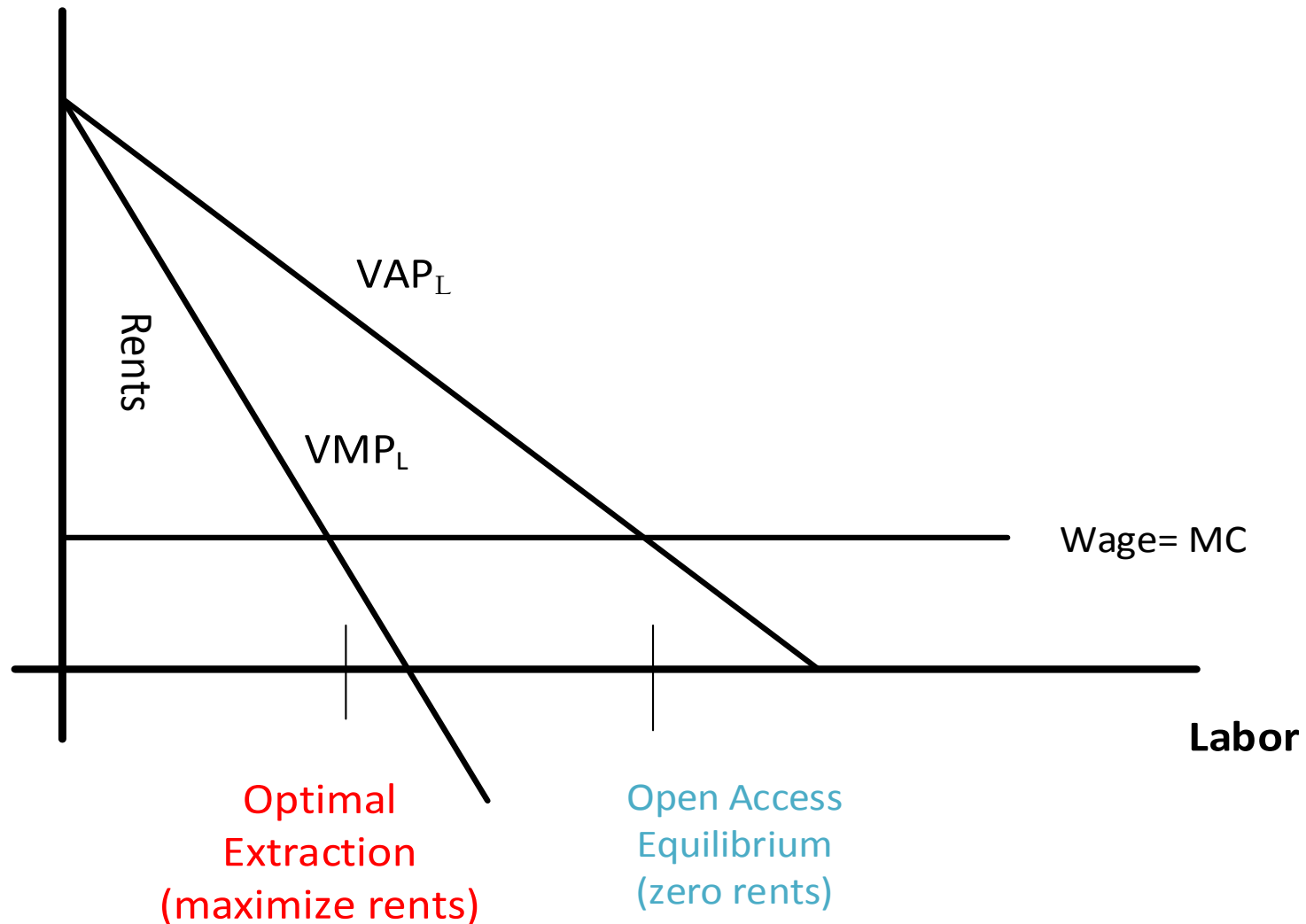
		Rivalry or Subtractability in Use	
		High	Low
Ability to Exclude	High	Private goods	Toll goods
	Low	Common-Pool Resources (CPRs)	Public goods

A Basic Model of CPRs

- Open Access – with full replenishment per period
- Resource generates valued resource units (water), where the level of water extracted is a quadratic function of extraction effort (L).
- L has an opportunity cost (e.g. wage (w) that is foregone if the labor is used for extraction).
- Value: Total Product of Labor: $Q_w = \$f(L) = \$(aL - bL^2)$
- Value: Average Product of Labor = $\$(a - bL)$
- Value: Marginal Product of Labor = $\$(a - 2bL)$

Appropriation and Dissipation of Rents: Open Access

Value of Water extracted



Story may be worse

- Insufficient or high variability in replenishment rates
- Time dependence and strategic “race to the water”
- Degradation of the Water Resource
- Degradation of the broader resource system (the broader public good)
- Limited Access may help – but there still exists the problem of non-cooperation and strategic behavior

Rent Dissipation in an Experimental Laboratory

- Limited access - groups of 8 made anonymous appropriation decisions in a setting designed to capture the incentives of the CPR.
- The decision setting is repeated with “feedback” on group outcomes.
- Limited-access non-cooperative outcome generates 37% of maximum rents – 8 tokens used for appropriation.
- Treatment conditions: a) appropriation capacity, b) face-to-face communication; c) individual imposed sanctions

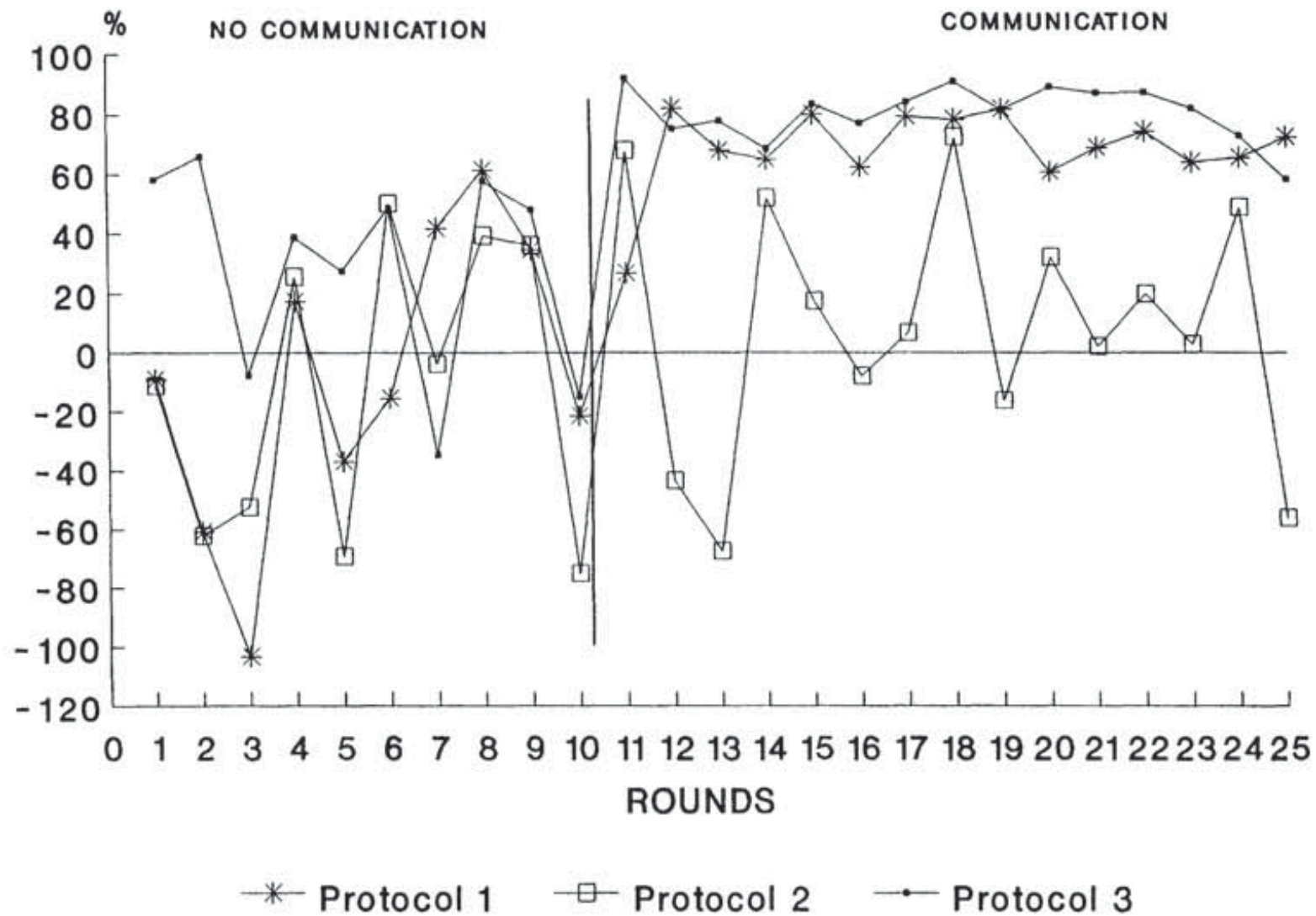
Experiments: OGW - Covenants and Swords

Decision Setting	Decision Rounds 1-10	Decision Rounds 11-25
Low Capacity to Appropriate	47%	35%
High Capacity to Appropriate	-22%	21%
High Capacity – Imposed Institutional Change After Round 10		
One-Shot Communication	-26%	53%
Repeated Communication	9%	73%
Imposed Sanction Opportunity	-37%	36%
One-Shot Communication & Sanction Opportunity	-14%	84%
High Capacity – Endogenous Institutional Change After Round 10		
One Shot Communication & No Sanction Chosen	42%	53%
One Shot Communication & Sanction Chosen	-11%	91%

Experiments: With Incomplete Collective Action

- Insiders – face-to-face communication with ability to make verbal commitments.
- Outsiders – vary their ability to respond to insiders.
 - Protocol 1 – outsiders: computerized Nash players
 - Protocol 2 – outsiders: unrestricted human players
 - Protocol 3 – outsiders: restricted human players

Experimental Results: SSW Insiders and Outsiders



Summary Results

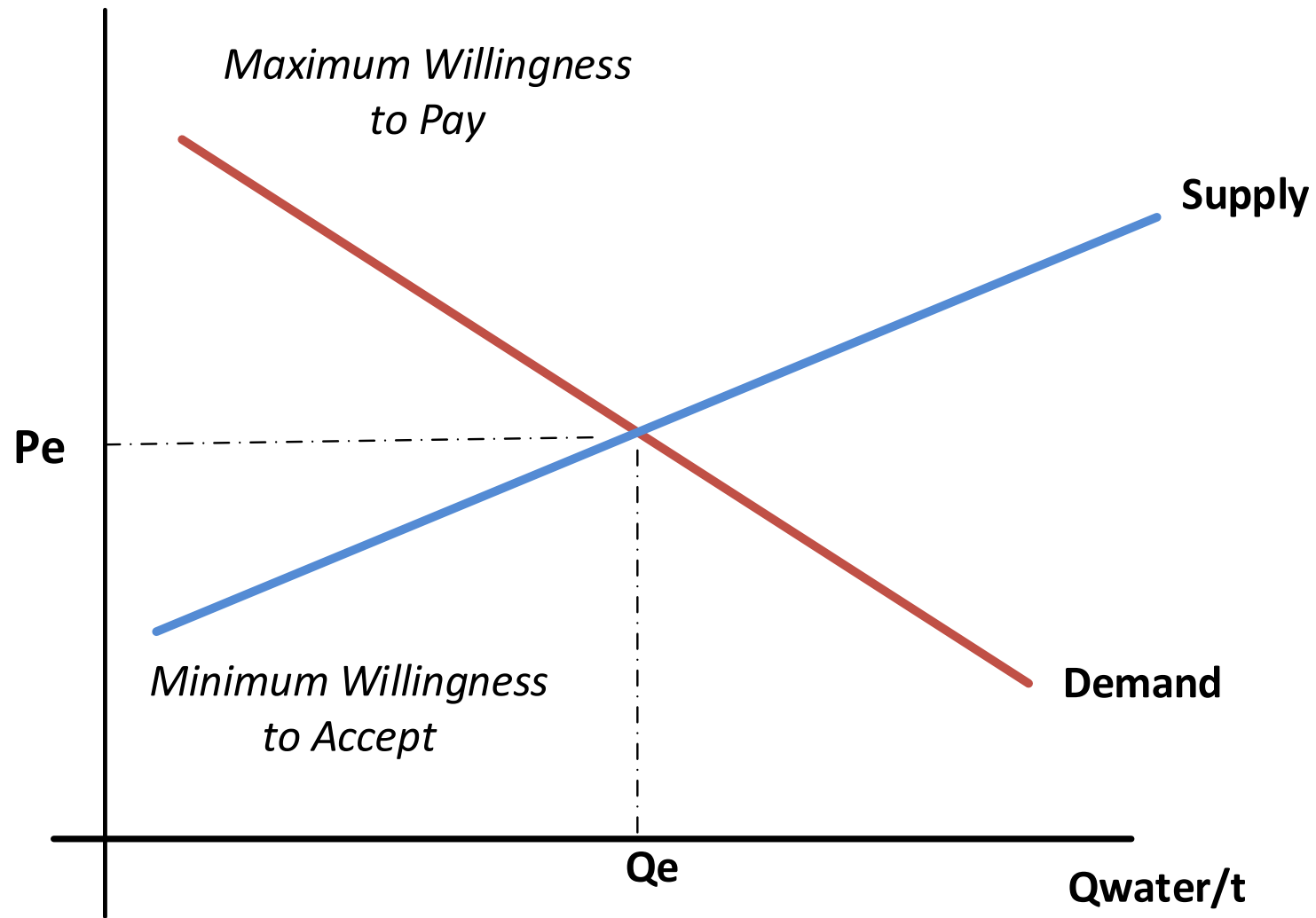
- Human outsiders respond strategically to opportunities created by insiders;
- Insiders deviate more frequently from agreement with imperfect monitoring;
- Insiders anticipate issues and are less likely to reach agreements.

Implementing a market mechanism

- Suppose policies can be designed to assign effective property rights that are tradeable.

Viewed from the perspective of a competitive market mechanism, with price taking behavior, yields the model of Supply and Demand.

Perfect Competition as a Market Allocation Mechanism



Markets as a solution? Some not-so-small issues

- Assignment of effective property rights
- Transaction costs – e.g. information, policing/monitoring, enforcing
- Externalities in production and consumption
- Public acceptance of the allocation process (assigning property rights and the market allocation)

Collective Action - lessons from a pioneer

A Subset of Ostrom Design Principles

□ “Governing the Commons”

- Clearly defined boundaries (including who has appropriation rights)
- Effective Monitoring
- Graduated Sanctions
- Appropriate conflict resolution mechanisms
- Opportunity for rules to be conditioned on bottom up approach
- Rules designed to address appropriation and conflict across larger/overlapping resources – nested rules

“No Panaceas” – importance of local information and conditions

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Thank You