

# Using Experimental Methods to Inform Public Policy Debates

Jim Murphy

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# Experiments are just one more tool for the applied economist

- **Econometric analysis of non-experimental data**
- **Surveys (quantitative and qualitative)**
- **Experimental methods**

# What is experimental economics?

- **Pioneered by Vernon Smith**
- **Observe behavior of human subjects in a controlled setting**
- **Setting captures essential elements of an economic problem**
- **Subjects paid cash based on their performance**

# What distinguishes experiments from other empirical research?

- **Control**

- Over rules of exchange (institution)
- Over incentives (environment or parameters)
- Over individual preferences (cash payments)
  - Know theoretically predicted outcome
    - Compare with observed behavior

- **Replication**

- Often difficult with field data

# Why experiments? (I)

## Experiments and theory

- **Test a theory**
  - Enforcement of permit markets
  - Public goods & bargaining experiments
- **Explore causes of a theory's failure**
  - Public goods & bargaining experiments
- **Establish empirical regularities**
  - Existence of hypothetical bias in CV
  - Efficiency of double auctions

# Role of experimental methods in the policy process

- **Incentive-based management gaining popularity**
  - Rights trading for emissions, fishing, water use...
  - Taxes, tax breaks and subsidies for land use and agricultural practices (CRP)
- **“If you build it, they will come...”**
  - Economic theory says little about **role of institutions**
  - Experiments show that institutions are critical in determining outcomes
- **Cheaply and quickly evaluate economic properties of proposed new programs**
  - Identify problems before implementation

# Why experiments? (II)

## Inform policy decisions

- **Compare institutions (“rules of exchange”)**
  - EPA Acid Rain Program
- **Evaluate policy proposals**
  - Proposed alternative ITQ market structures
  - Cotenancy on natural gas pipelines
  - Management of common-pool resources
- **Design & test new institutions**
  - RECLAIM combinatorial auctions
  - Water market design
  - FCC spectrum auctions

# External validity (parallelism)

- **Economic behavior is governed by basic principles which work in the lab as well as in naturally-occurring environments.**
  - Depends on how well design captures incentives of naturally-occurring environment
  - Cash payment aligns subjects' incentives with those of agents they represent
- **Eventually established through repeated successful application to a range of problems**



# Building an airplane (or new policy)

1. Engineers develop design

2. **Test in windtunnel**

3. Flight tests

4. Use plane

1. Economic theory & econometrics

2. **Experimental economics**

3. Field pilots

4. Implement policy

# Enforcement of tradable permits

- Test a theory – with policy implications!!

# Why run experiments?

- To test a theory about enforcement & compliance in permit markets
  - Theory has some counterintuitive results
  - Important policy implications
- Theory cannot be tested with existing data
  - Insufficient variation in enforcement strategies
  - Test theory in controlled lab setting
- Results
  - Largely support theory
  - One unanticipated result not predicted by theory

# Motivation

- Environmental regulations often involve **fixed standards**
  - Technology standards
  - Emissions standards
- **Market-based mechanisms** can meet environmental goals at lower cost
  - Programs must be enforced

# Enforcing markets different than standards

- **Regulators have experience enforcing emissions standards**
  - e.g., Target enforcement based on firm characteristics
- **Enforcing market-based mechanisms fundamentally different**
  - **Permit price** is key determinant of compliance

**Policy implication:** Enforcement strategies that were effective for standards might not be appropriate for markets

# Implications for enforcement of permit markets

- **With markets**, violations depend on:
  - Permit price and expected penalty



Violations are **independent** of firm-specific characteristics

→ no justification for targeted enforcement

# Direct and indirect price effects

- Compliance decisions are **linked** through permit market
- Effects of increased enforcement on violations:
  - Negative direct effect
  - **Countervailing positive price effect**

**Policy implication:** Changes in enforcement can induce changes in permit prices—which affect compliance decisions.

**Policy implication:** Targeted enforcement can **induce non-compliance** by those who are not targeted.

# Common pool resource management

- Field experiments



# From the lab to the field

- **Recent trend towards more field experiments**
  - Test robustness of lab experiments
  - Cross-cultural studies
  - Less artificial environments
- **Lab and field experiments are complements with +’s and –’s**

# Common pool resources (CPRs)

- **Easy to access, hard to exclude**
  - Can lead to resource over-extraction
    - “Tragedy of the Commons”
  - e.g., fisheries, forests
- **Dilemma: individual interest vs. group interests**
  - *“A situation in which mutual cooperation is collectively rational for a group as a whole, but individual cooperation may not be rational for each member”* —Bardhan et al., 2000

# Why in the field??

- Social dilemmas in CPR experiment parallels that in their daily lives
- Experience in CPR could affect choices in experiment
  - Familiarity with each other
  - Social norms about appropriate behavior
  - May get different results than with students
  - Observing how people actually affected by CPRs may be more relevant to understanding resource exploitation in developing world

# The sites

- We conducted the same set of experiments in 3 regions of Colombia
- Subjects were direct users of natural resources
  - Majority were fishermen.















# Background

- **Government intervention could have unintended consequences**
- **Regulations can shape not only behavior, but also preferences**
  - Crowding out
- **Limits to self-governance**



# Research questions

- **What motivates CPR users?**
  - Tested several models of pure Nash strategies when people motivated by combination of self-interest and alternative motives
    - Pure self-interest
    - Altruism
    - Reciprocity
    - Conformity
  - Choices consistent with **conformity**
    - Leads to more conservative use of resource

# Research questions

- **What are the effects of alternative institutions intended to promote more conservative choices in CPRs?**
- **How do these vary among regions?**
  - Possible complementarities between external (formal) and internal (informal) regulations
  - Some evidence in support of complementarities, but not consistent across regions

# Hypothetical bias in contingent valuation

- Establish empirical regularities
- Mechanism design / calibration
- Develop theory

# Contingent valuation

- **CV surveys elicit values for non-market goods**
  - WTP to preserve ANWR
  - Value of damages from *Exxon Valdez*
- **Hypothetical nature of CV**
  - Payment for the good
  - Provision of the good

How do you know your CV estimate is accurate?

# Basic elements of CV experiments

- **Subject pool**
  - Students / non-students
- **Good to be valued**
  - Public vs. private good
- **Elicitation mechanism**
- **Treatments**
  - Hypothetical
    - “Would you pay \$X?”
  - Actual / Real
    - “Will you pay \$X?”

## **Hypothetical bias**

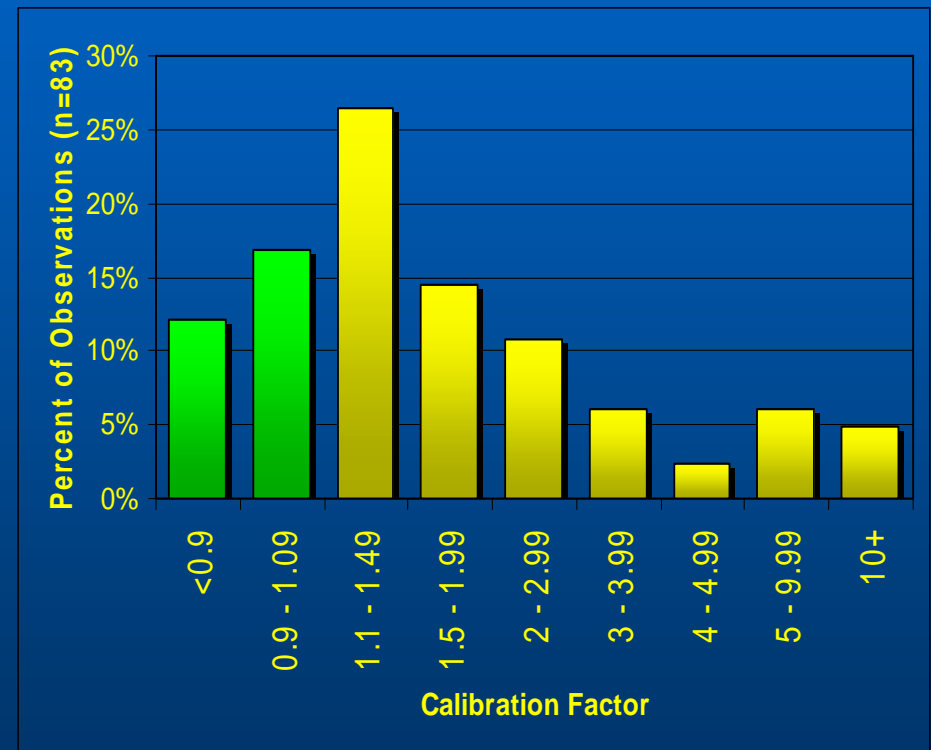
Hyp. payments exceed  
real cash payments

## **Key assumption**

Real cash payments  
are unbiased

# Why run experiments? (I)

- **Establish empirical regularities**
  - 1980's to early 90's
  - Does hyp. bias exist?
  - Murphy *et al.* meta-analysis
    - 28 studies, 83 observations
    - 71% observations  $CF > 1.1$
    - Mean  $CF = 2.60$
    - Median  $CF = 1.35$



$$CF = \frac{\text{Hypothetical Value}}{\text{Actual Value}}$$

# Why run experiments? (II)

- **NOAA panel (early 90's)**
  - “unfortunate” lack of data to calibrate responses
- **Develop and test new calibration techniques**
  - Late 90's to now
  - Ex ante or instrument calibration
    - Try to get unbiased responses
      - Budget reminders
      - Cheap talk script
  - Ex post or statistical calibration
    - Control for biased responses
      - Statistical bias functions
      - Respondent uncertainty

# Calibration techniques generally effective, but...

- **No theory to explain why they work**
  - Why do people systematically behave differently in hypothetical & real settings?
- **May not be able to generalize results**
  - Example: Cheap talk
    - Assumes that making people aware of bias will eliminate it
    - Sensitive to script length, amount asked, subject experience



# Why run experiments? (III)

- **Test theory & explain anomalies**

- Ultimatum game modal split roughly equal
  - Subsequent experiments sought to explain why
- What causes hypothetical bias?
  - Surprisingly little experimental work seeks to address this
  - Explanations have been offered, but not systematically tested

# Some other projects

- **Mechanism design**
  - California and Peruvian water markets
  - Australian non-point source trading
- **Voluntary disclosure (EPA Audit Policy)**
- **Voluntary agreements**
- **International environmental agreements**
- **Effects of social emotions on behavior in a CPR**

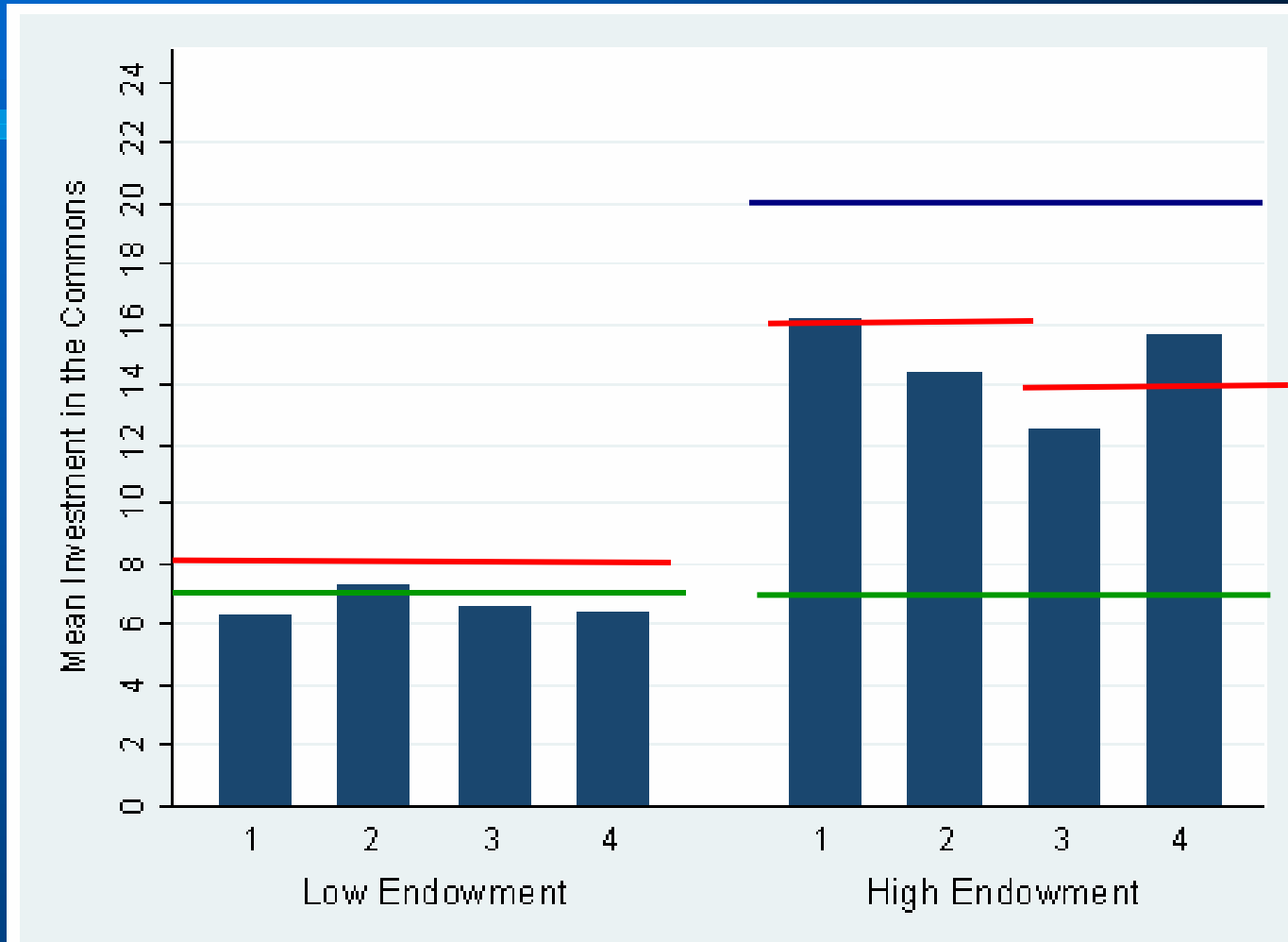
# Conclusion: When should I think about experiments?

- **When naturally occurring data don't exist**
  - New institutions, regulations, policies
- **To complement field data or surveys**
  - All types of empirical studies have their strengths and weaknesses
- **To identify how human behavior might affect policy outcomes**
  - Social dilemmas / social norms
  - Behavioral economics

# Other Ongoing UAA Faculty Research Experiments

- Sharman Haley
  - “Fairness, Information and Coalition Building in Tax Policy: An Experimental Approach”
- Lee Huskey and Wayne Edwards
  - “Job Search with an External Opportunity”
- Gunnar Knapp
  - “Rent Dissipation in Limited Entry Fisheries with Aggregate Quotas: An Experimental Analysis”
- Lance Howe
  - “Common Pool Resource Management and the Effect of Heterogeneous Users: an Experimental Investigation”

# Average Investment in the Common-Pool Resource Across Treatments, High and Low Endowment Subjects



— Open Access — Nash — Pareto Optimal