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Experimental Economics and Emissions Trading (ET)

Presentation at NSW Department of Environment & Conservation

Presented by
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, 9th of May 2007

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Presentation outline

- Introduction in experimental economics
  - Why is it useful?
  - Process
- Experiments in Emissions trading
  - Overview
  - Experiment on banking
  - Current experiments and ET at UNSW
- Outlook of Experimental Economics at UNSW

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Nobel Prize in Economics, 2002

- **Vernon Smith**: “for the use of laboratory experiments as a tool in empirical economic analysis, in particular, for the study of different market mechanisms”. **Founder of experimental economics**.

- **Daniel Kahneman**: “for the introduction of insights from psychological research into economics, in particular with regard to judgements and decisions under uncertainty”. Kahneman’s research is based on psychological experiments and questionnaires. **Founder of behavioral economics**.

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Purpose of Experiments

1. Speaking to theorists: Testing theories like in natural science with controlled experiments (e.g. "homo oeconomicus")
2. Searching for facts, e.g. exploring bounded rational behavior and preferences for risk, fairness
3. Dialogue between experimenters and policymakers: comparison of institutions for policy advice
4. Using experiments in teaching

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Advantage of Experimental Economics

Laboratory experiments as an empirical pretest of economic theory of market design prior to field testing

- Economic theory: strong assumptions
- Field data: long time frame, substantial costs and problems of political feasibility.
- Therefore: Laboratory experiments can fill some of the gap between economic theory and field trials.

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Advantages of (Lab.) Experiments – Enhanced Control

- Experimenter can make *ceteris paribus* changes in the exogenous variables – allows to isolate the effect
- Variables that cannot be directly observed in the field can be observed in the laboratory.
  - Different market rules (banking versus no banking)
- Subjects are randomly assigned to the treatment conditions – rules out selection bias
  - Recruitment software is important to store data on past experiments to make sure that subjects are e.g. first time participants
- Since it is transparent which variables are exogenous and which are endogenous – allows to make causal inferences.
- Can be replicated – provides the basis for statistical tests. Critics can run their own experiments

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Critique on experiments

- Participants are just students – lack of representativeness
- The stakes are small
- The number of participants is small
- Participants are inexperienced

- Response
  - Take other subject pools (workers, CEOs)
  - Conduct representative experiments
  - Increase the stakes
  - Increase the number of participants
  - Invite experienced participants (e.g. traders)

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Components of an Economic Experiment

- **Environment**:
  - Recruit participants: subject pool
  - Choose tools: e.g. Software
  - Suitable Lab: Blends, enough space, no interruptions
  - Appropriate monetary incentives

- **Institutional framework** (Rules of the game)
  - Initial endowment
  - Feasible actions
  - Sequence of actions
  - Information conditions

- **Framing** of instructions
  - Abstract or contextualised to application

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Conduct economic experiment

1. Elaborate "research question"
2. Seek ethics approval
3. Design experiment (balance between realism and complexity) and instructions
4. Develop and test software
5. Choose a suitable lab and determine experimental sessions
6. Invite participants via recruitment software
7. Pilot experiments
8. Conduct experiments
9. Analyse data

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Overview: Experiments on Emissions trading

Good overview paper Muller and Mestelman 1998:

- Efficiency of Emissions Trading compared to other instruments (Plott 1983)
- Market Power (Carlén 2002)
- Allocation – and market institutions (e.g. different Auctioning Types):
  - Revenue neutral auction (Hahn 1988)
  - SO2 auction: Uniform vs. discriminating (Cason and Plott 1996)
  - NOx auction: Porter et al. (2004)
- **Banking** (Cronshaw and Brown-Kruse 1999, Ehrart et al. 2005)
- Enforcement (Cason and Gangadharan 2005, Murphy and Stranlund 2006)
- Uncertainty and risk aversion (Ben-David et al. 2000)
- Clean Development Mechanism (Buckley et al 2004)

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Conclusions from ET experiments

- Markets work
- Market institution matter
- Design features matter:
  - Banking
  - Enforcement
  - Vintages
- Design features interact
- Design feature and production environment interact

  Find right balance: between feasibility (not too complex) and reality (not too far from reality)

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Banking experiment - Treatments

	Banking restriction (3rd to 4th period)	No Banking restriction	
4x high allocation with low abatement cost and 4x low allocation with high abatement cost	**Treatment I** 6 groups 8 companies	**Treatment II** 6 groups 8 companies	
4x high allocation with high abatement cost and 4x low allocation with low abatement cost	**Treatment III** 6 groups 8 companies	**Treatment IV** 6 groups 8 companies	„balanced“

Source: Ehrhart et al 2005.

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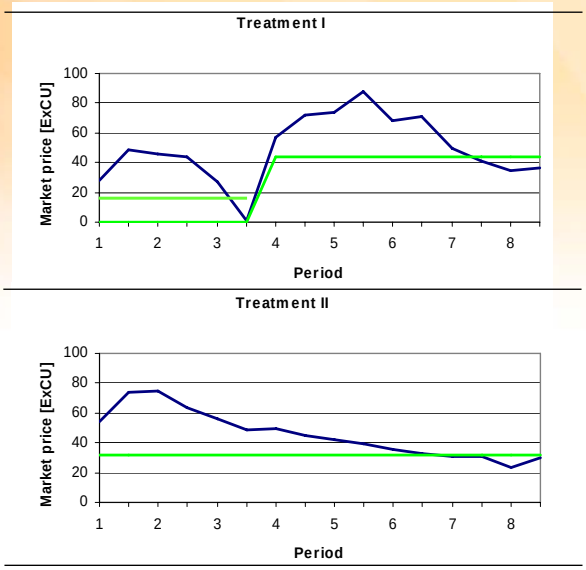
Price Bubbles

- In all treatments excessive prices in the first periods as well as after banking restrictions, followed by a drop to a low price level.
- Exemplarily see average price curves of treatments I and II



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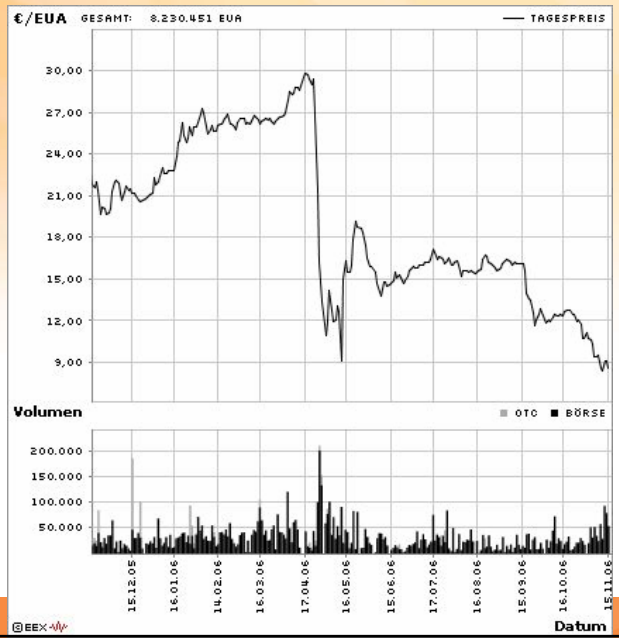
EU ETS price development

9th of May 2007:
0.48 €/EUA



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UNSW Experiment status today

- Recruitment software: pool of 500 students
- Suitable Labs
- Software: based on Meet2trade modifications in cooperation with school of information technology

Vintage experiment (Betz / Gunnthorsdottir)

- Instructions developed
- Treatments piloted
- Experiments conducted (October / November)
- Data Analysis ongoing

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UNSW: ET Experiment

- **Hypothesis**: Vintage trading provides investment certainty and will increase efficiency of ETS.
- **Treatments:**
  - **No vintage trading:** permits are allocated annually, might be banked but can only be traded after allocation
  - **Vintage trading**: all permits are allocated at the beginning, might be banked and can be traded simultaneously.
- Experiment: based on experimental framework developed by Ehrhart et al.

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Outlook: Economic Experiments at UNSW

- Today:
  - Few researchers interested in experiments therefore no specific experimental lab
- Future:
  - Own lab in new economics building
  - Economic Design Network (EDN) and CERF grant
    - Evaluation of economic instruments in Australia
    - Experimental testing of policy instruments
    - More resources (Post docs and PhD)
    - Case studies with political relevance
  - Increase use of experiments in teaching

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Many of our publications are available at:
www.ceem.unsw.edu.au