Liability Experiments: Seller’s or Buyer’s?

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Takao Kusakawa and Tatsuyoshi Saijo
kusakawa@iser.osaka-u.ac.jp   saijo@iser.osaka-u.ac.jp

Research Institute of Economy, Trade and Industry (RIETI), Tokyo, Japan,
Global Industrial and Social Progress Research Institute (GISPRI), Tokyo, Japan; and
ISER, Osaka University, Osaka, Japan
1. Introduction and Summary

Basic Question: Is Emissions Trading really Cost-Effective?

Our Previous Experiments

Experiment 1: (13 sessions, 78 subjects, 1998)
- Reversible and No Time Lag Investment
- Seller’s Liability
  => Extremely High Efficiency

Experiment 2: (12 sessions, 72 subjects, 1999)
- Irreversible and Time Lag Investment
- Seller’s Liability
  => Two Cases:
  (1) Success Case and (2) Bubble Case
Our Focus is

**Experiment 3:** (18 sessions, 90 subjects, 2001)
- Irreversible and Time Lag Investment
- Seller’s vs. **Buyer’s Liability**

Two **Buyer’s Liability** Systems: (the order is VERY important!)
- **Kyoto-First:** Retire Permits to Compliance Committee
  => Settle promises among countries

- **Country-First:** Settle promises among countries
  => Retire Permits to Compliance Committee
2. Emissions Trading

Efficiency
0%

Total Reductions = 2

$100

$10

Russian Reduction 1
Japanese Reduction 1

Total Reductions = 2
Japanese Benefit $40

Russian Profit $50

Payment from JPN to RU $60

Efficiency 100%

Efficiency 50%

Payment from JPN to RU $30

Japanese Benefit $20

Russian Profit $25

Payment from JPN to RU $15

Efficiency 100%

Total Reductions = 2

Russian Reductions = 2

Total Reductions = 2

Russian Reductions = 1.5

JPN = 0.5
Marginal Abatement Cost Curve

Marginal Abatement Cost and Price

Marginal Abatement Cost Curve

Payment to Emission Permits

Amounts of Emissions

Assinged Amount

Status Quo (Business as usual)
3. Point Equilibrium

Excessive reduction → Price drops

Point Equilibrium Price:
Market clearing price at each point of time
4. Experimental Design for Experiment 3

Common features to all sessions

- Ten student subjects in each session
- Used realistic marginal abatement cost curves
- Every subject could be a buyer and a seller depending on the prices. Bohm (1997)
- We paid subjects money that was proportional to the earnings in experiment.
Experimental Controls: Trading Methods and Information

- **Bilateral Trading**: A pair negotiates the price and quantity vs.

- **Double Auction**:

<table>
<thead>
<tr>
<th>Buyers’ Bids</th>
<th>Sellers’ Asks</th>
</tr>
</thead>
<tbody>
<tr>
<td>(3) $56, 20 units</td>
<td>(6) $104, 15 units</td>
</tr>
<tr>
<td>(1) $86, 13 units</td>
<td>(4) $92, 20 units</td>
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<tr>
<td>(2) grabs (4)’s ask</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Trading Methods</th>
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<tr>
<td>Bilateral Trading</td>
</tr>
<tr>
<td>Open</td>
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<tr>
<td>Closed</td>
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</tbody>
</table>
5. Experimental Control: Liabilities

Seller’s Liability vs. **Buyer’s Liability**

Country A

- Assigned amount: 22
- Emissions: 20

Sold to Country B

- Assigned amount: 10
- Emissions: 15

Country B

- Assigned amount: 5
- Emissions: 15
Seller’s liability

All the units purchased are absolutely valid for the buyer.

Country A
- Sold to B: 10
- Emissions: 20
- 12 units
- 8 units of non-compliance

Country B
- Purchased: 10
- Emissions: 15
- Exactly complied
Buyer’s liability (Kyoto-First)

Some units purchased may be invalid for the buyer.
Other Rules

Default:
  No monetary compensation

Non-compliance:
  Penalty of $250 per unit => No Borrowing

Over-compliance:
  Surplus has no value => No Banking
• Is Over-Selling beneficial?

When a country sold more bonds than her assigned amount,

Default => No Compensation

Country-First

Non-compliance => Penalty

Default => No Compensation

Country-First

Non-compliance => Penalty

Default => No Compensation

Country-First

Compliance => No penalty
5. Results

Seller’s Liability: Two Cases

- Bubble Case
- Success Case

- Double Auction
- Bilateral Trading Information Open
- Bilateral Trading Information Closed

Seller’s Liability
Country-First Buyer’s Liability: Three Cases
Kyoto-First Buyer’s Liability: Four Cases

- Bubble Case
- Success Case
- Intentional Bankruptcy Case
- Anti-Bubble Case

- Double Auction
- Bilateral Trading Information Open
- Bilateral Trading Information Closed

- Seller's Liability
- Buyer's Liability (Country-First)
- Buyer's Liability (Kyoto-First)
Success Case

Seller's Liability, Bilateral Trading
Information Open, Second Session

- **Contract**
- **Point Eq. Price**
- **Competitive Eq. Price**
- **Expectation of Price**
Bubble Case

Seller's Liability, Double Auction, Second Session

Price

Minutes
Anti-Bubble Case

Buyer's Liability (Country-First), Bilateral Trading Information Closed, Second Session

Price

Minutes
Intentional Bankruptcy Case

Buyer's Liability (Kyoto-First), Bilateral Trading Information Closed, Second Session

Price

Minutes

Contract of Russian Bond
7. Concluding Remarks

(a) Four Cases:
   (1) Success Case
   (2) Bubble Case
   (3) Anti-Bubble Case
   (4) Intentional Bankruptcy Case

(b) **Country-First** is better than **Kyoto-First** (Incentives)

(c) Which is better between **Seller's** and **Country-First**?
   (1) Statistically, no difference (need more experiments!)
   (2) If we can design some mechanism to eliminate the failure case, it seems that **Seller's** is better than **Country-First** (?)