Water Cap & Trade

Water market scenarios for Southern Europe

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Outlines of the presentation

- Introduction
- Project presentation
- Economic modelling results
- Barriers to trade
- Conclusion
Introduction

> Context
  • Water resources fully allocated
  • Administrative rationing procedures (quotas) / historical water rights (Cap)
  • Prevents entry of new user & source of inefficiency
  • Reallocation procedures are needed
  • Water trading is one option
  • Can operate with different types of rights / concessions

> Designing water markets
  • Type of resource
  • Object of the transfer
  • Type of users involved
  • Spatial extent of trading
  • Permanent / temporary trade
  • Characteristics of water rights
  • Market structure / trading mechanisms
  • Government role

> WM in Spain
  • Public purchase
  • Agricultural markets
  • Interbasin transfers
  • Inter-sectoral transfers

Project presentation

> Research questions and activities of the Water Cap & Trade project

Benefits of establishing WM?
- Simulation of exchanges between farmers - farm economic models (Fr, It)
- Simulation of option contract - Stochastic economic model (Tajo-Segura)
- Experimental evaluation of agricultural WM using stated preferences (Guadalquivir-Andalucia)
- Simulation of water trading between cities – cost minimisation model (Fr)

Model predictions are generally optimistic
Successful WM development depends on farmers attitudes (Spain Australie, Chile)

Analysis of WM perception
- Surveys, focus groups
- Farmers, stakeholders, lay public
- France, Italy, Spain

Perception of WM against other economic instruments
- Scenario workshops

Estimated benefit
Volume traded
Equilibrium price

Barriers to trade
**Project presentation**

- **Case studies**
  - **Marais Poitevin (Fr)**
    - Agricultural use
    - Groundwater pumping rights
    - Temporary / permanent transfers
  - **Hérault (Fr)**
    - Urban use
    - Water saving certificates
  - **Emilia Romagna (It)**
    - Agricultural use
    - Private harvesting reservoirs
  - **Reno basin (It)**
    - Agricultural use
    - Collective irrigation system
  - **Guadalquivir – Andalucia (Sp)**
    - Agricultural use
    - Permanent / temporal exchange
    - Inter-basin transfer
  - **Tajo-Segura (Sp)**
    - Agricultural use
    - Option contracts
    - Inter-basin transfer

**Groundwater basins (5) Fr**
- Agricultural use
- Groundwater pumping rights
- Temporary / permanent transfers

**Economic modeling results**

**Case study 1: Ravena province, Italy**
- Exchange between farmers using small reservoirs
- Voluntary exchanges already exist, no monetary compensation, under supervision of Irrigation board
- Simulation of free trade

**Results**
- Economic gains: +9%
- 29% volume traded
- Price 0.61 €/m³

**Case study 2: Marais Poitevin, France**
- Agriculture
- Surface, GW, reservoirs
- Farm economic model (LP)
- Free trade simulation with TC

**Results**
- Limited economic gains (+3%)
- Water exchanged: 7%
**Case study 4: Option contract among water users (Tagus and Segura basins)**

Cumulative ascending curves of pdfs of the net benefit derived from the Tagus-Segura water transfers.

_Scenario 1A: New Tagus-Segura Transfer Management Rule_
_Scenario 2C: New Rule + Option contract_

**Results**
- A change of the Transfer’s management rule would have severe impacts (estimated on average at nearly 75 € million).
- Option contracts can reduce the negative impact of this change, mainly in the left-tail of the distribution, reducing scarcity risks.

**Case study 5: a stated preference approach (Guadalquivir – Andalucia)**

- Survey 241 farms in Guadalquivir & Almeria
- Willingness to pay, willingness to accept
- Construction of demand / supply curves (bids ordering) for each basin
- Simulation of trade within basins
- Simulation of interbasin exchange

**Results**

<table>
<thead>
<tr>
<th></th>
<th>Guadalquivir</th>
<th>Almeria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal year</td>
<td>WTP 0.08</td>
<td>0.39</td>
</tr>
<tr>
<td></td>
<td>WTA 0.1</td>
<td>0.4</td>
</tr>
<tr>
<td>Drought year</td>
<td>WTP 0.15</td>
<td>0.54</td>
</tr>
<tr>
<td></td>
<td>WTA 0.17</td>
<td>0.55</td>
</tr>
</tbody>
</table>

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Intra

<table>
<thead>
<tr>
<th>Point</th>
<th>Price €/m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almeria</td>
<td>P₁</td>
</tr>
<tr>
<td>Guadalquivir</td>
<td>P₂</td>
</tr>
</tbody>
</table>

Inter

<table>
<thead>
<tr>
<th>Joint-basin</th>
<th>Price €/m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>P*</td>
<td>0.17 (0.37)</td>
</tr>
</tbody>
</table>
Case study 6: Urban WM, Hérault, France

- Context and scenario
  - Simulated future urban demand $D_{2030,n}$.
  - Quota system: $Q_{2030,n}$.
  - If $D_{2030,n} > Q_{2030,n}$, implements water conservation measures or purchase water from other utility.
  - If $D_{2030,n} < Q_{2030,n}$, sells water.

- Simulation
  - Cost / volume of water conservation ($i,j$).
  - Optimisation without / with hydrological constraints.

**Results**

- Equilibrium price $= 0.54 / 1.03 \text{ €/m}^3$ (2 bassins).
- 25% cost reduction.
- Volume traded = 39% of total water saving target.
- Hydrological constraint $\Rightarrow +17\%$ cost.
- Transaction costs could be significant.

Barriers to trade

> Farmers’ attitudes can determine the successful development of water markets (Australia, Chile, Canada).

> Empirical studies

<table>
<thead>
<tr>
<th>Farmers</th>
<th>Stakeholders</th>
<th>Citizen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quasi-experiment (421)</td>
<td>Quasi-experiment (407)</td>
<td>Italy (463)</td>
</tr>
<tr>
<td>Focus groups</td>
<td>Spain (national level)</td>
<td>Italy (national level)</td>
</tr>
<tr>
<td>Scenario workshops</td>
<td>France, groundwater basins (N=45)</td>
<td>France (110)</td>
</tr>
</tbody>
</table>

> Main findings

(Spain, France, Italy)

- Strategic behaviour
  - Pressure on Gov to increase CAP or create new resources.
  - Not a commercial good
  - Privatisation
  - Link water & land
  - Unfair initial allocation, illegitimate rents.

- Ethics
  - Definition of rights
  - Market structure
  - Environmental impact
  - Impact on rural development

- Social justice
  - Unsecured rights (enforcement, irrigation bans risk, use it or loose it).
  - Transparency problems, asymmetric negotiation power, speculation.
  - Increase water use, negative externalities.
  - Farm concentration, social issues.

- Pre-conditions to water trading are not met

- Design of appropriate mechanisms.
**Barriers to trade**

> Willingness to participate: survey results

<table>
<thead>
<tr>
<th>Position relative to water trading</th>
<th>Fully supports</th>
<th>Accepts under condition</th>
<th>Totally opposed</th>
<th>No opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td>3%</td>
<td>43%</td>
<td>45%</td>
<td>9%</td>
<td></td>
</tr>
</tbody>
</table>

If WM were implemented, would you be willing to:

- Sell: 23%
- Buy: 19%

- Sell: 13%
- Buy: 14%

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**Do you agree with temporary trade?**

- Yes, intra-basin only: 28%
- Yes – intra & inter basin: 45%
- No: 27%

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**France, 5 regions**

- 80 farmers, 44 stakeholders

**Guadalquivir**

- 241 farmers

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**Alternative economic instruments**

> Scenario workshops in France

- Alternative economic instruments

<table>
<thead>
<tr>
<th>Tax &amp; subsidy</th>
<th>Joint liability contract</th>
<th>Tradable quotas</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1 - tax &amp; subsidy scenario</td>
<td>S2 - Joint liability contract</td>
<td>S3 - Water market scenario</td>
</tr>
</tbody>
</table>

Current situation: Baseline scenario

- 2008
- 2012
- 2020
- 2023
- 2030

New water law

- 16 workshops in 5 regions
- 80 farmers, 44 stakeholders
Alternative economic instruments

> Scenario workshops in France
  • Results

Preferred scenario:

<table>
<thead>
<tr>
<th></th>
<th>Farmers</th>
<th>Stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint liability contract (JLC)</td>
<td>38%</td>
<td>84%</td>
</tr>
<tr>
<td>Current quota system (TQ)</td>
<td>38%</td>
<td>7%</td>
</tr>
<tr>
<td>Tradable quotas</td>
<td>9%</td>
<td>7%</td>
</tr>
<tr>
<td>Tax &amp; Subsidy</td>
<td>8%</td>
<td>2%</td>
</tr>
<tr>
<td>None</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Mix JLC &amp; TQ</td>
<td>4%</td>
<td></td>
</tr>
</tbody>
</table>

N=124

Introducing flexibility in water allocation through
  • market based instruments (focus on individual decisions)
  • Institutions (consider interactions within groups)

Conclusion

> Policy recommendations
  • Spain
    — Agreement among stakeholders of the need to improve the current system.
    — Legal reform needed. Formal and effective separation of water rights and allocations.
    — Flexibility. Eliminate barriers to enter the market and restrictions to trade.
    — Reduce political interference in inter-basin trading
    — Better information and transparency (water volumes subject to trade, administrative procedures, prices, …)
    — New water trading formats (option contracts).
  • France and Italy
    — Cap first! Global abstraction ceiling; monitoring of water withdrawal; enforcement; equity of initial allocation
    — Creating rights: remove priorities, restrictions …
    — WM, an option for the long term (2030)
    — Keep land and water linked / separate right from allocation
    — String societal barriers to overcome
    — Environmental constraints will restrict the potential (no storage); groundwater in particular
Conclusion

> **Research perspective**

- WM as part of a more general tool box; other instruments can be used to introduce flexibility
- Institutional economics can help to design innovative instruments
- Need for experimental approaches to investigate stakeholder behaviors (choice modeling; exp. econ; games; …)
- Participatory foresight approaches (long term)
- Integrate economics with hydrology (hydro-economic modeling)
- Common approach with other natural resources (forestry)

A challenge for Horizon 2020 ?