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## Designing market-based instruments: Lessons from the laboratory and the field


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## Outline of presentation ...

1. MBIs (auctions/tenders)
  - What are they and why use them?
  - State of play in Australia
- Some insights from three recent research areas:
2. Learning and efficiency in repeated auctions
  - Does MBI remain efficient with repetition?
3. Landscape-scale coordination
  - Can competition and cooperation be combined?
4. Contracting on outcomes
  - Can we incentivise landholders better?


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## What are tenders?

- Tenders are a tool for allocating a good with unknown price amongst competing buyers
- Allocations are on the basis of offers submitted by potential buyers/suppliers
- NRM tenders are essentially a procurement tender for multiple goods
- In Australia usually run as a discriminatory price, sealed bid, single round reverse auction


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## The theory behind tenders

- Incentives motivate actions
- Therefore can promote conservation on private land
- How much should incentive payments be?
- Not too little...
- Not too much...
- But how much is just right?


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## The theory behind tenders

- Information is the key
- People know their own business better than we do
- People are different
- In a competitive tender people reveal this information
- The more different they are, the greater the benefits of an MBI

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## How tenders work

- Landholders offer projects (with advice where required)
- Landholders decide price
- Metric quantifies environmental benefits
- Projects ranked in terms of benefits per \$
- Those offering best value for money selected until budget constraint is reached

→ cost effective allocation of limited resources


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## MBIs in Australia


- Water markets
- Bushtender
- Regional NRM management (56 regions)
  - opportunity for diversification and experimentation
- Multiple schemes run in some areas
- Also federal and state schemes
- Now mature technology
  - But emerging issues and opportunities

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## Learning and efficiency in repeated auctions



## Repeated auctions

- Discriminatory price auction maximises buyer's surplus
- Makes best use of limited (usually public) funding for ecosystem services
- But benefits may be eroded with repetition
  - Latacz-Lohmann and Van der Hamsvoort (1997)
  - Cason and Gangadharan (2005)
  - Schilizzi and Latacz-Lohmann (2007)

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## Repeated auctions

- There may be a problem with repetition...
- Learning is the key
- Learning is dependent on access to information
- MBI bids are confidential
- But people may talk...

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## Research questions

- How does bidding behaviour and auction performance evolve with repetition?
- How is this mediated by the availability of information?
- (How can an anticipated decline in performance be overcome?)

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## Experimental testing

- Experimental economics brings human behaviour into economic theory
- Controlled laboratory environment
- Real participants, real incentives
- Replication
  - 'Policy wind tunnel'

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## Experimental scenario

- Single unit, discriminatory price auction
- Nine participants, 3 sets of environmental values and opportunity costs
- Bids accepted up to (unknown) budget constraint
- 10 rounds

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## Information treatments

- Control – know own bid only
- Partial information – know (2) neighbours' bid price, environmental value and result
- Full information – know everyone's bid price, environmental value and result

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## Experimental scenario

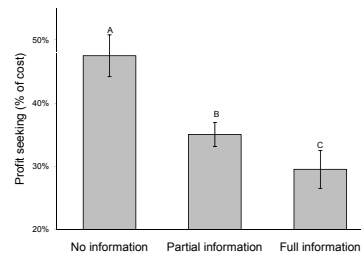
Player number Y	Round 1		
The private-use value of your land is \$10			
The rentability of your land is 5			
I am willing to rent my land in this round for \$ _____			
<b>Result</b> _____			
Player X: Rentability: 15	Price _____	Result _____	
Player Z: Rentability: 10	Price _____	Result _____	

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## Results

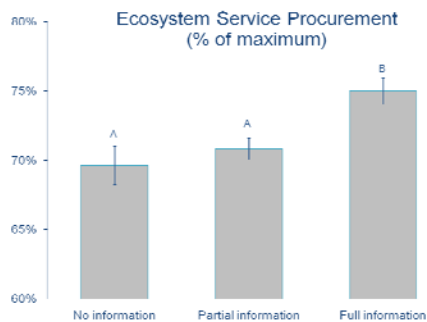
- Auction efficiency *greater* with information
- Bids closer to opportunity cost
- Greater procurement within budget constraint



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## Results



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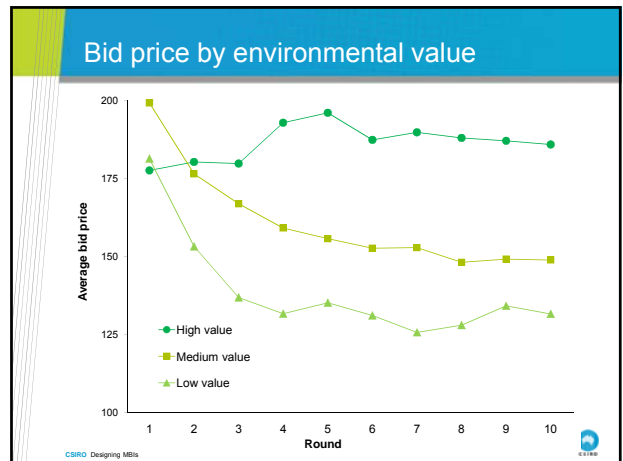
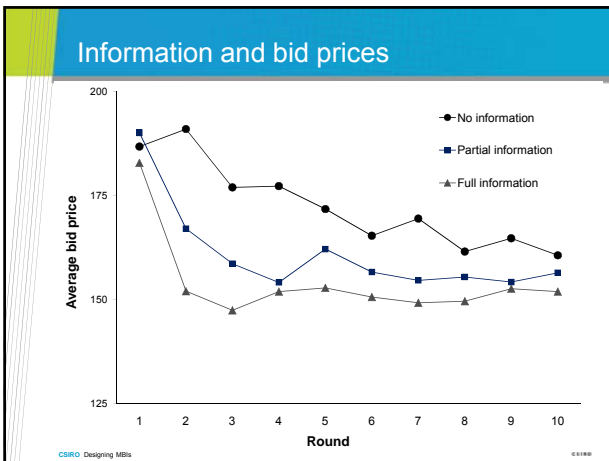


## Results

- Average bid price *declined* significantly with repetition
- Ecosystem service procurement declined non-significantly with repetition
- Mediated by information
- High value bidders respond differently

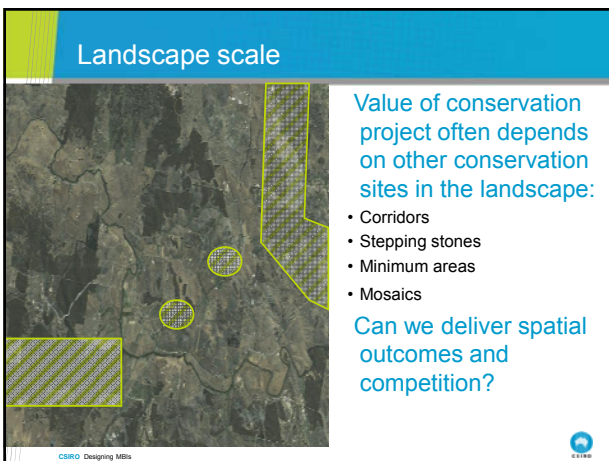
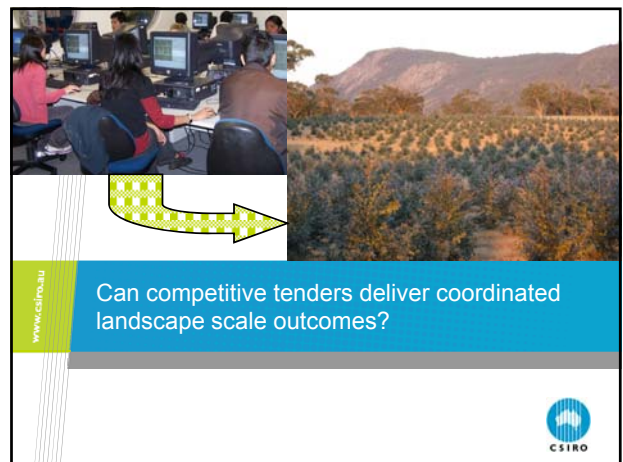
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### Policy implications

- Learning cannot overcome competition
- Competitive auction can remain competitive with repetition
- Critical that marginal bidders remain engaged



### Tender design

- Landscape-scale outcomes require coordination among landholders
- e.g. wildlife corridors
- As numbers increase, coordination becomes increasingly difficult
- Tenders also require competition to overcome information asymmetry
- How to reconcile?

## Tender design

- Run tender over multiple bidding rounds
- Provide information on locations of other bids between rounds
- Landholders have opportunity to modify bids to align with neighbours
- Over a number of rounds, low cost corridors can emerge across landscape...

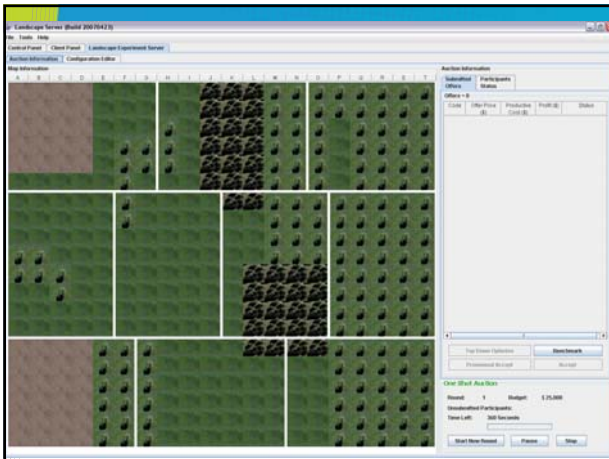
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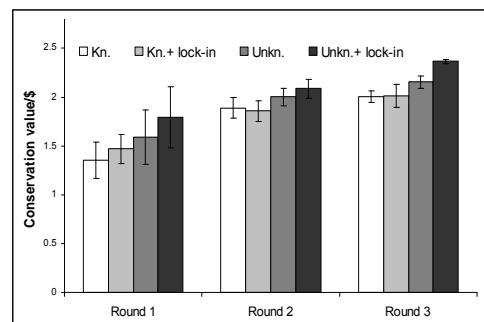
## Experimental testing

- Easy in theory
- But will it work in practice?
- Many questions remain around details of tender mechanism design
  - Multiple rounds
  - Lock-in provisional winners
  - Unknown endpoint
- How will people respond?

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## Experimental results



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Paying for outcomes: evidence from a field trial targeting ground nesting birds

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## Tender design background

- Conservation tenders typically contract on a set of specified management actions:
  - Grazing management, weed control, tree planting, etc.
- But this is just a means to an end...
- Can we incentivise conservation results?
  - Motivate hidden actions, reveal hidden information
  - Encourage flexibility and innovation
  - Increase accountability for public funds
- But outcome payments are not easy
  - Uncertainty of achieving outcomes
  - Time lags between action and outcomes
  - Costly and imperfect monitoring

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## Can we pay by outcomes ... a field test!

- Ground-nesting bird populations are declining in many parts of Australia
  - Predation (foxes)
  - Loss of suitable habitat
  - Degradation of habitat (weeds, firewood collection, pests)
  - "Fence and forget" won't work – active management is required



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## Bush stone curlew habitat

Hidden information: bird presence



Hidden actions: predator control

Visible outcomes: grazing, firewood



Management ... How much? When?

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## Other target species

Brolga



Plains wanderer



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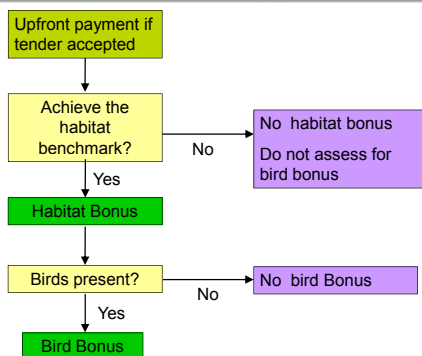
## A compromise tender design ...

- Landholders offered choice of contract (input or outcome)
- Outcome contract combined upfront and outcome payments
- Bonus payment for meeting habitat benchmarks
- Bonus payment for birds

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## Outcome bonus payments



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## Lessons for design ...

1. Efficiency requires an outcome price that minimises upfront bids (approximately zero)
2. Setting the outcome payment too high has less impact than setting it too low
  - Higher means fewer but highly motivated participants with high quality sites. Low = poor sites with little effort
3. Outcome payments induce revelation of hidden information through participation and lower bids
4. Risk aversion has compensating effects:
  - a risk premium that reduces the incentive value of the uncertain outcome payment = less effort
  - induces agents to increase effort in order to reduce the uncertainty of the outcome payment

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## Insights and implications

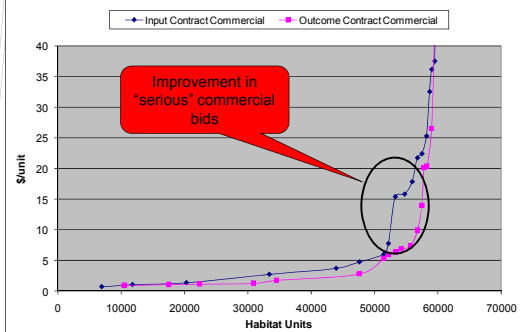
### Headlines

- Field trial – 41 interested, 23 bids, 20 accepted.
- Outcome contracts the favoured option (100% of bids)
- Outcome contracts more cost-effective than action/input option

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### Marginal cost curves - commercial landholders



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## Risk and flexibility

- On average commercial landholders outcome contract bids were 33% percent lower than input based bids
  - Outcome contracts were perceived as *less risky* by commercial agricultural producers
  - Commercial producers value the flexibility in outcome contracts
  - Note that this cost of contract  $\neq$  cost of outcomes (motivating hidden action is the real value of outcome contracts?)

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## Outcome-focused auction conclusions

### Contracts with outcome linked payments are:

- Theoretically attractive and feasible
- Acceptable to landholders
- Offer valuable savings (~30% in case study ...)
- Have potential where hidden information, flexibility and innovation are important

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## Hidden information

- Outcome based contracts appear to reveal private conservation values
  - Identified one new region of stone curlew populations
  - Identified new locations of stone curlews in known population areas

**Note:** confirmed expectations about impact of prior policy on future participation (plains wanderer)

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## Thank you!

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