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Uncertainty, Ambiguity and implications for Coal Seam Gas development: An experimental investigation

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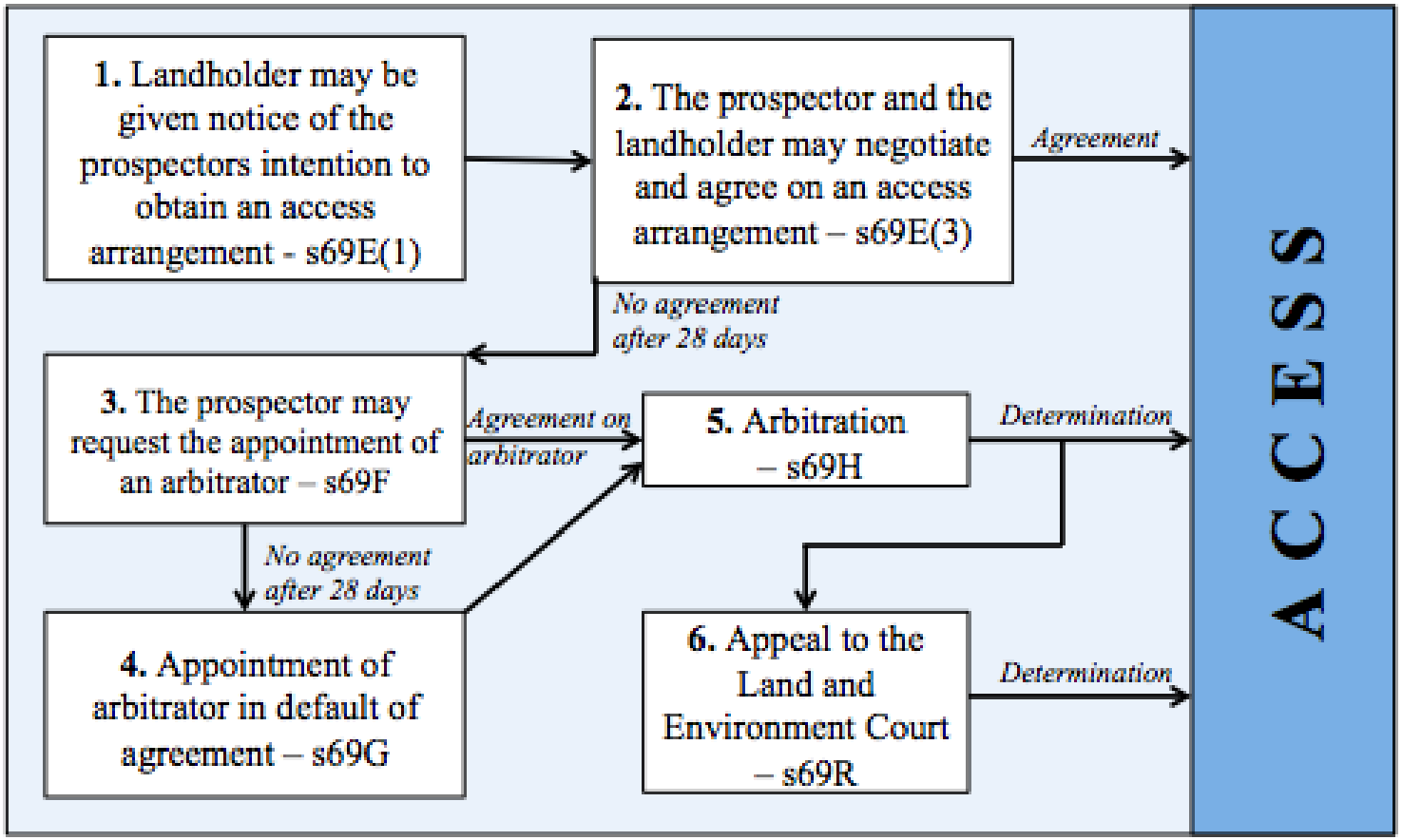
Background

- Social discourse around CSG has been anything but rational.
- Current state of play, especially in Australia, is one of impasse.
- How can society move beyond this gridlock and make some rational decisions about CSG development?
- A research program to look into the dynamics of negotiations around CSG development.
- First bit presented at this conference last year: increased transparency in negotiations dominated by the uncertainty.
- This paper: understand the effects of uncertainty and ambiguity on CSG negotiations.

Legal framework

› Access arrangement (AA) should be negotiated between the CSG miner and landowner.

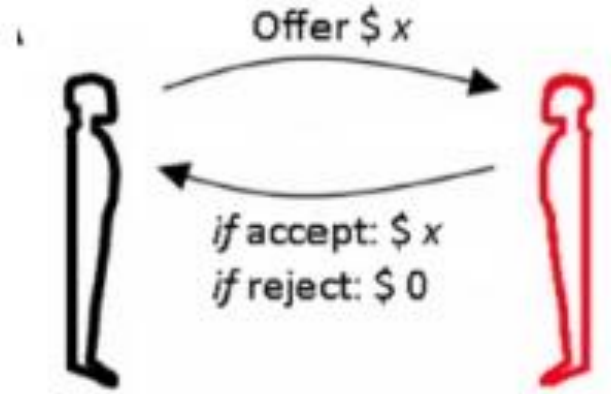


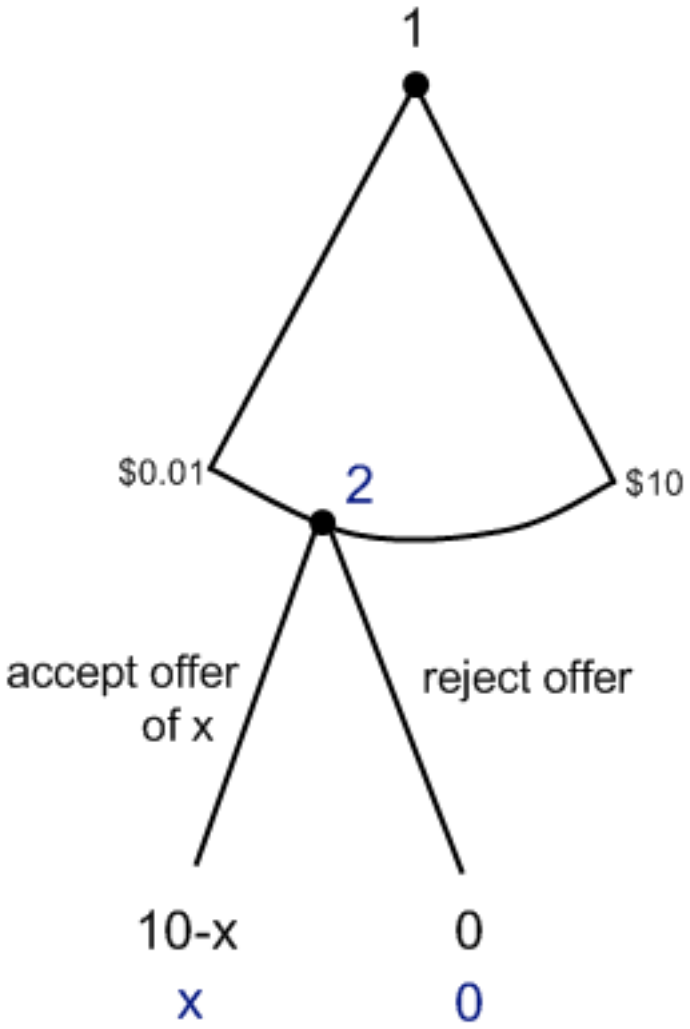
Compensation under AA

- Definition of the compensation test is vague:
- Compensate “loss caused or likely to be caused”
- Does not stipulate how the ‘likely’ is to be quantified.
- In reality: losses to landowners are highly uncertain at best, and more likely ambiguous.
- Definitions of ambiguity (deep uncertainty, Knightian uncertainty) vs. uncertainty:
  - deep uncertainty: probability distributions of occurrence cannot be formed *ex ante* => cannot form expected value of loss.

Experimental approach

› Simulate the negotiations between GSG developer and landower by a modified ultimatum game (Hoffman et al.,1994): CSG developer is a ‘proponent’, and a landowner is ‘respondent’.





Mechanism

- Proponent makes a monetary ‘offer’ to a respondent.
- If the ‘offer’ is accepted, the proponent can ‘develop’, which yields them a certain return.
- If the ‘offer’ is accepted, the respondent experiences a loss, which is certain / uncertain / ambiguous (deeply uncertain).
- If the offer is rejected, both proponent and respondent end up with their initial endowments.

Experimental treatments

- Certainty: the respondent experiences certain loss
- Uncertainty: the respondent experiences a loss over which they can form expectations (i.e. distribution known).
- Expected value of loss under uncertainty is equal to the certain loss.
- Ambiguity: the respondent experiences a loss over which they cannot form expectations (i.e. distribution unknown), but bounds are known (e.g. loss between 0 and 10)

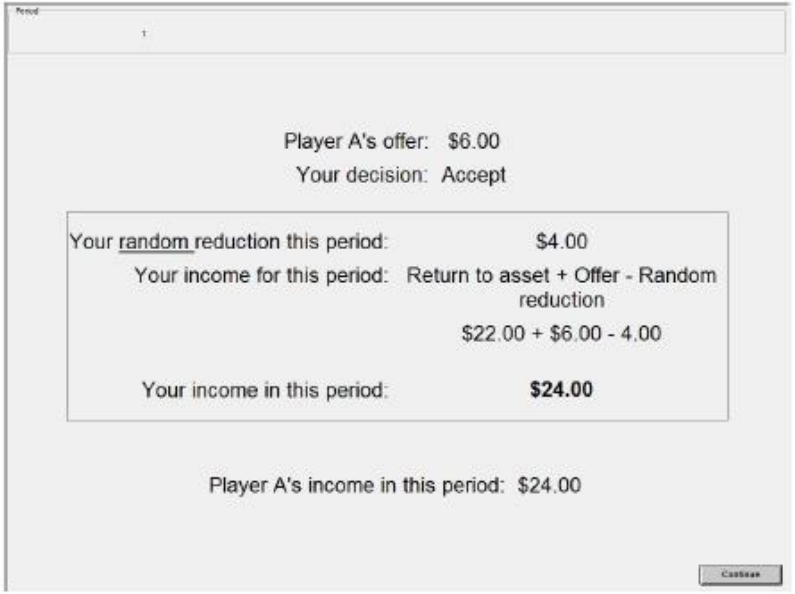
Hypotheses

- Higher offers under uncertainty than under certainty
- Higher offers under ambiguity than under uncertainty
- Offers rejected more frequently under uncertainty then under certainty
- Offers rejected more frequently under ambiguity than under uncertainty

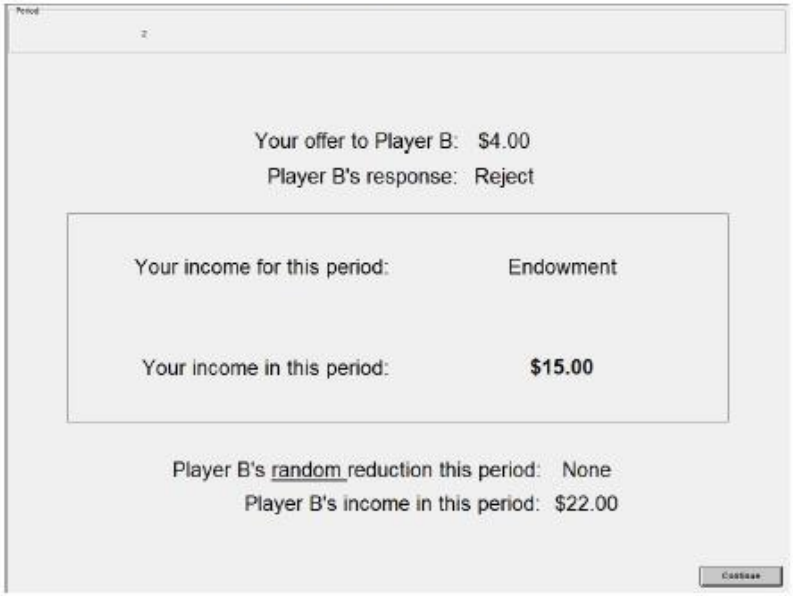
Procedure

- Economic experiments in the laboratory.
- In the present experiment: Players are matched into 10 groups (based on the randomly allocated computer terminals), each consisting of one “proponent” and one “respondent”.
- They play 5 rounds, and are then re-matched: each ‘proponent’ plays with a different ‘respondent’ and vice-versa.

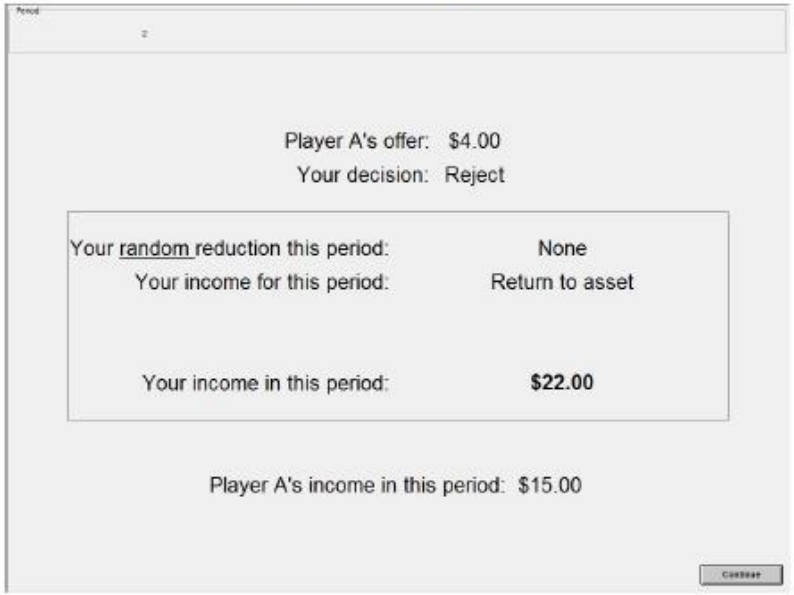
(a) Player A pay-off (Acceptance)



(b) Player B pay-off (Acceptance)



(c) Player A pay-off (Rejection)



(d) Player B pay-off (Rejection)

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Results

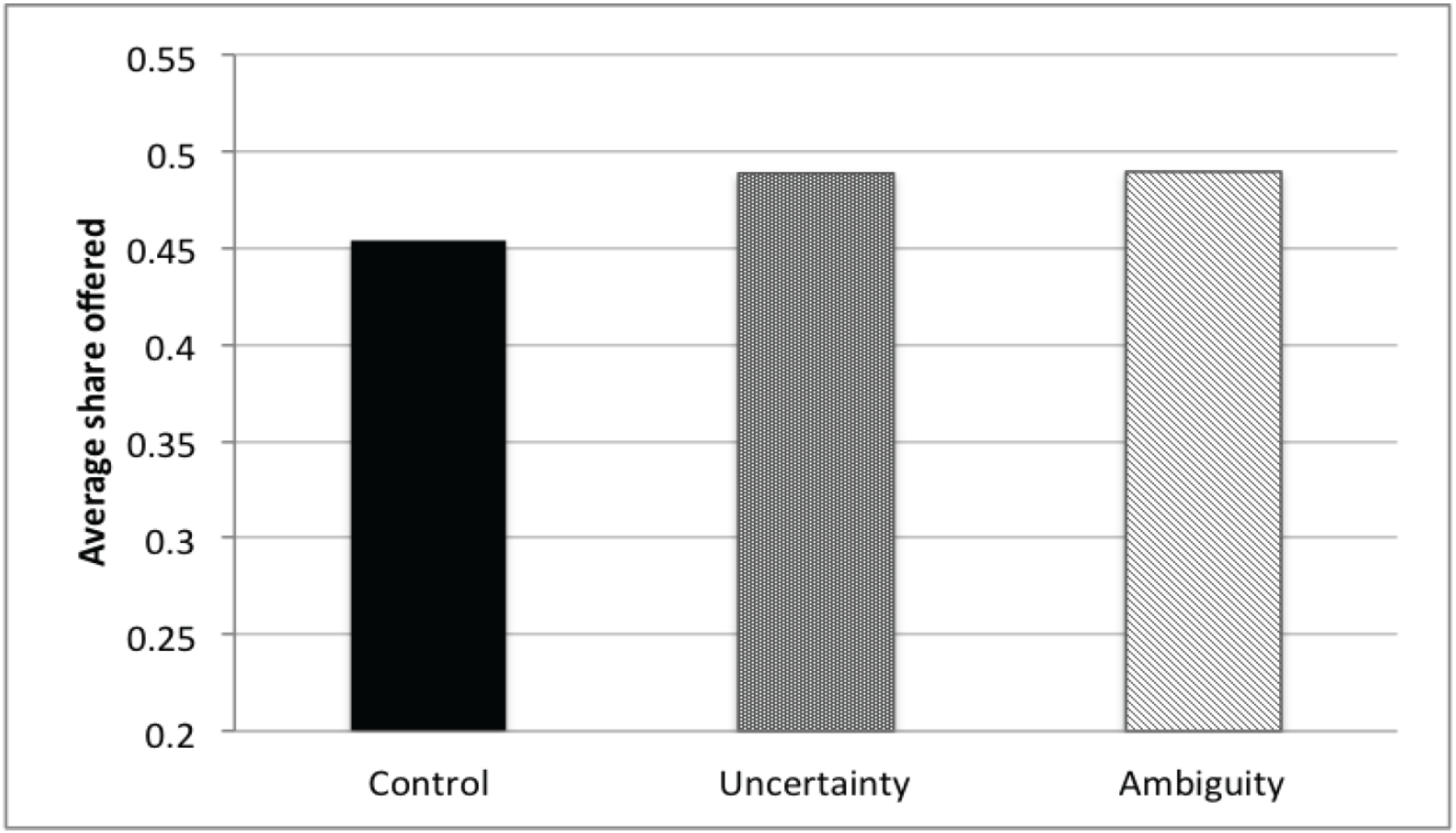

Figure 4.1: Offer Proportion Across Treatments

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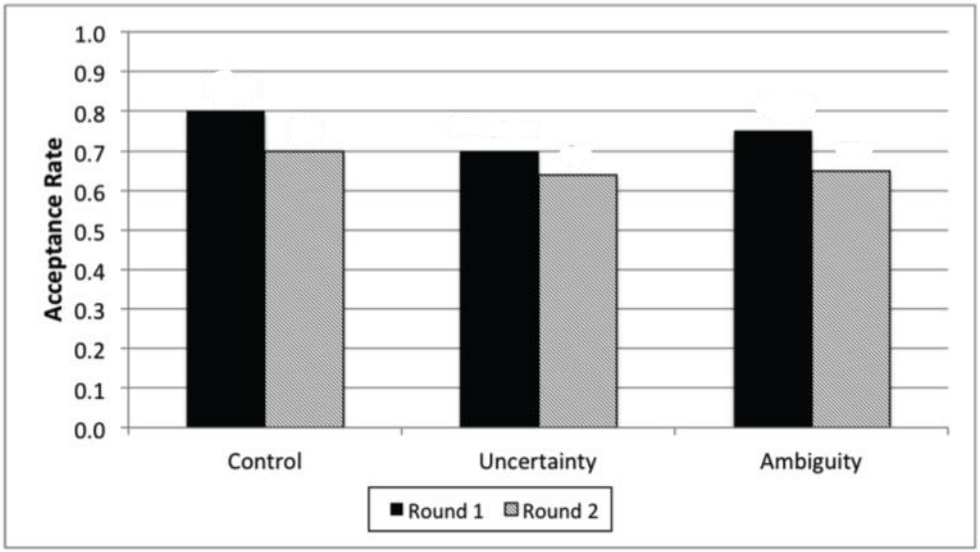
Table 4.2: Difference in Mean Offers Between Treatments

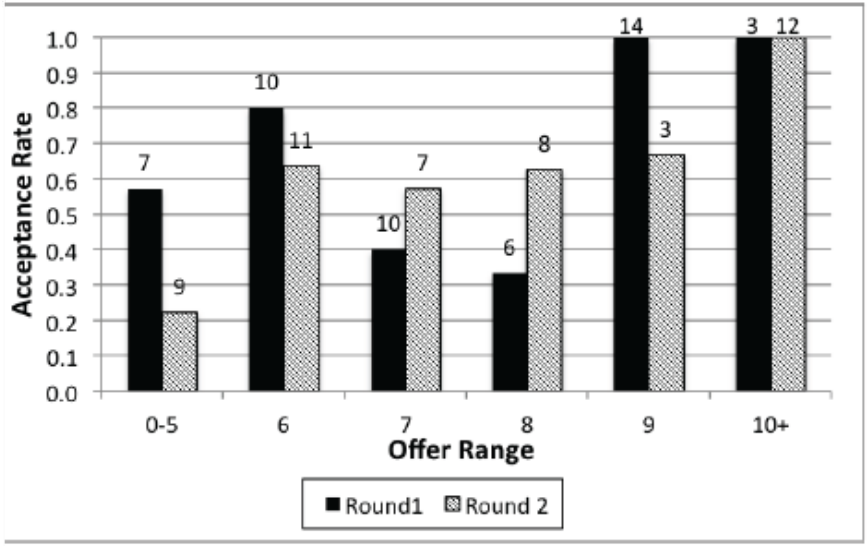
	Control	Uncertainty
Uncertainty	0.522**	—
	(0.036)	
Ambiguity	0.533**	0.012
	(0.021)	(0.962)

Notes: reports differences between means and p-values in parentheses. P-values obtained by two-tailed t-test for equality of means.

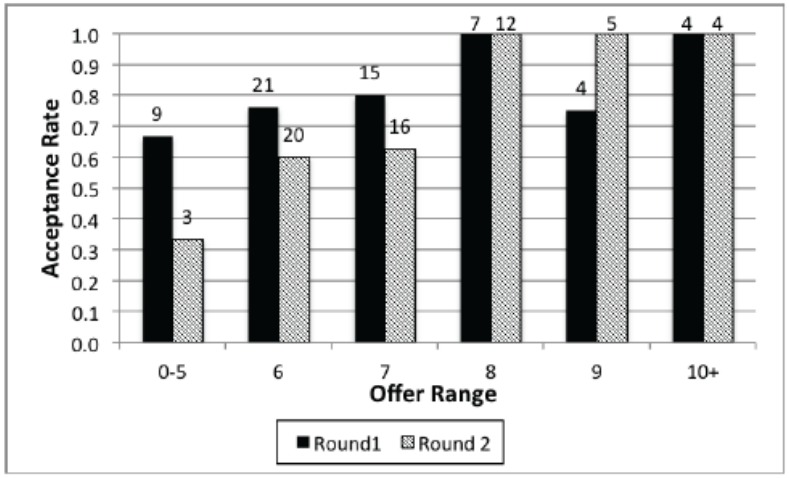
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Acceptance rates across rounds and by offer range

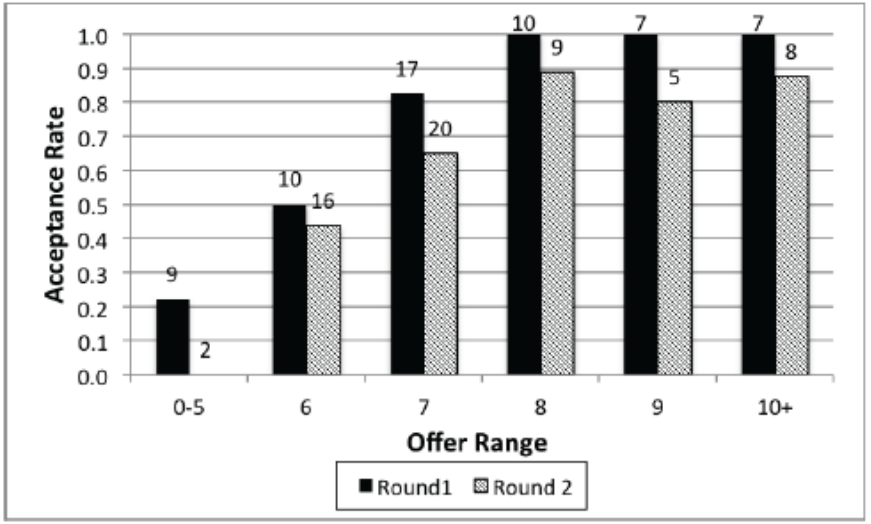




(b) Uncertainty



(a) Control



(c) Ambiguity

Conclusion

- Hypotheses 1 and 3 clearly supported.
- Hypotheses 2 and 4 are clearly not.
- Uncertainty matters. Compensation under uncertainty should be greater compared to certainty. Reducing it will likely improve outcomes of negotiations between CSG developers and landowners.
- Ambiguity cannot be distinguished on average from uncertainty. However, the rejection rates are higher than under uncertainty even for highest offers.
- More precise legal definitions of the uncertain nature of the CSG problem needed.
- Actions for resolving or mitigating uncertainty/ambiguity will be beneficial.

Thank you!

Questions!