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INCORPORATING VARIABLE COSTS OF ADOPTION INTO CONSERVATION AUCTIONS

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Background

- Water quality concerns in Lake Manitoba → provincial and federal authorities establish WEBs in order to understand the effects of human activity on the watershed
- Manitoba government committed to reducing the amount of nitrogen and phosphorus entering Lake Winnipeg to pre-1970 levels (Agriculture and Agri-Food Canada, 2011)
- Reduction must come from non-point sources upstream
- To reduce the nutrient load entering the lake, a number of beneficial management practices (BMPs) are being researched on watersheds across the Canada.

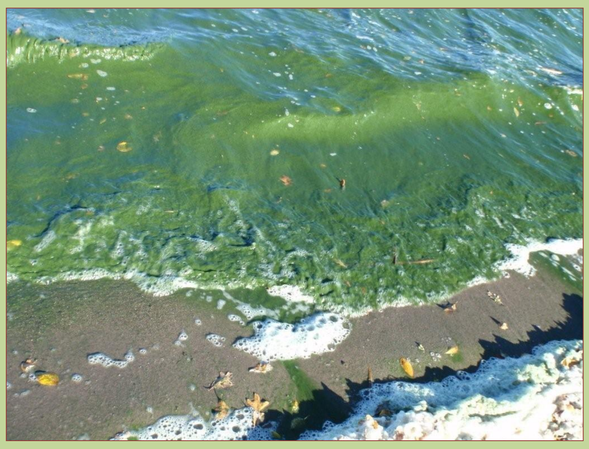

Figure 1. Blue-green algae in Lake Winnipeg (manitobaliberals.blogspot.ca, 2010)

Conservation Auctions

- Conservation auctions → reverse auction mechanism
  - Government or NGO (buyer) offers payment to producers for providing BMPs.
- Producers submit bids to provide the BMPs.
- The buyer ranks bids based on cost effectiveness (kgs abated, acres restored, etc) and pays producers until budget exhausted or environmental target met.

Figure 2. Wetland near Lac La Biche, Alberta (Source: Scott Wilson)

Project Goals

- Increase realistic nature of the bid function by adding risk into the experiments
- Determine if risk affects individual bidding behaviour for conservation auctions
- Determine how risk affects auction efficiency
- Determine if risk deters participation in reverse auctions

Auction Design

- 8 sessions experimental auctions with participants at the University of Alberta.
- Each session included 12 participants with 18 periods of auctions.
- There are 3 rounds with 6 periods with constant farm parameters.
- Every 3 periods, the auction switched from:
  - Risky periods → actualized costs may vary from estimated costs
  - Non-risky periods → costs do not vary
- Information about how much estimated costs could vary from actualized cost was provided each period.

Table 1. Auction design

2 X 2 Design		Risk Level*	
		15%	30%
Risk Round Order	Non Risk Round First	15% Risk, No Risk First	30% Risk, No Risk First
	Risk Round First	15% Risk, Risk First	30% Risk, Risk First

***Participants were informed by how much their realized cost could vary from their estimated costs of adoption**

Risk Aversion

- Theory suggests risk averse individuals more likely to bid closer to their costs →increasing likelihood of winning the auction (Latacz-Lohmann and Van der Hamsvoort, 1997).
- Risk seeking individuals are expected seek higher profits → higher risk of not winning the auction (Latacz-Lohmann and Van der Hamsvoort, 1997).
- Risk aversion is established using the Eckel-Grossman (2007) risk task. The task is completed before beginning the experiments. Choice of six gambles with a 50/50 chance of either a high or low payment.
- Gambles are ranked on a scale of 1 to 6 of least to most risk seeking.

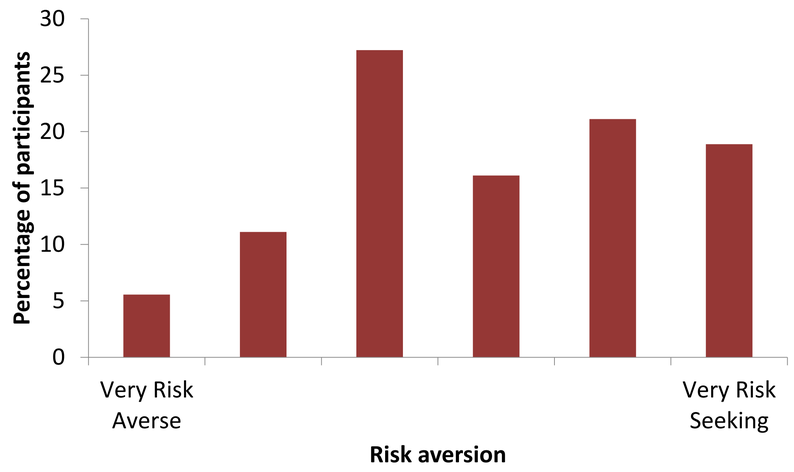

Figure 3. Risk aversion levels for participants in experimental auctions

Results

Bidding Behaviour

- In accordance with the theory, risk averse individuals bid closer to their costs and risk seeking individuals seek more profit.
- The level of potential cost variance (risk level) is significant and positive → an increase in potential cost variance increases bids.
- There is learning within each round of the auction; participants lower bids as the round progresses.
- Interactions of a previous periods percent markup with whether they adopted, and cost variance with whether they adopted are positive and significant.
- The cost difference in the previous period is not significant, adoption was; if they adopted, their profit seeking decreased

Table 2. Panel regression for individual profit seeking across all participants

Variable	Coefficient
Risk seeking	0.92*
Level of potential cost variance	0.09***
Period within a round	-2.05***
Lag Profit seeking * Lag Adopted	0.49***
Lag Cost difference* Lag Adopted	1.19*
Lag Cost Difference	-0.09
Lag Adopted	-2.14*
Constant	19.91***

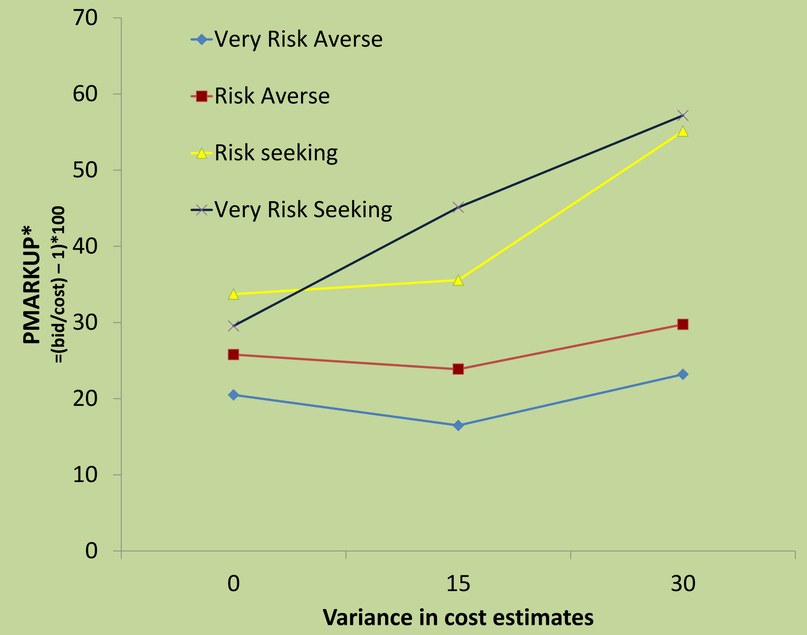

Figure 4. Individual profit seeking for different risk seeking levels across variance in estimated cost levels

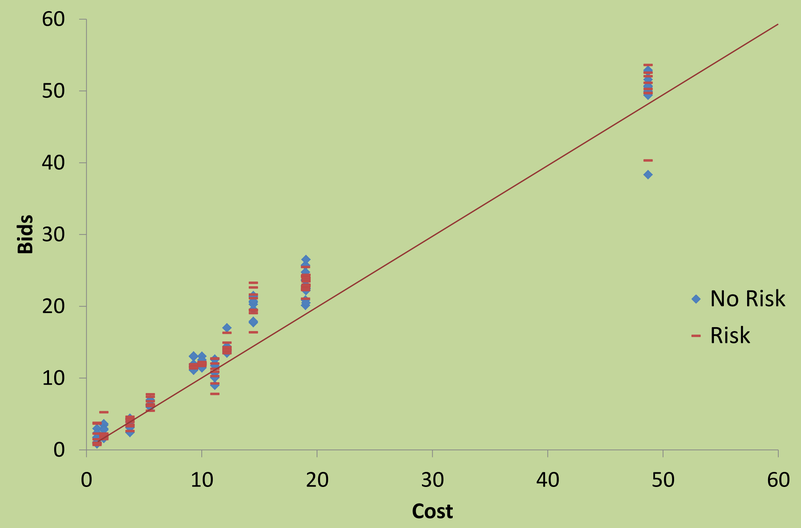

Figure 5. Average bids per session group for risk rounds and non-risk rounds for all 12 farms

Auction Performance

- Auction efficiency is negatively affected by the potential cost variance (risk level) for a given period.
- Risk level is significant and negative, indicating less rent seeking as the level of risk for the auction increases.
- The interaction variable is significant and positive.

Table 3. Panel regression results for average percentage markup per session group

Variable	Coefficient
Period	-4.57***
Level of potential cost variance	-46.95***
Risk aversion	-4.14
Cost variance*risk aversion	12.67***
Constant	59.04

Summary

- Risk averse individuals bid closer to their costs. This result could inform conservation auction policy.
- Both risk aversion and potential cost variance can affect the results of the auctions.
- Variance of bids is greater during periods where costs could change.
- Participation levels are not affected by risk aversion; participation was very high at 97%.
- In order to ground truth the experimental results, a survey in the South Tobacco Creek watershed will be conducted to establish risk aversion levels of producers.

- For more information please contact Scott Wilson - saw4@ualberta.ca or Peter Boxall - pboxall@ualberta.ca

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