Additionality and Asymmetric Information in Environmental Markets: Evidence from Conservation Auctions

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Can Auctions Target "Additional" Landowners?

- Conservation Reserve Program (CRP) is the world's biggest conservation-auction scheme ($1.6- $1.8 billion/year)
- Conservation markets often struggle to identify landowners whose participation is truly additional $\Longrightarrow$ those who would not have conserved their land without payment (marginal to an incentive)
- Incorporate the expected additionality into the auction mechanism may make a great difference
- **Research question**:
  - How big is the non-additionality wedge?
  - What drives it, and can well-designed auctions fix it?
  - What are the welfare implications?

Intuition of Additionality

- The auction selects landowners to enroll in a conservation program
- The program pays landowners based on their bids; payments aim to compensate them for their foregone profits
- Landowners differ in how much they would reduce harmful practices if enrolled
- **Additionality rate[1] measures the share of landowners who actually change their behavior because of the program** (not those who would have done it anyway)

[1] In the paper, this is denoted as τ

Simple Example of Additionality

- Suppose three farmers—Ann, Ben, and Chen—each own 100 acres
- The agency values fully converting an acre to habitat at B = \$100 of environmental benefit; the contract will pay P = \$60 per enrolled acre

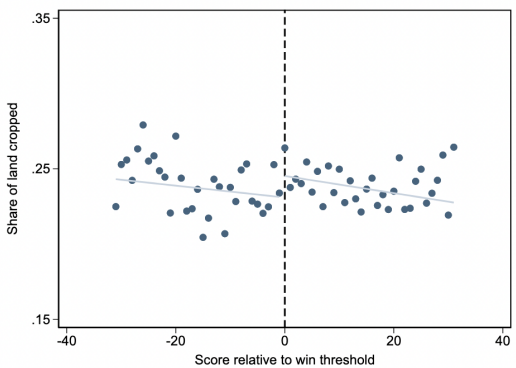
	Ann	**Ben**	**Chen**
True cost	\$40	\$30	\$0
Counterfactual share of habitat	0	30%	100%
Additionality τ	**1.00**	**0.70**	**0.00**
Incremental benefit ($B \times \tau$)	\$100	\$70	\$0
Net social gain if contracted ($B \times \tau - c$)	**+\$60**	**+\$40**	**\$0**

- Ann is fully additional: every dollar you pay buys a new conservation; Chen is non-additional: already fully conserves without incentive; Ben is partly additional (70% of Ben's land needed a nudge; 30% would have been habitat anyway)
- Standard auction orders bids by lowest cost (Chen→Ben→Ann), exactly opposite to highest additionality (Ann→Ben→Chen)

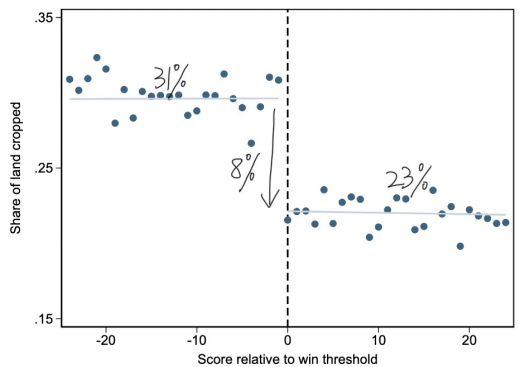
Evidence from Conservation Auctions

- Data: 7 CRP auctions (2009-2021) + satellite/admin land use
- RD around score cutoff $\Longrightarrow$ causal treatment effect of winning
- There is a significant reduction in cropping among enrolled participants, but it is **modest in magnitude**, compared with how much lands are covered by a CRP contract
- This suggests that while currrent auctions help, they do not perfectly target only additional participants, and some payment leakage remains

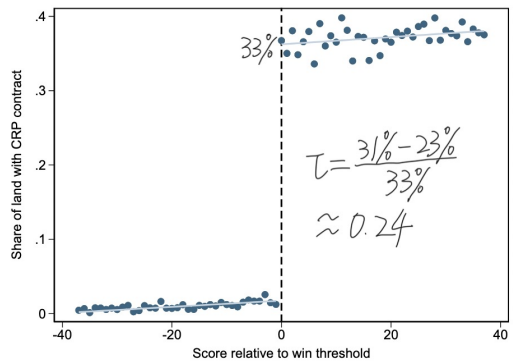
(b) Placebo: pre-auction



(a) Share of land cropped



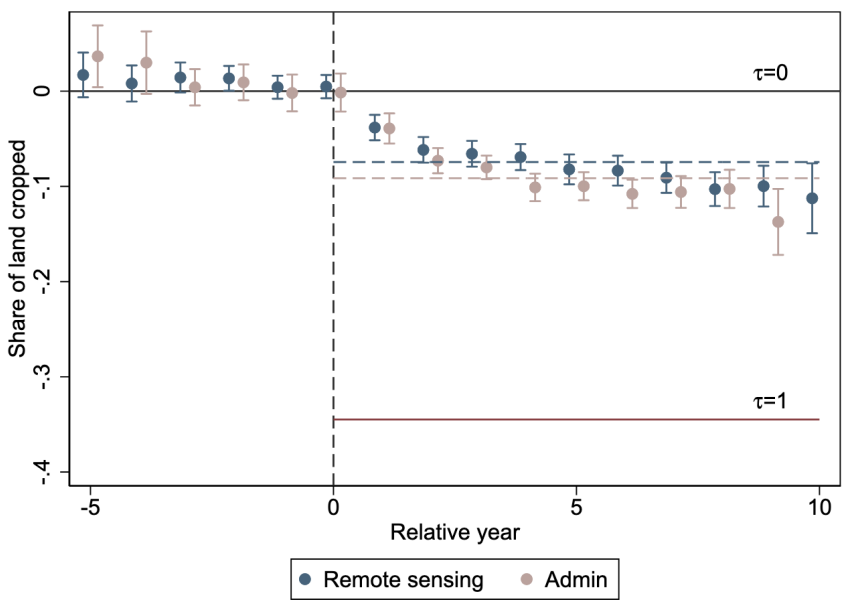
(d) First stage: share of land contracted



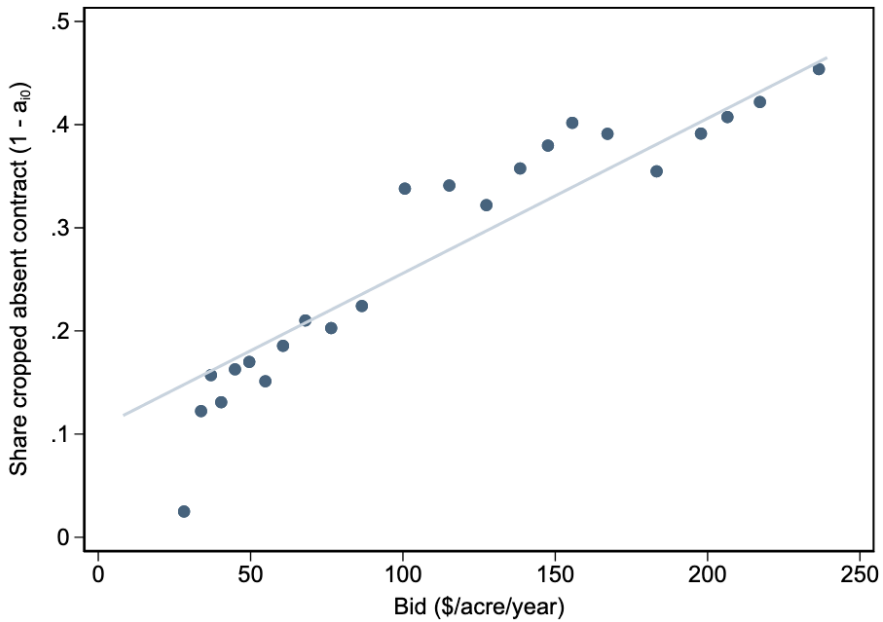
The x-axis is a bidder's score (bid price plus other environmental factors) minus the winning score threshold; zero is the last winner

Empirical Results

- RD: only 22-27% of marginal winners are additional $\Longrightarrow$ only about 1 in 4 marginal winners is truly additional ($\tau \approx 0.25$)
- Adverse selection: bids positively correlated with additionality; substantial heterogeneity (tree contracts worst)
- Cost elasticity of τ: 1 SD higher cost $\Longrightarrow$ 6 pp additionality $\uparrow$ (more expensive lands are more genuine)



(a) Additionality vs. bids



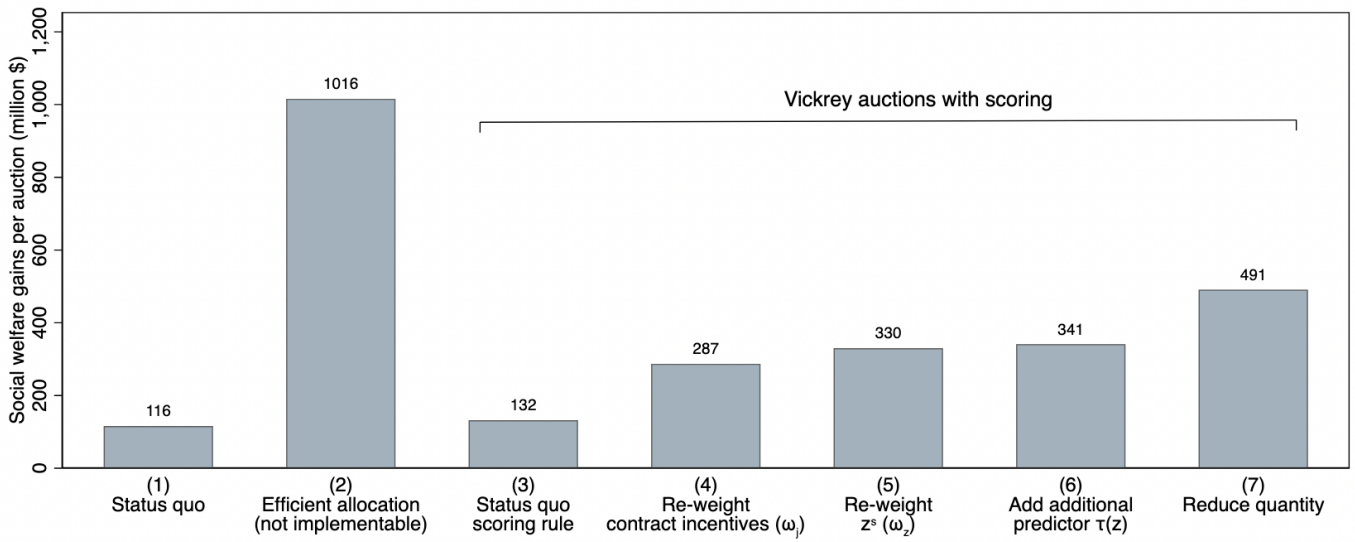
Auction Logic: Status-Quo vs. "Additionality-Aware"

- Current CRP uses a multi-attribute scoring rule that ignores additionality (τ) $\implies$ A cheap but non-additional land can still win
- Paper's idea: keep the familiar scoring auction but multiply it by a predicted $\hat{\tau}$. Then rank bids by Score = Environmental Benefit $\times$ Predicted Additionality – Cost.
- Propose a modified Vickrey-style auction that weights types by estimated additionality
  - Intuition: the rule now finds lands that are both cheap and likely to change behavior
- Goal of new auction: Not to completely exclude non-additional landowners, but to correctly **balance cost and additionality**.
  - The new scoring rule prioritizes landowners who deliver the most incremental conservation per dollar spent

Welfare & Policy Punchline

- Current auction captures 11% of possible surplus ($116 m/auction)
- Simple rule tweaks + smaller market close 42% of the gap ($375 m ↑)
  - Re-weight existing score factors
  - Add "additionality factor ($\hat{\tau}(z_i)$)" (soil productivity & erosion deciles)
- **Measure additionality, price it into the auction design**
  $\Longrightarrow$ **don't need a fancy new program**

Figure 9: Social Welfare Under Alternative Auctions



Thank You!

Questions or Comments?

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