

Extended Abstract

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Paper/Poster Title	Spatially Coordinated Conservation Auctions: A Framed Field Experiment Focusing on Farmland Wildlife Conservation in China
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Abstract	<i>200 words max</i>
<p>This paper presents a framed field experiment from China studying a spatially coordinated (SC) auction mechanism for the allocation of agri-environmental contracts, which pay farmers to change their agricultural practices to provide environmental benefits. The SC auction is designed to maximise a metric of environmental benefit that depends both on site-specific environmental values and benefits due to spatial coordination of conserved patches, subject to a budget constraint. We investigate whether auction performance can be improved by the introduction of agglomeration bonus (AB) and joint bidding (JB) mechanisms. The AB is a bonus payment awarded to neighbouring farmers who bid individually but receive agri-environmental contracts simultaneously. The JB mechanism allows neighbouring farmers to bid jointly and provides a bonus payment for successful joint bids. We conducted experimental SC auctions with a total of 432 Chinese farmers. Our empirical results suggest that the SC auction has similar environmental performance regardless of whether an AB is provided, although cost-effectiveness is slightly higher when AB is not provided. Moreover, introducing the JB mechanism into the SC auction leads to lower environmental performance and lower cost-effectiveness. Finally, the AB mechanism achieves higher environmental performance than the JB mechanism but has similar cost-effectiveness.</p>	
Keywords	Agglomeration bonus, joint bidding, agri-environmental schemes, Payments for Ecosystem Services, framed field experiment.
JEL Code	C72, C93, D44, Q15, Q57 see: www.aeaweb.org/jel/guide/jel.php?class=Q)
Introduction	<i>100 – 250 words</i>
<p>The past few decades have witnessed a rapid global proliferation of agri-environmental schemes (AES), which provide payments for farmers to incentivise them to voluntarily undertake environmentally friendly land-use activities. In many countries, AES account for a substantial proportion of total public spending on agriculture. To further enhance the performance of AES, one important consideration is to allocate AES contracts to better account for supplementary ecological benefits arising from the spatial coordination of changing agricultural practices on multiple farms ('edge' benefits), in addition to benefits of changing agricultural practices on each farm individually ('node' benefits). The AES review literature has proposed several mechanisms intended to incentivise the spatial coordination of AES</p>	

contracts, including the spatially coordinated (SC) AES auction, agglomeration bonuses (AB) and joint bidding (JB), as explained in the abstract. This study is the first framed field experiment on whether the performance of SC AES auctions can be further improved by the introduction of AB and JB mechanisms. Moreover, our experiment employs farmer subjects who represent the target population potentially participating in real-world AES auctions, whereas previous experiment studies on this topic were mostly run on university students. Lastly, the experimental AES auctions in this study were set in the context of China, which has been investing heavily in AES and conventionally inclined to forcible enrolment to achieve spatial coordination. This study provides useful insights about voluntary AES mechanisms that favour spatial coordination as potential alternatives to the country's conventional mandatory approach.

Methodology

100 – 250 words

We conducted experimental SC AES auctions with a total of 432 Chinese farmers randomly assigned to one of four treatments which differed in whether the AB and JB mechanisms were adopted, following a two-by-two full factorial experimental design. Each auction group consisted of six farmers. Each farmer was assumed to grow fruit trees using chemical pesticides on one of the six farms on a circular network. The farmers bid for hypothetical AES contracts that compensate them for switching from chemical to biological pesticides, which would benefit farmland wildlife such as bees and butterflies. Biological pesticides were assumed to be more expensive than chemical pesticides, but would ensure the same fruit yield. The farmers' task in the experiment was to specify the amount of the payment they would be willing to accept to adopt this new pesticide. Farmers winning the AES auction would receive a hypothetical AES contract and a net payoff equal to the difference between the AES payment they bid for (plus bonus payments in the AB and JB treatments) and the cost of switching pesticides. The SC AES auctions selected winning farmers in such a way that would achieve the highest total environmental benefits (consisting of both edge and node benefits), under a budget constraint. The effects of the AB and JB treatments were assessed through between-treatment statistical comparison of six indicators that measure the environmental and economic performance of the AES auctions. The treatment effects were estimated using parametric *t*-tests and non-parametric rank-sum tests.

Results

100 – 250 words

We find that: 1) the presence of the AB to further reward spatial coordination in the SC AES auction has no impact on environmental performance and negatively impacts economic performance relative to the baseline when this payment is not offered; 2) Introducing the JB mechanism into the SC AES auction leads to lower environmental performance and marginally lower cost effectiveness; 3) the SC AES auction provides lower environmental benefits and is less cost effective in the presence of both the AB and JB mechanisms; 4) in the SC conservation auction setting, providing AB for individual bids leads to higher environmental performance and similar cost-effectiveness, compared to allowing JB and providing a joint bidding bonus; 5) A farmer is likely to bid lower in an SC conservation auction in the following



circumstances (other conditions being equal): a) AB is provided; b) the farmer chooses to bid jointly under the JB mechanism; c) the conservation activity incurs lower opportunity costs or provides lower environmental benefits; d) the farmer has greater auction experience; or e) the farmer is more risk-seeking; 6) in an SC conservation auction with the JB mechanism, a farmer is more likely to bid jointly rather than individually if, a) AB is not provided, b) the conservation activity could generate higher edge benefits, c) the farmer has less auction experience, d) the farmer won the previous auction period, e) the farmer has pre-existing agricultural collaboration experiences with their neighbours, or f) the farmer owns more cattle, *ceteris paribus*.

Discussion and Conclusion

100 – 250 words

This paper presents the first framed field experiment study that investigates whether the performance of the spatially coordinated (SC) AES auction can be further improved by the introduction of agglomeration bonuses (AB) and joint bidding (JB) separately and jointly. Moreover, this study conducted experimental AES auctions in field settings using farmer subjects, which enriches the evidence base of the wider experimental literature on AES auctions which has been dominated by laboratory experiments run on student subjects. The SC AES auction already accounts for the spatial coordination of conservation actions by allocating AES contracts in such a way that maximises not only node environmental benefits, but rather, the total environmental benefits comprised of both node and edge benefits. Despite that, our theoretical analysis suggests that the AB and JB mechanisms could further improve the environmental performance of the SC conservation auction, although this largely depends on farmers' expectations of the bonus payments and their preferences about higher levels of uncertainty associated with the bonus payments. Our experimental auctions found no evidence of such improvement. It turned out that, under the AB and JB mechanisms, it was more costly on average to enrol farms in the AES programme, which led to fewer contracts being affordable compared to the SC auction without AB and JB under the same budget constraint. This, however, raises a further research question about the situation if an AES auction has a less restrictive budget, which is not uncommon in real-world AES auctions in case of low participation.