Land Tenure and Adoption of Straw Retention: Evidence from Chinese Grain Crop Growers

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Abstract
Straw: To burn, or not to burn? it is a question!

This study aims to examine how land tenure arrangements affect Chinese farmers' adoption of straw retention, a critical conservation practice promoted by the Chinese government to improve soil quality and combat air pollution. Using survey data from 1,659 crop plots in Henan Province in central China conducted last year, we examine the impacts of land tenure on growers’ straw retention choices. Results from a Heckman selection model reveal that, after controlling for crop choice, harvest season, spatial climate and other plot-level and household-level covariates, farmer households are more likely to adopt straw retention after harvest on own contracted than rented plots throughout 2015.

Research Question and Hypothesis

Straw Tenure Types in Henan (2010) 29

Data and Study Region - Henan

- Major wheat area
- 100 million people
- Severe straw burning

PM 2.5 emissions

Sample size

Methods

Conceptual framework

- A grower adopts straw retention only if

\[ \pi_s - C_s + \lambda V_s / (1 + \rho) > \pi_n - C_n + \lambda V_n / (1 + \rho) \]

- Short-term profit loss < long-term land value improvement
- Long-term profit: Straw retention can reduce soil runoff, improve the fertility and productivity over time, and better retain the long-term value of the land V.

Heckman selection model

Selection Equation: to rent or not

- Exclusion restrictions
  - Distance to larger cities: closer to cities, easier to get off-farm employment opportunities > higher chance of being rented out, but not necessarily affect conservation
  - Distance to nearest counties: farther away from county centers > harder to sell grains > higher cost for owned plots

- Outcome equation: to adopt straw retention or not

- Control variables: household head's age, farming experience, family education, income, participation in farmer organization, training # laborers, purchase of insurance; plot size

- Variables only in 2nd-stage outcome equation: July temperature and precipitation (May-July is wheat harvesting season), harvest season, crop choice

Results

- Why do growers adopt straw retention?

Heckman selection model results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Selection - Rent or Not</th>
<th>Adoption Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.0026***</td>
<td>0.0039</td>
</tr>
<tr>
<td>Farming experience</td>
<td>-0.0171***</td>
<td>-0.0025</td>
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<tr>
<td>Education</td>
<td>0.0035**</td>
<td>0.0052</td>
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<tr>
<td>Number of laborers</td>
<td>-0.0181*</td>
<td>-0.0012</td>
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<tr>
<td>Income</td>
<td>0.0042***</td>
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<td>Organization</td>
<td>0.0150**</td>
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<tr>
<td>Insurance</td>
<td>0.5338***</td>
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<tr>
<td>Training</td>
<td>-0.0179</td>
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<tr>
<td>Plot size</td>
<td>0.0176***</td>
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<tr>
<td>July temperature</td>
<td>0.3783</td>
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<tr>
<td>July precipitation</td>
<td>0.0029**</td>
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<tr>
<td>Winter season</td>
<td>-0.0044***</td>
<td>-0.0006</td>
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<tr>
<td>Distance to city</td>
<td>0.0009</td>
<td>0.0004</td>
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<tr>
<td>Distance to county</td>
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<td>-0.0023</td>
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<tr>
<td>Observations</td>
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<td></td>
</tr>
</tbody>
</table>

Conclusion and Policy Implication

- Our empirical results reveal a significant effect of land tenure structure on farmer’s decision to adopt straw retention in Henan: being a renter is associated with lower probability (p < 0) of adoption.
- To encourage adoption of conservation practices like straw retention, the government may need to improve the land tenure security for rented farmland by:
  - enforcing more stable, formal leasing agreement contract;
  - Loosening restrictions on land eligible for rental and transfer

References