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Tenure and Technical Efficiency Among Philippine Rice Farmers

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Poster prepared for presentation at the Agricultural & Applied Economics Association's 2012 AAEA Annual Meeting, Seattle, Washington, August 12-14, 2012

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Introduction

- Formalized property rights regime is insufficient to generate an effective land sales and rental market (Feder 1985; Binswanger et al. 1995).
- Empirical studies have focused on the effect of secure tenure contracts, combined with formalized property rights, and on access to credit and land rental markets.
- We use unbalanced panel data from the Philippines to test whether formalized property rights have translated into efficient land sales and rental markets.
- Additionally, we test for security of land tenure contracts.
- Unlike most nations in Asia, which underwent land reform in the wake of WWII, the Philippines only underwent extensive land reforms in 1988.
- As opposed to previous, populist movements for land redistribution, the goal of the post-Marcos land reforms was to formalize property rights so as to allow land sales and land rental markets to operate more efficiently.

- Evidence from the Philippines of land market efficiency would provide justification for other countries to undergo similar reforms.
- Evidence of land market inefficiency would provide support for Deininger and Binswanger's (1999) hypothesis that market driven land reforms are ineffective.

Model and Data

- Using Stochastic Frontier Analysis (SFA) we test two questions (Aigner et al., 1977):
  1. How does technical efficiency affect whether a parcel is owned or rented?
  2. Over time, are parcels that are always owned more efficient than parcels that are always rented out?
- We model the production of rice at a parcel level using the translog function:

$$\ln y_{it} = \beta_0 + \sum_k^3 \beta_k \ln X_{kit} + \frac{1}{2}\sum_k^3\sum_l^3 \beta_{kl} \ln X_{kit} \ln X_{lit} + \sum_j^8 \gamma_j D_{jit} + \frac{1}{2}\sum_k^3\sum_j^8 \varphi_{kj} \ln X_{kit} D_{jit} + v_{it} - u_{it}$$

X_{kit} - Quantitative inputs (labor, fertilizer, pesticide) on parcel i at time t
D_{jit} - Control variables (year, location, tractor, irrigation) on parcel i at time t
v_{it} - Idiosyncratic disturbance term distributed $i.i.d.\ N(0, \sigma_v^2)$.
u_{it} - Technical efficiency term distributed independently $N^+(\alpha^T Z_{jt}, \sigma_u^2)$

- Technical efficiency of production for the ith parcel in the tth year is defined by (Kumbhakar and Lovell, 2000):

$$\text{TE}_{it} = \frac{y_{it}}{\hat{y}_{it}} = \frac{y_{it}}{f(x_{itk})e^{v_{it}}} = \frac{f(x_{itk})e^{v_{it}-u_{it}}}{f(x_{itk})e^{v_{it}}} = e^{-u_{it}}$$

Z_{jt}-- Matrix of farmer and parcel characteristics , including tenure
α^T - Vector of parameters to be estimated

- Data come from a longitudinal study (1995-2002) conducted of two farming villages in the southern part of Palawan Province, Philippines.
- Parcel level panel consists of 746 observations from 230 parcels (Shively and Zelek, 2003).

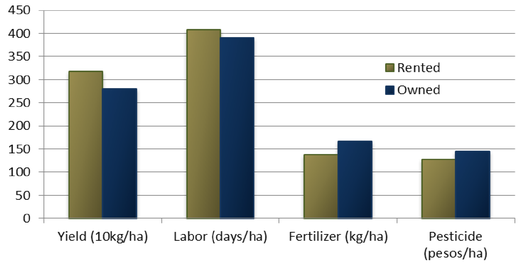
Hypothesis and Summary Results

Hypothesis:
1. Formalized property rights coming from land reform in the late 1980s have led to efficient land sales and rental markets in Southern Palawan Provence.
2. Tenure security is not an issue in that time persistent effects due to tenure status do not exist.

Summary Results:
1. Evidence from the study sight shows farmers on owned parcels are more efficient than on rented parcels. This does not support our hypothesis. Land rental and sales markets are not allocating land efficiently.
2. Evidence shows no time persistent effects due to tenure type. This supports our hypothesis. Land contracts appear to be secure.

Results

Inputs per Parcel by Tenure Status



Mean Technical Efficiency

Variable	N	Mean	Std. Dev.	Min	Max
Cumulative TE	712	0.637	0.637	0.001	0.957
TE of transfer parcels	252	0.647	0.219	0.001	0.936
TE of parcels always owned	331	0.618	0.222	0.001	0.952
TE of parcels always rented	129	0.663	0.243	0.001	0.957

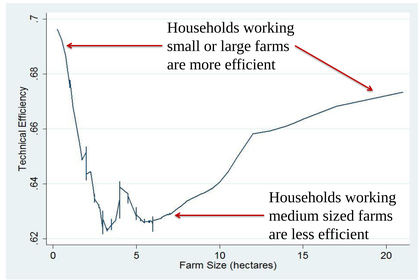
Production Results

- Labor, fertilizer, and pesticide all have positive and significant effects on yield.
- Interaction terms for labor/fertilizer and labor/pesticide are negative and significant suggesting labor is a substitute for fertilizer and pesticide.

Efficiency Results

- Tenure has a positive and significant effect on efficiency. Farmers who own the parcels they work are more efficient then farmers who rent the parcel in question.
- Households who own a small percentage of their farm are more efficient than households who own a large percentage. We speculate that this is due to the high opportunity cost of renting additional parcels. Inefficient farmers will not seek to expand their farm by renting parcels.
- Households working small or large farms tend to be more efficient than those working medium sized farms. We speculate that this is due to the existence of inefficient land rental markets.

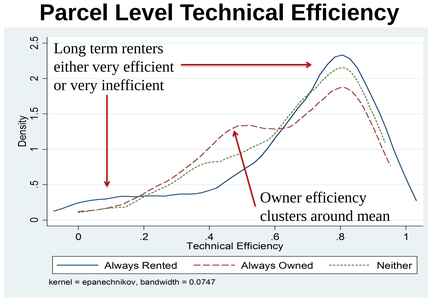
Technical Efficiency and Farm Size



Tenure Security Results

- The characteristic of a parcel always being owned or always being rented has no effect on efficiency. There is no evidence of time persistent effects of tenure on efficiency.
- While the difference in mean efficiency for always owned/rented parcels is not significant, there are differences in the distribution.
- Plots that are always owned tend to have mid-level efficiency while renter's efficiency is clustered on each end of the distribution.
- Long term renters appear to be of two types:
  1. Inefficient farmers that must rent because they cannot afford to purchase land
  2. Efficient farmers that rent land to expand their farmed area.

Parcel Level Technical Efficiency



Conclusions

- Our results provide mixed evidence regarding the effects of tenure on technical efficiency:
  1. We find evidence of allocative inefficiency in the market for land in our sample.
     - If farmer j owns parcel i at time t, that farmer will demonstrate greater technical efficiency than if the same farmer j was renting the same parcel i at the same time t.
  2. Yet, given a time invariant tenure arrangement, tenure no longer matters in the technical efficiency equation.
     - If parcel i is owned at all time t, regardless of which farmer j farms the parcel, that farmer would be no more efficient if parcel i was rented at all time t.
- These two findings present an apparent paradox.
- Legally well-defined property rights have not resulted in efficient allocation of land while legally ill-defined tenure contracts have resulted in secure tenure arrangements.
- It is unsurprising that our results support Deininger and Binswanger's (1999) doubt regarding the effectiveness of market driven land reforms.
- What is surprising is that, absent similar formalization of rental contracts, land tenure agreements are secure in this sample, raising questions for current policy directed at land reforms.

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For Further Information

Please contact *jmichler@purdue.edu*. This poster is based on a working paper of the same title. The paper can be accessed at:

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