

# Agricultural Insurance and Share Tenancy

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# Motivation

- Fixed rent and crop share are the most popular farm land rental contract types in the US. From 1999 to 2014, share of leased farmland under crop share dropped from 33% to 21%, while the share of leased farmland under fixed cash rent increased from 67% to 69%.<sup>1</sup>
- Under information asymmetry between landlord and tenant, crop share provides insufficient incentive for tenants compared to fixed rent contract (Marshall, 1890). Increasing tenants' share improves productivity (Burchardi, Gulesci, Lerva, & Sulaiman, 2019).
- Crop share is rationalized by both risk-sharing and incentive (Stiglitz, 1974).
- The trade-off between incentive and risk determines the optimal contract on a spectrum of land and labor contracts (Otsuka, Chuma, & Hayami, 1992).

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<sup>1</sup>Based on data from 1999 AELOS and 2014 TOTAL survey.

# The spectrum of land and labor contracts

Hired labor

Crop share

Fixed cash rent



Tenants are offered higher incentive



Tenants bear less risk



Figure 1

# Research question

Does crop insurance, as an alternative risk management tool, reduce the need for crop share?

We test this by looking at whether the incidences of crop share reduce with the adoption of federal crop insurance.

## Theoretical

- Canonical principal-agent model derives direct implications of reduced monitoring cost and tenant risk aversion on optimal contract, but not the reduction of risk itself, nor the provision of insurance.
  - "... a change in risk in agriculture cannot in themselves explain the change in the payments system; ... And even as the risk goes to zero, the share goes to a limiting value that is not one of the polar (rental or wage) cases." (Stiglitz, 1974)
  - To derive the prediction that higher risk increases the incidences of a share contract, an additive form between tenant effort and random forces is imposed, as in Allen and Lueck (1999).
- The trade-off between incentive and risk?
  - Transaction cost, rather than risk, explains contract choice (Allen & Lueck, 1995; Bellemare, 2012).
  - Prendergast (2002) argues that incentive is important even in highly risky situations, since the agent has more discretion over decisions.

## Empirical

- Empirical evidence does not support the trade-off between incentive and risk
  - The fraction of output tenants keep is increasing in the noisiness of the financial returns and yield variability, opposed to theory prediction (Rao, 1971; Allen and Lueck, 1992, 1995, 1999).
- Studies about land rental contract choice and crop insurance do not speak to causality
  - Fukunaga and Huffman (2009) examine the role of tenant and landlord attributes in the choice between crop share vs fixed cash rent using 1999 AELOS data .
  - Paulson et al. (2010) compare insurance decisions under cash rent and crop share.

- We focus on the provision of insurance, which has more direct policy implication than change in riskiness and risk attitude.
- We use nation-wide farm level, repeated cross-sectional data to test our hypotheses.
- We account for the endogeneity of insurance participation using instrumental variables.

- Insurance participation is endogenous to land tenure contract
  - Landlords routinely require insurance
  - Insurance participation and tenure contract are simultaneously determined by land, landlord and tenant attributes (adverse selection in insurance)
- Instrumental variables for insurance participation
  - Subsidy rate of the federal crop insurance premium, similar to (Yu, Smith, & Sumner, 2018) and (Connor & Katchova, 2020)



- ARMS Phase II microdata: randomly selected field of surveyed crop, sub-sample of leased land
  - Dependent variable: a categorical variable for whether the selected field is on fixed cash/flexible cash/share/free contract
  - Independent variable: multi-peril crop insurance coverage
- RMS Summary of Business data:
  - Instrumental variable: state premium subsidy rate (for 65% and 75% yield and revenue protection) = total subsidy paid/total premium paid in the same state-year

- FINBIN data
  - Farm financial data from FINPACK software farmer users in 12 states in the Midwest and Plains regions (1997 - 2021)
  - Cost and return reports at the state average level by tenure type and crop

# Descriptive statistics: Do cash rent operators spend more on insurance than crop share operators?

Table 1: Insurance premium per acre by tenure type

Corn				
	Cash Rent (N=153)	Owned Land (N=151)	Share Rent (N=108)	Overall (N=412)
<b>Insurance premium per acre</b>				
Mean (SD)	15.7 (7.00)	14.8 (6.97)	10.2 (4.97)	13.9 (6.88)
Median [Min, Max]	16.2 [2.44, 31.6]	13.5 [3.26, 31.4]	10.1 [0.420, 23.8]	12.3 [0.420, 31.6]
Missing	5 (3.3%)	4 (2.6%)	0 (0%)	9 (2.2%)
Soybeans				
	Cash Rent (N=151)	Owned Land (N=142)	Share Rent (N=108)	Overall (N=401)
<b>Insurance premium per acre</b>				
Mean (SD)	12.4 (5.52)	11.8 (5.15)	8.23 (3.57)	11.0 (5.21)
Median [Min, Max]	11.9 [0.390, 26.2]	11.2 [1.15, 24.7]	7.99 [0.200, 18.8]	10.2 [0.200, 26.2]
Missing	5 (3.3%)	1 (0.7%)	0 (0%)	6 (1.5%)

# Descriptive statistics: Does expenditure on insurance increase with operator's share?

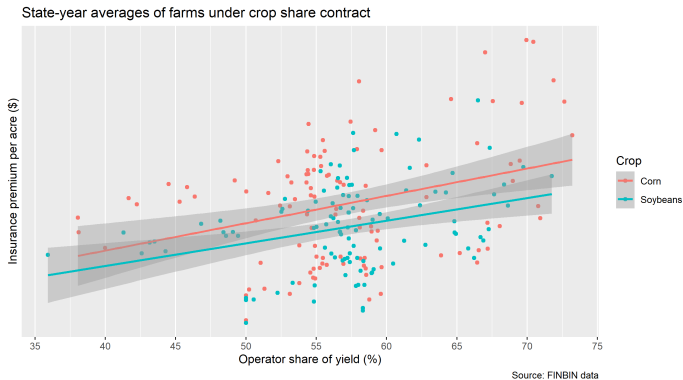


Figure 2

But this positive relationship could simply mean that the more share of yield operators keep, the larger the insurable liability.

# Descriptive statistics: Do cash rent operators spend more on insurance than crop share operators?

Divide insurance premium per acre by operator's share of yield

Table 2: Insurance premium per 1000 bu. of yield kept by the operator

Corn				
	Cash Rent (N=153)	Owned Land (N=151)	Share Rent (N=108)	Overall (N=412)
<b>Insurance premium per 1000 bu. of yield kept by the operator</b>				
Mean (SD)	1.15 (0.610)	1.09 (0.626)	1.29 (0.618)	1.17 (0.622)
Median [Min, Max]	1.07 [0.164, 4.58]	0.963 [0.188, 4.02]	1.27 [0.0554, 3.03]	1.08 [0.0554, 4.58]
Missing	5 (3.3%)	4 (2.6%)	0 (0%)	9 (2.2%)
Soybeans				
	Cash Rent (N=151)	Owned Land (N=142)	Share Rent (N=108)	Overall (N=401)
<b>Insurance premium per 1000 bu. of yield kept by the operator</b>				
Mean (SD)	3.03 (1.50)	2.85 (1.49)	3.52 (1.62)	3.10 (1.55)
Median [Min, Max]	2.72 [0.0769, 8.70]	2.55 [0.245, 8.34]	3.37 [0.0790, 9.51]	2.95 [0.0769, 9.51]
Missing	5 (3.3%)	1 (0.7%)	0 (0%)	6 (1.5%)

# Descriptive statistics: Does expenditure on insurance increase with operator's share?

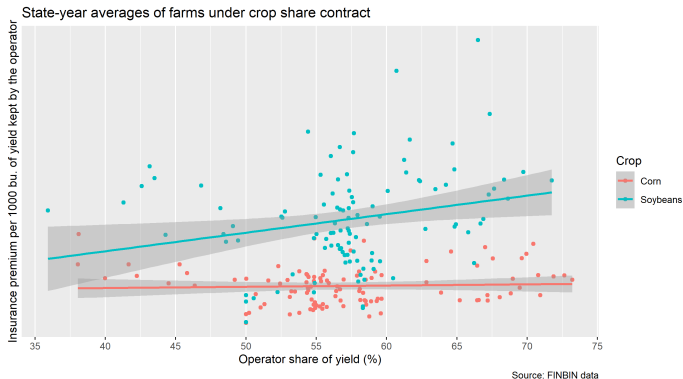


Figure 3

Once we standardize insurance expense by liability, the positive relationship between insurance expense and tenant share is gone.

- Use the ARMS microdata to test our hypotheses, applying instrumental variable design.
- Build a principal-agent model that incorporates insurance participation
  - It is a cut off on the lower tail, rather than a reduction in variance
  - Is sharecropping landlord still exposed to risk when tenant enroll in insurance? Not if they purchase an insurance together that covers both shares.
  - There might be selection in tenant based on insurance participation, or insurance participation is integrated in tenure contract (interlinked contracts).
  - Insurance participation itself could affect tenant effort level due to moral hazard between insurance agency and tenant, possibly negatively