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# Crop insurance's impact on agricultural lenders

Jennifer Ifft  
Todd Kuethe  
Greg Lyons  
Alexander Schultz

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Dyson  
Cornell  
SC Johnson College of Business

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# Motivation

Previous research using **farm** survey data shows that crop insurance participation leads to higher operating loan levels, likely through increasing likelihood of loan repayment

- Limited research using lender information
- Both farmers and lenders respond to changing availability of farm programs and risk management tools
- Has there been a corresponding credit-supply response by lenders, especially farm-dependent lenders?

# Research Question

## Primary question

Does crop insurance increase the supply of credit to agriculture?

## Understanding lender supply response

Are banks that are more exposed to agriculture more likely to offer higher levels of operating credit? Is crop insurance important for banks that are more likely to rely on hard information?

# Mechanisms

- Collateral guarantee
- Some banks with a large agricultural portfolio may have had broad, 'previously uninsurable' exposure to yield risk
- Hard information on creditworthiness preferred by larger banks, where relationship banking is less effective (Berger et al., 2005; Bülbül et al., 2019)

# Previous research

- Lenders: we would provide more credit to farms with crop insurance (Pfleuger and Barry, 1986)
- Correlation between banks with a greater concentration in agricultural loans and higher levels of multi-peril crop insurance uptake (Pederson, 1986)
- Farm survey data analysis suggests ‘insurance as loan collateral’ in India (Mishra, 1994), U.S. (Ifft et al., 2017)

# Data sources

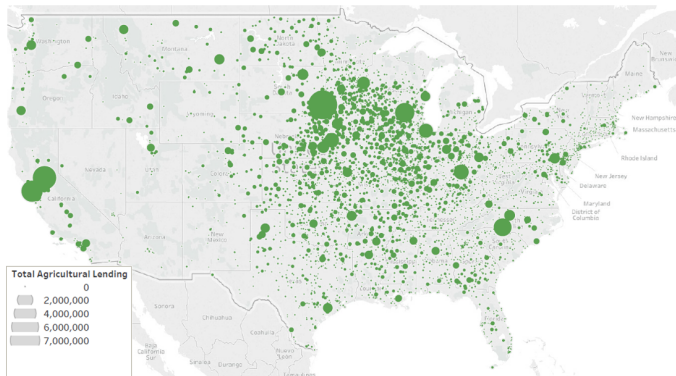
- Call reports
  - (FDIC) Consolidated Reports of Condition and Income
  - Cleaned and assigned to counties based on Den Haan et al. (2007)
- RMA Summary of Business - crop insurance use and availability
  - Use/participation from 1989
- NASS and other data on county crop production

# Measuring credit supply

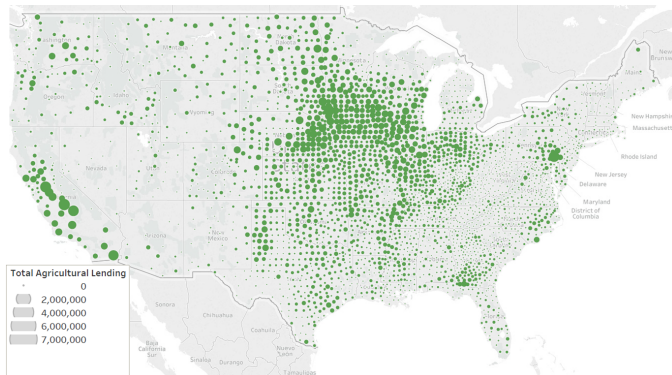
- Summary of Deposits survey (SOD) data to identify branches of each bank.
- Community Reinvestment Act (CRA) data to identify additional counties where the bank conducts lending.
  - CRA data fills holes in SOD data left by banks lending outside of where they have a physical presence.
- Interest rate expense from the Census of Agriculture to assign loan volumes to counties.



# Call reports - raw data weighted by volume



## Call reports - after cleaning



# Empirical strategy

- Cornbelt states only
- Standard county FE model (1989-present)
- IV based on O'Donoghue et al. (2009)
  - Based on plausibly exogenous change in premium subsidy levels due to FCIRA
- Diff-in-Diff using counties with high crop-hog ratio as treated group
  - Hogs were not eligible for crop insurance after FCIRA
  - Limit to years when hog and corn prices were "in balance"

# Estimating equation: county panel

$$Y_{it} = \beta_0 + \beta_1 P_{it} + \beta \mathbf{G}_{it} + \tau_t + \gamma_i + \epsilon_{it} \quad (1)$$

where:

$Y_{it}$  is operating loans for county  $i$  in year  $t$

$P_{it}$  is FCI premium or acres

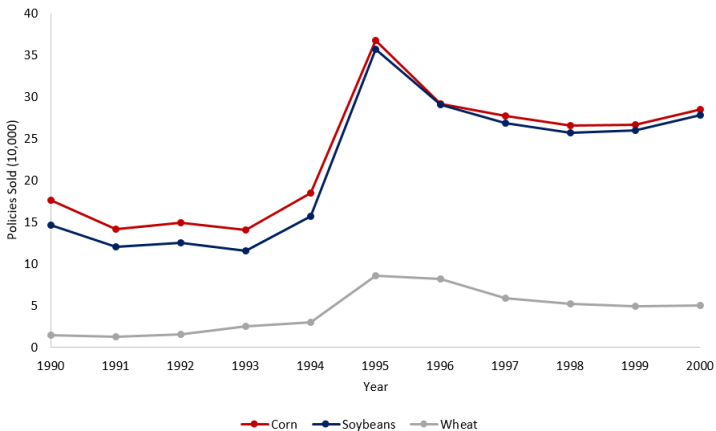
$G_{it}$  are controls for time-variant county characteristics

$\tau_t$  are year fixed effects

$\gamma_i$  are county fixed effects

$\beta_1$  is potentially biased, because  $Y_{it}$  and  $P_{it}$  may be determined simultaneously

# Policies sold, 1990–2000



Source: Risk Management Agency, Summary of Business

# Estimating equation: Instrumental variable

$$\Delta Y_{it} = \alpha + \beta \Delta C_{it}^{IV} + \mu X_{it} + \varepsilon_{it} \quad (2)$$

where:

$Y_{it}$  is operating loans for county  $i$  in year  $t$

$C_{it}^{IV}$  is an instrumental variable as described in

O'Donoghue et al. (2009)

$X_{it}$  is a vector of control variables

# Variable descriptions (O'Donoghue et al., 2009)

Instrumental variable:

$$\Delta C_i^N = \sum_j (P_{j1}/A_{j1}) s_{ij1} - \sum_j (P_{j0}/A_{j0}) s_{ij0} \quad (3)$$

Independent variable:

$$\Delta C_i = \sum_j (P_{ij1}/A_{ij1}) s_{ij1} - \sum_j (P_{ij0}/A_{ij0}) s_{ij0} \quad (4)$$

# Estimating equation: Difference-in-differences

$$Y_{it} = \alpha + \beta D_{it} + \delta time + \gamma D_{it} \times time + \mu X_{it} + \varepsilon_{it} \quad (5)$$

where:

$Y_{it}$  is operating loans for county  $i$  in year  $t$

$D_{it}$  is a dummy variable for a low hog-to-crop production ratio

$time$  is a dummy variable taking value 1 after 1994

$X_{it}$  is a vector of control variables



# Results: county panel

	(1)	(2)	(3)	(4)
	Prod. Loans		Prod. Loans (Ag)	
Weighted Premium / Acre	601.4*** (10.05)		341.4*** (6.807)	
% of Acres Covered		28426.2*** (656.8)		15515.6*** (439.6)
Constant	22588.0*** (235.4)	13578.6*** (466.6)	13274.4*** (159.4)	8554.4*** (312.3)
$R^2$	0.189	0.106	0.141	0.0732
N	15925	16320	15925	16320

Standard errors in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < .01$

# Results: instrumental variable

	OLS	IV	OLS	IV
	Production Loans		Production Loans (Ag)	
$\Delta$ Weighted Premium / Acre	11.51 (339.2)	3774.6** (1858.2)	-157.7 (229.2)	1099.8 (1162.2)
$\Delta$ Wheat	0.00370** (0.00160)	0.00572*** (0.00201)	0.00205* (0.00108)	0.00272** (0.00125)
$\Delta$ Corn	-0.000688*** (0.000238)	-0.000789*** (0.000265)	-0.000663*** (0.000161)	-0.000697*** (0.000166)
$\Delta$ Soybeans	0.00152* (0.000835)	0.00175* (0.000924)	0.00187*** (0.000564)	0.00194*** (0.000578)
Constant	4029.0** (1931.4)	-8064.7 (6222.8)	2044.2 (1305.2)	-1997.1 (3891.9)
$R^2$	0.137	.	0.207	0.161
N	538	538	538	538

Standard errors in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < .01$

# Results: difference-in-differences

	(1)	(2)
	Prod. Loans	Prod. Loans (Ag)
Post-FCIRA	3262.4*** (620.4)	2073.3*** (510.8)
Low Hog	-1794.3*** (642.8)	-2445.8*** (529.3)
Post-FCIRA × Low Hog	1906.3** (880.6)	193.4 (725.0)
Constant	34143.0*** (778.7)	28223.5*** (641.1)
$R^2$	0.350	0.414
N	5440	5440

Standard errors in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < .01$

# Conclusion/Next Steps

- Results suggest increased uptake in crop insurance uptake leads to an increased supply of operating credit
- Effect is much stronger for non-agricultural banks: crop insurance may lead to an increase in competition in farm lending
- Next Steps:
  - Robustness tests with different approaches to use call report and other data to estimate county loan volume

# Thank you!

Any questions?

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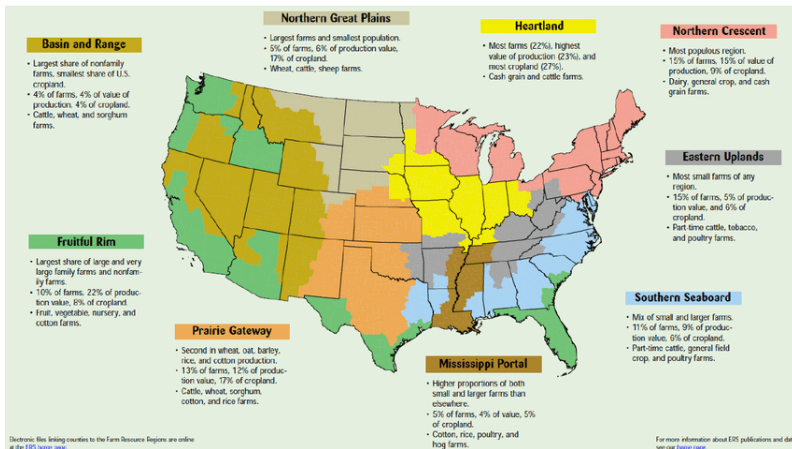
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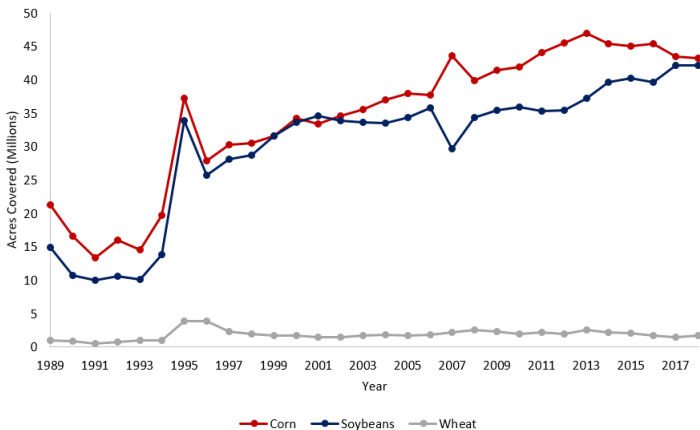
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# Appendix: ERS farm resource regions



Source: Heimlich (2000)

# Appendix: Acres covered, 1989–2018



Source: Risk Management Agency, Summary of Business

## Appendix: Means, 1989 & 2018

	1989	2018
Loans To Finance Agricultural Production (\$1,000)	14538.9	41329.8
Real Estate Loans Secured By Farmland (\$1,000)	7131.7	50220.0
Policies Sold	828.7	1177.7
Acres Covered	72636.1	163366.8

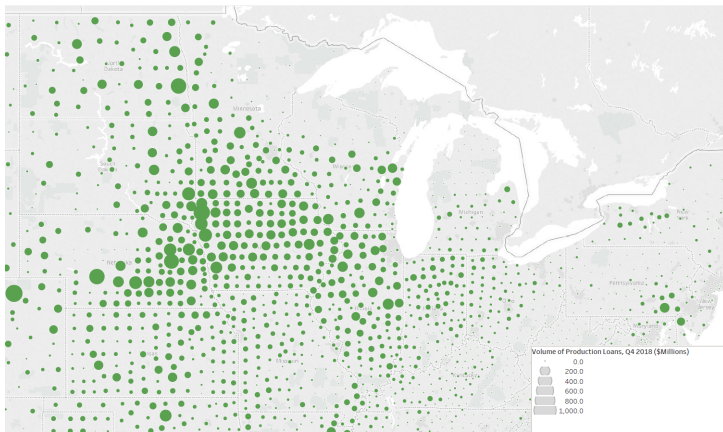
# Appendix: Bank competition

	(1)	(2)	(3)	(4)
	Prod. Loans		Prod. Loans (Ag)	
Weighted Premium / Acre	375.7*** (12.38)		250.6*** (8.534)	
No. of Banks	1653.6*** (55.59)	2191.2*** (54.35)	665.1*** (38.33)	1031.4*** (37.32)
% of Acres Covered		10102.5*** (773.1)		6890.9*** (530.8)
Constant	9837.1*** (485.9)	3632.3*** (508.2)	8145.8*** (335.1)	3872.8*** (348.9)
$R^2$	0.233	0.190	0.157	0.116
N	15925	16320	15925	16320

Standard errors in parentheses

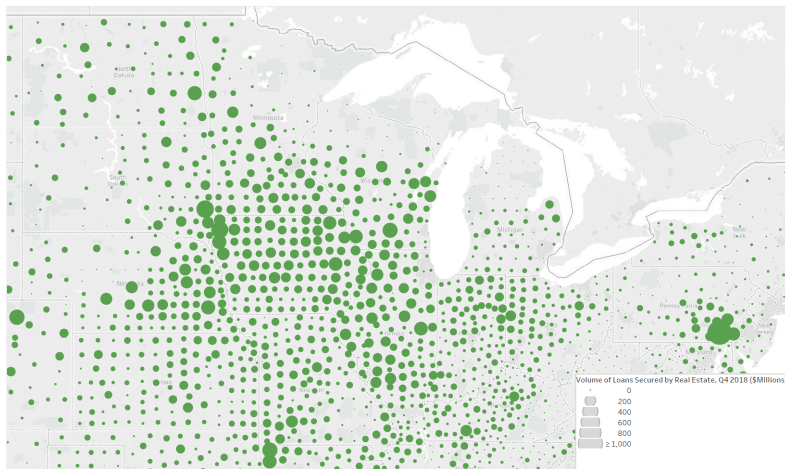
\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < .01$

# Call reports - Loans to finance agricultural production





# Call reports - Real estate loans secured by farmland



Note: We are focusing our analysis on the Heartland region (Heimlich, 2000)

# Robustness checks

- Different periods in county panel
- Counties with and without FCA branches
- Changing cutoff for low hog / treated group in diff-in-diff
- Alternative measures of bank specialization and lending competition

