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The Effect of Capital Constraints on the Growth of Agricultural Cooperatives

Meng-Fen Yen and Ani Katchova
The Ohio State University

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Motivation (I)

▶ Background

- ▶ Ownership of cooperatives - equity ownership only among members
- ▶ Lack of external source of capital because of membership-owned structure
- ▶ Growth usually requires financing
- ▶ Cooperatives rely mostly on debt financing because of no market for equity
- ▶ Increase use of retained earning and allocated reserve

Motivation (II)

- ▶ High level of long term debt constrains future borrowing
- ▶ Accounts receivables is a balance sheet item (the assets part), but A/R a big issue for cooperatives currently
- ▶ Positions of A/R more than 30 days determine the risk level of cooperatives
- ▶ Of the 709 grain marketing and farm supply cooperatives in the 2014 CoBank data, 28% of them experienced a rise in A/R due over 31 days
- ▶ Research question: Is growth of agricultural cooperatives affected by capital constraints?

Literature of Firm Growth Theory

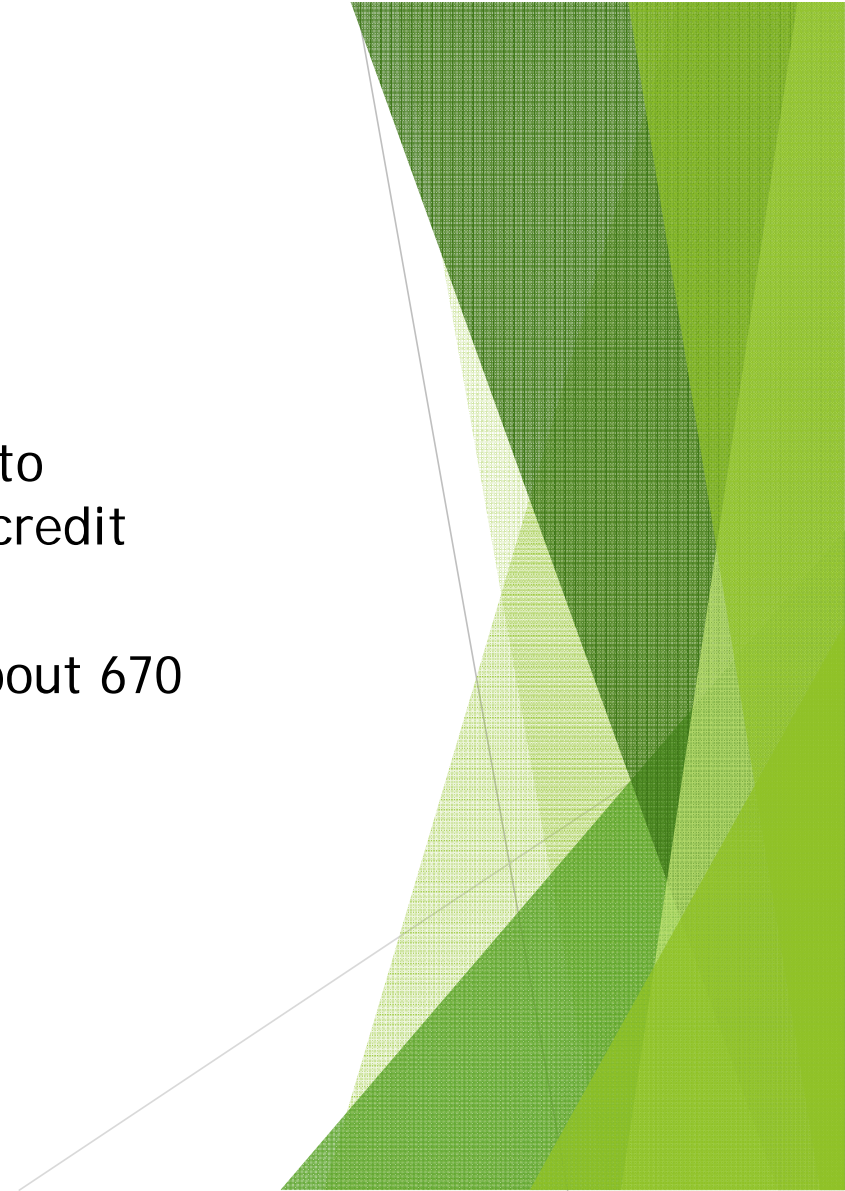
- ▶ Several studies examine capital constraints and firm growth
 - ▶ Fagiolo and Luzzi (2006) -- controlling for size, liquidity constraints have a negative effect on growth, using GMM
 - ▶ Lang et al. (1996) -- inverse relationship between leverage and growth
 - ▶ Oliveira and Fortunato (2006) -- direct relationship between liquidity and growth for small firms, using GMM

Literature on Growth of Agricultural Cooperatives

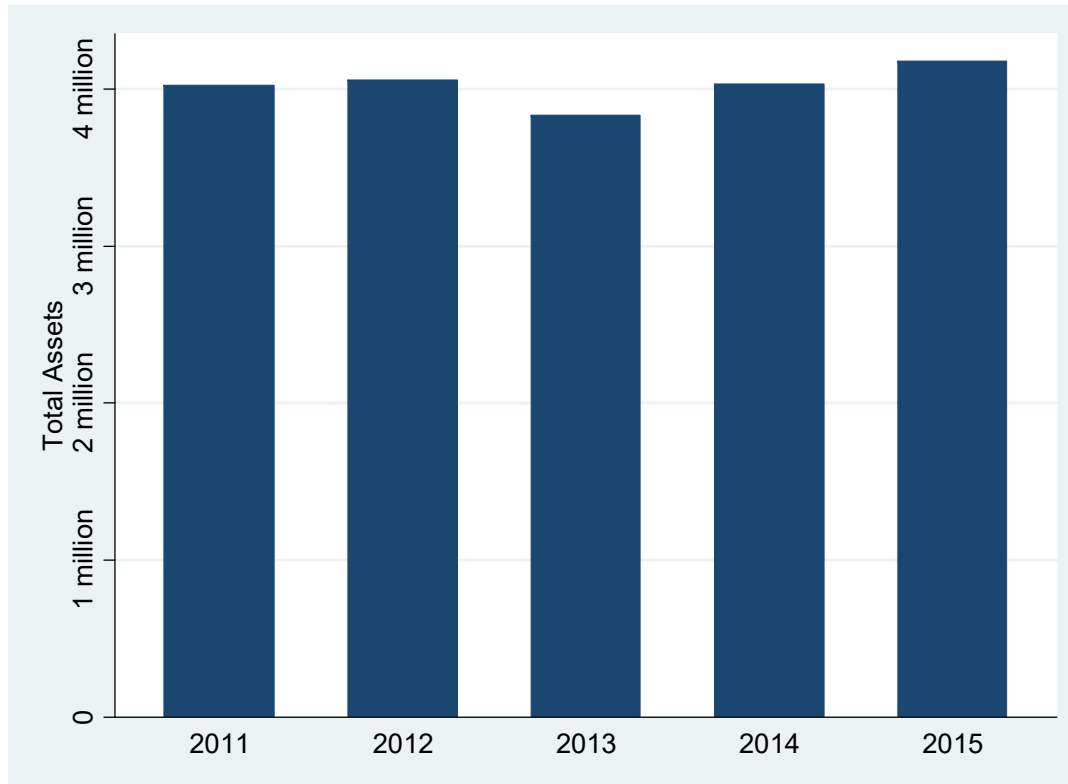
- ▶ Most research focuses on relationship between financial performance and growth -- do not test capital constraint hypothesis
- ▶ Fulton et al (1995) find that growth of cooperatives is not different from zero statistically
- ▶ Chaddad et al (2005) find that capital expenditures are significantly affected by the availability of internal funds

Data

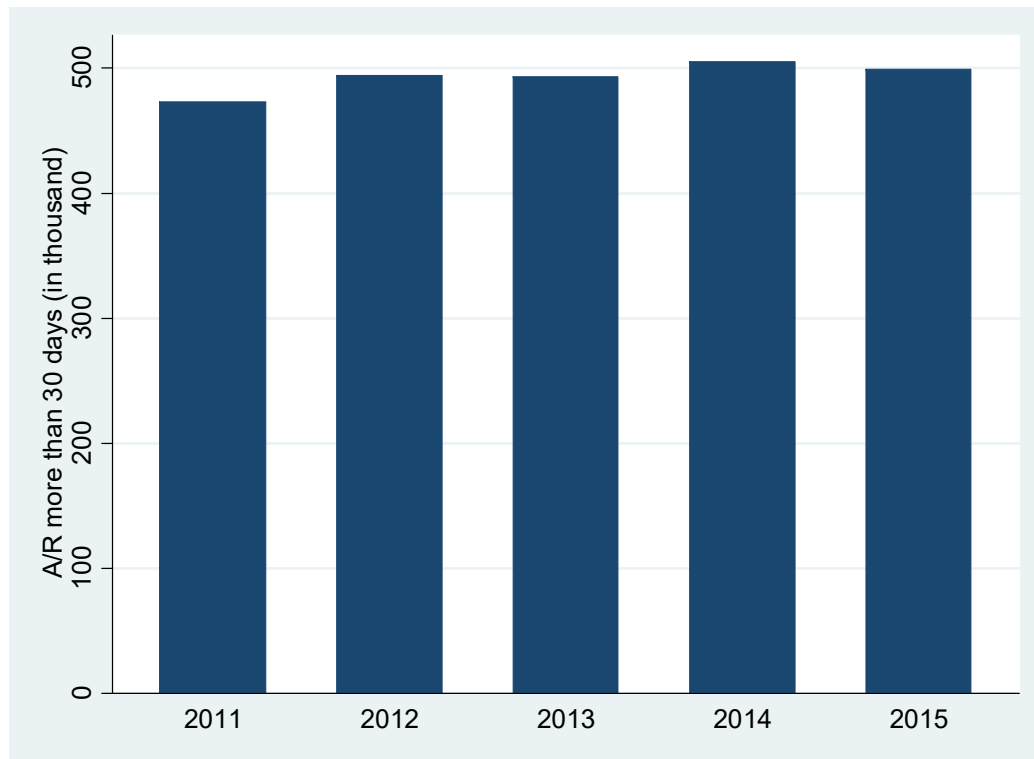
- ▶ Source: CoBank
- ▶ CoBank provides loans and financial services to cooperatives, agribusinesses and other farm credit associations
- ▶ Panel data: financial information, 5 years, about 670 cooperatives
- ▶ Short Time period, but many observations
- ▶ Problems with dynamic panel bias



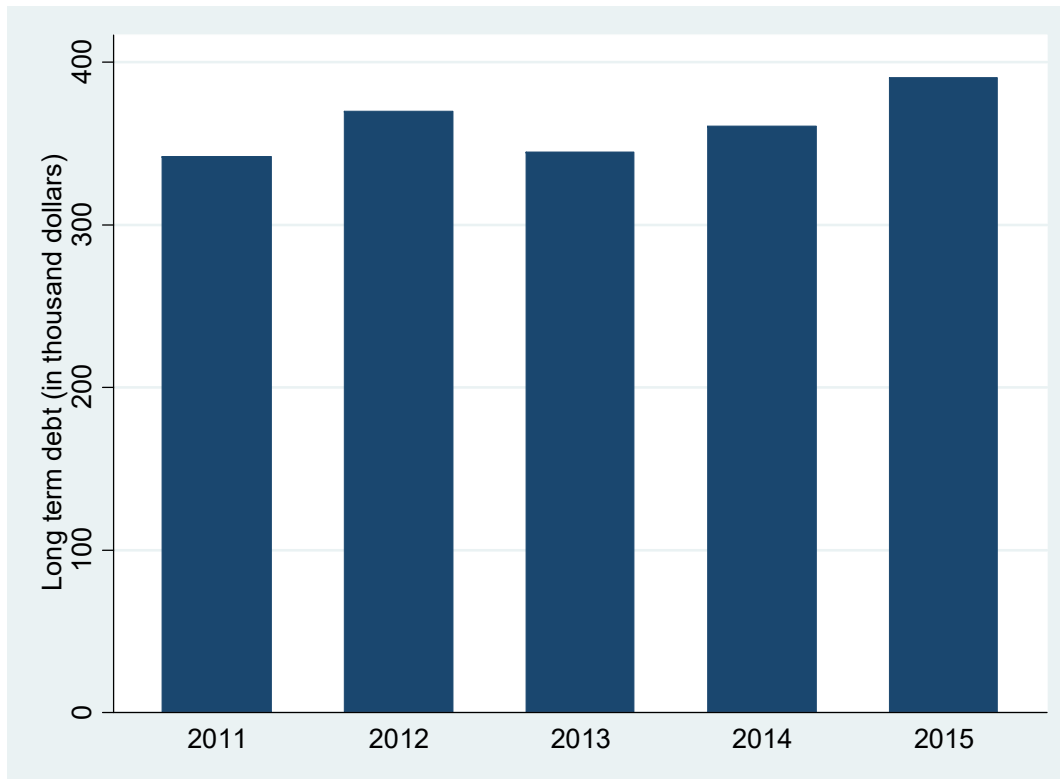
Graphs of Average Total Assets over Year



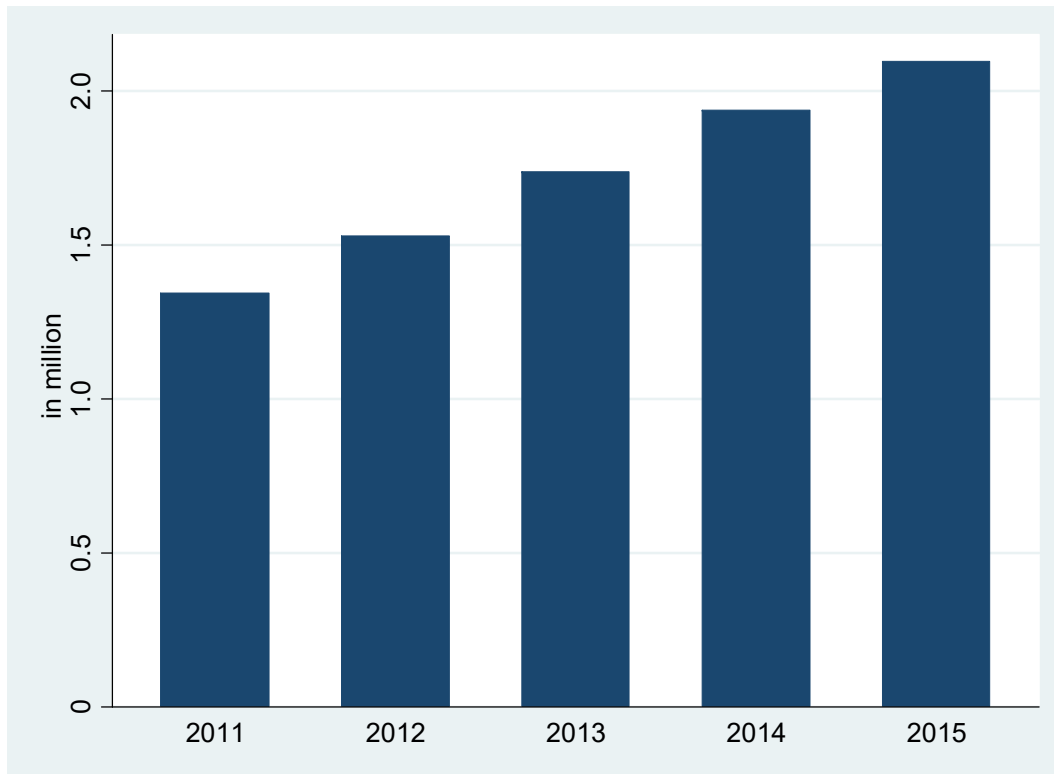
Graphs of Average A/R more than 30 days over Year



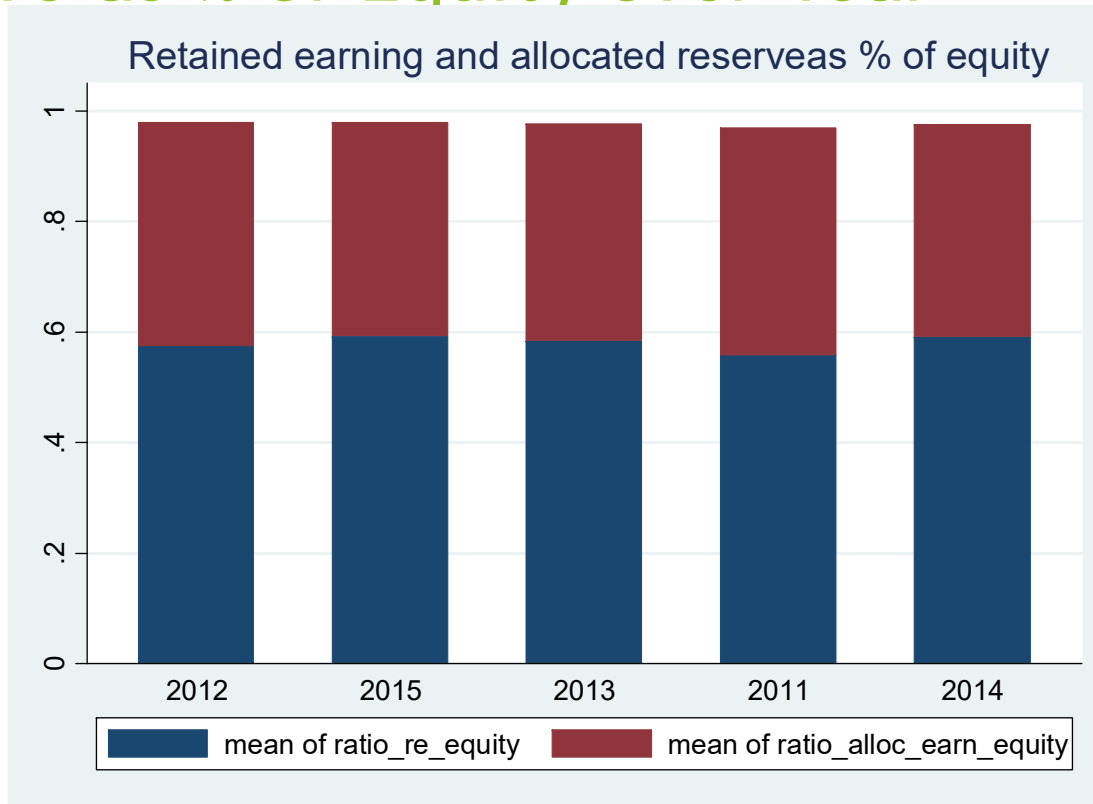
Graphs of Average Long Term Debt over Year



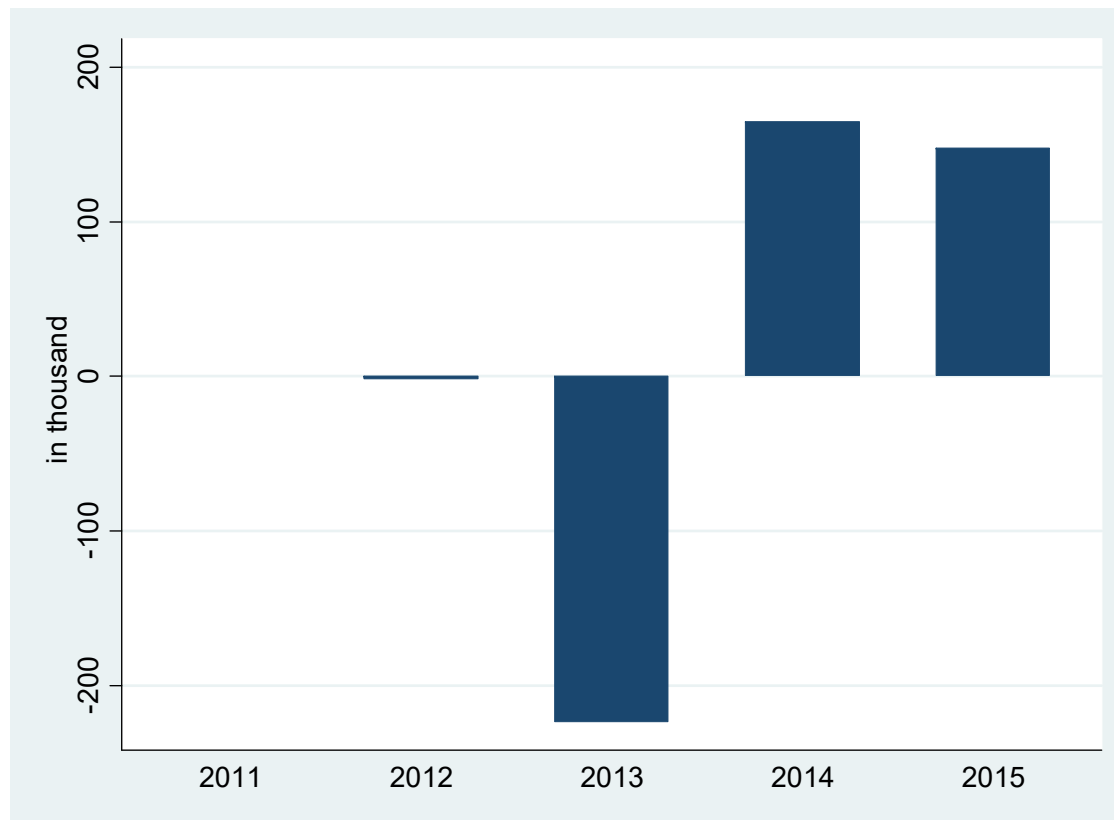
Graphs of Average Equity over Year



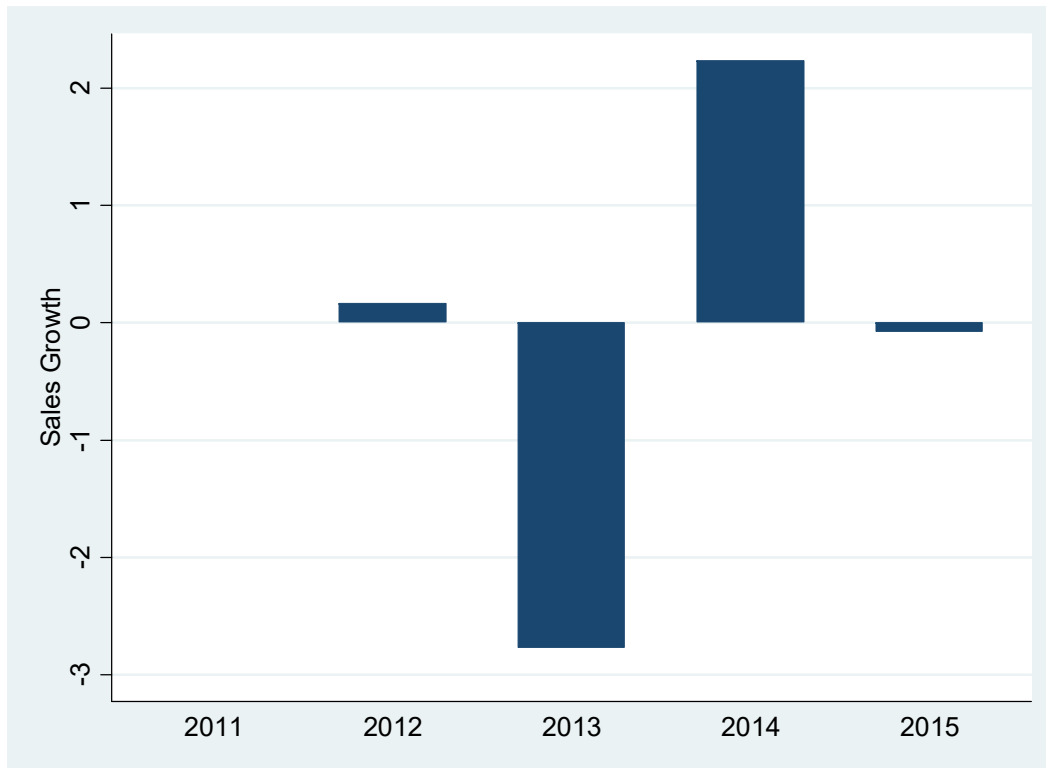
Average Retained Earning and Allocated Reserve as % of Equity over Year



Average Total Assets Growth over Year



Average Sales Growth Over Year



Empirical Methods

- ▶ Modeling Options:
 - ▶ GMM - captures dynamic structure and rids of dynamic panel bias, most common
 - ▶ Propensity Score Matching
- ▶ Proxies for capital constraints
 - ▶ Current debt, long term debt and allocated reserve(GMM)
 - ▶ A/R more than 30 days (PS matching treatment 1)
 - ▶ Long term debt financing (PS matching treatment 2)

Empirical Method (II)

► GMM model:

►
$$\log(\text{assets growth})_{it} = \alpha_i + \lambda_t \text{year dummies}_t +$$
$$\beta_1 \log(\text{total assets})_{it-1} +$$
$$\beta_2 \log(\text{long term debt})_{it-1} +$$
$$\beta_3 \log(\text{short term debt})_{it-1} +$$
$$\beta_4 \log(\text{allocated reserve})_{it-1} +$$
$$\beta_5 \log(\text{capital_ex})_{it-1} + \beta_6 \log(\text{cashflow})_{it-1} +$$
$$\beta_7 \left(\frac{\text{profit}}{\text{total assets}} \right)_{it-1}$$

Empirical Result: GMM

<i>Independent Variable</i>	<i>Parameters (Dependent Assets growth_{it})</i>
<i>Size_{it-1}</i>	-0.129*** (0.028)
<i>Ln(Long term debt)_{it-1}</i>	-0.017* (0.009)
<i>Ln(Short term debt)_{it-1}</i>	-0.0726*** (0.0136)
<i>Ln(Allocated Reserve)_{it-1}</i>	0.031*** (0.008)
<i>Ln(Cashflow)_{it-1}</i>	0.129*** (0.016)
<i>Ln(Capital expenditure)_{it-1}</i>	0.043*** (0.011)
<i>Ln(Profit/Assets)_{it-1}</i>	0.003*** (0.0009)



Propensity Score Matching

- ▶ 2015 data used for PS Matching.
- ▶ Treatments
 - ▶ Account receivables more than 30 days.
 - ▶ With or without Long term debt.
- ▶ Outcome: Sales growth
- ▶ PS Matching ATT (average treatment effects for those treated)
- ▶ $E(Y^T | D = 1, p(X_i)) - E(Y^T | D = 0, p(X_i))$

PS Matching Counterfactual Framework

The Propensity Score Matching Counterfactual Framework
Outcome: Sales growth

Groups
Treatment Group
D=1

$Y(1|D=1)$

$Y(0|D=0)$

Observable
 $E(Y(1|D=1))$

Counterfactual
 $E(Y(0|D=1))$

Control Group
D=0

Counterfactual
 $E(Y(1|D=0))$

Observable
 $E(Y(0|D=0))$

Differences

ATT
Average treatment effects for
treated

ATU
Average treatment effects for
untreated

Propensity Score Matching Stage I

Covariates

A/R more than 30 days

W/ or W/O Long Term debt

Ln(total_assets)	0.327 (0.085)	0.704 (0.349)
ST_pay_growth	0.001 (0.002)	0.006 (0.003)
Quick_ratio	0.23 (0.194)	-0.653 (0.230)
Profits/Total_assets	-0.023 (0.019)	
Roe	-0.019 (0.166)	
Ln(Cash flow)		-0.062 (0.376)
ROA		-0.006 (0.125)

PS Matching Stage II Results

PS Matching Results (1)						
Treatment : A/R more than 30 days						
Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
Sales Growth	ATT	-0.1405	0.0005	-0.1409	0.0606	-2.33
PS Matching Results (2)						
Treatment : With or Without Long term debt						
Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
Sales Growth	ATT	-0.1031	0.0116	-0.1147	0.0667	-1.72

Conclusion (I)-GMM

- ▶ In GMM estimation: the parameters of long term debt, short term debt and allocated reserve are all significant at 1% level
- ▶ Long term debt, short term debt and allocated reserve have impact on cooperative asset growth
- ▶ There exists a inverse relationship between long term debt and asset growth, and between short term debt and asset growth
- ▶ There is a positive relationship between allocated reserve and cooperative asset growth

Conclusion (II)-Propensity Score Matching

- ▶ Propensity score matching shows long term debt has negative impact on sales growth - solvency critical to agricultural cooperative growth.
- ▶ A/R more than 30 days also have a negative impact on sales growth, indicating that A/R is a big issue for capital constrained agricultural cooperatives.



Conclusions (III)-Propensity Score Matching

- ▶ A/R management
 - ▶ is important in times of financial stress
 - ▶ requires day to day payment for co-ops to maintain routine operations
 - ▶ High A/R or distant maturity date, hurts co-ops sales growth
- ▶ Long term debt is a source of external financing but co-ops need to be able to meet debt obligations to maintain growth otherwise, LTD hurts co-ops sales growth

Thank You !



Descriptive Statistics for Variables Used

	Mean	25% precentile	Median	75% percentile	S.D
Sales Growth	-10%	-11.5%	-2.90%	11%	48
Investment (in thousand dollar)	8381	1093	3022	8869	14900
Cashflow/Total assets	0.333	0.231	0.314	0.403	0.161
Size (in thousand dollar)	40200	6801.421	16400	43900	63900
Debt ratio	0.483	0.345	0.485	0.621	0.197
LTD (in thousand dollar)	3609	0	630	2998	9802
A/R (in thousand dollar)	5994	733	2086	5944	11400