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**Financing Agriculture and Rural America:
Issues of Policy, Structure and Technical Change**
Proceedings of the NC-221 Committee Annual Meeting
Denver, Colorado
October 7-8, 2002

Matthew A. Diersen, Editor
Econ Pamphlet 2003-1
June 2003

Department of Economics
South Dakota State University
Brookings, South Dakota

The Farm Sector Balance Sheet: A Partitioning of Operator, Landlord, and Contractor Contributions

Jim Ryan

**NC-221 Annual Meeting
CoBank, Greenwood Village, CO
October 8, 2002**

Participants in a Changing Farm Sector

A Variety of Resource Owners Contribute

Risk Bearers

- **Bear Market, Production, and/or Financial Risk**
 - **Farm operator households**
 - **Other farm households**
 - **Nonfamily farm corporations, estates**
 - **Contractors**

Stakeholders

- **Do not bear Risk**
 - **Hired labor**
 - **Lenders**
 - **Landlords**
-
-

Income Returns to Participants

Risk Bearers => Residual Income Recipients:

- Net Farm Income, Net Cash Income
 - Farm operator households
 - Other farm households
 - Nonfamily farm corporations, estates
 - Contractors

Stakeholders => Fixed Income Recipients:

- Expenses in computing Net Farm/Cash Income
 - Hired labor --> Wages
 - Lenders --> Interest
 - Landlords--> Rent

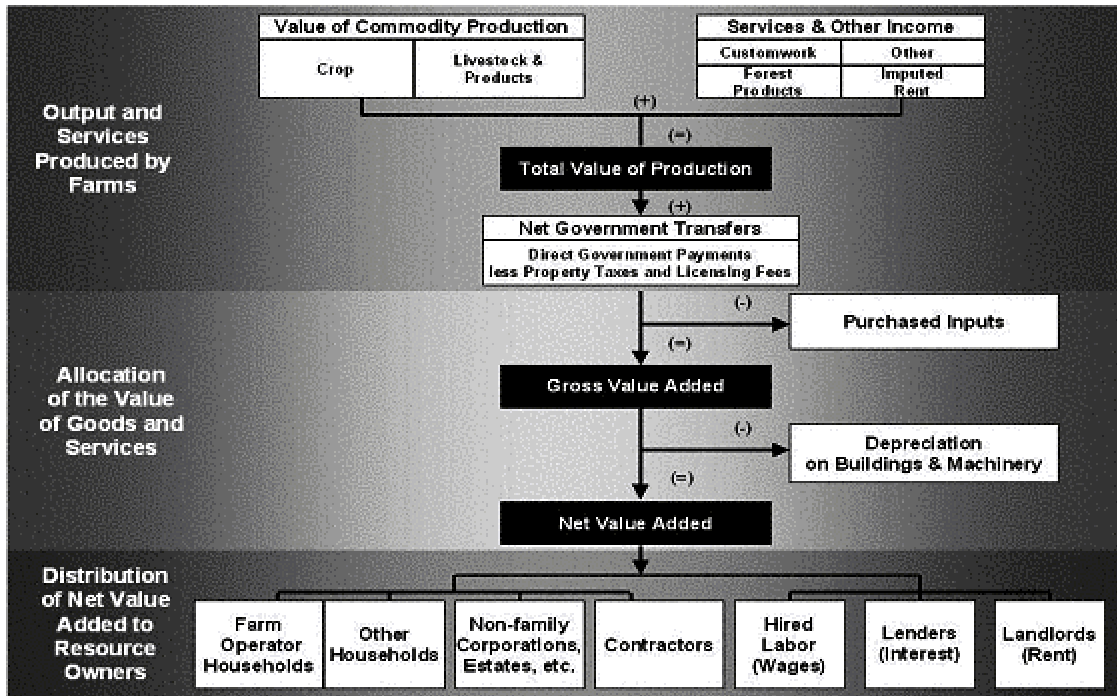
A “New” Approach to Net Farm Income

Value Added Approach Alters Presentation

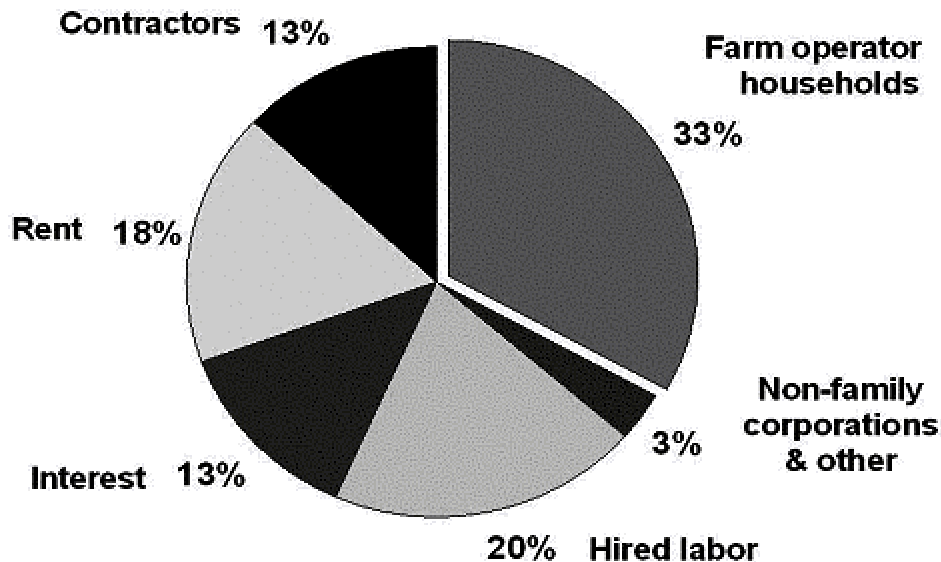
Net Farm Income is still a component

- More consistent with NIPA and OECD
 - Identifies ag contribution to economy
- Greater detail
 - Identifies transactions with other sectors
 - Identifies returns to stakeholders
 - Identifies returns to risk-bearers
- Net farm income is residual

Farm Sector's Contribution to the National Economy



Distribution of Value Added to the National Economy, 2001



Source: USDA, Agricultural Resource Management Study, 2001

Concern with Sector Balance Sheet?

Relationship Between Usual Income Statement Measures and Balance Sheet?

Net Farm Income, Net Cash Income

- Measure returns to risk-bearers
 - Operators, contractors, corps, other households
 - Returns to landlords, lenders are expenses

Farm Sector Balance Sheet

- Includes assets/debt regardless of ownership
 - Assets owned by operators, landlords, others
 - Debt reported by lenders
 - Owed by operators, landlords, others

Partitioning Farm Sector Balance Sheet

Balance Sheet Splits Not Straightforward

- Sector Balance Sheet based on independent data
 - Landlord data from Ag Finance Surveys
 - Follow-on to selected Census
 - Farm Finance--1964, 1970, 1979
 - AELOS--1988 and 1999
 - ARMS => Operators estimate/Land value
 - Direct contractor data not available
 - Assets?
 - ARMS => Livestock under contract
 - Debt?

Farm Sector Balance Sheet

A Brief History

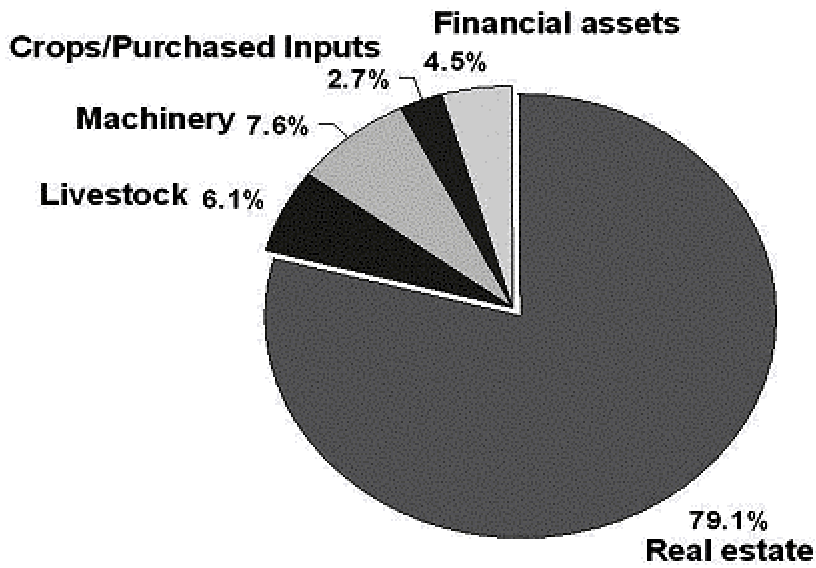
- Identifies assets, debt, equity
 - Constructed annually since 1945
 - Beginning in 1939
 - As of December 31 of each year
 - Prepared on annual basis--no quarterly

- Published Balance Sheet Series
 - For farm household from 1939-1992
 - Only for farm business since 1960
 - State level since 1960

Farm Sector Balance Sheet, 1997-2002F

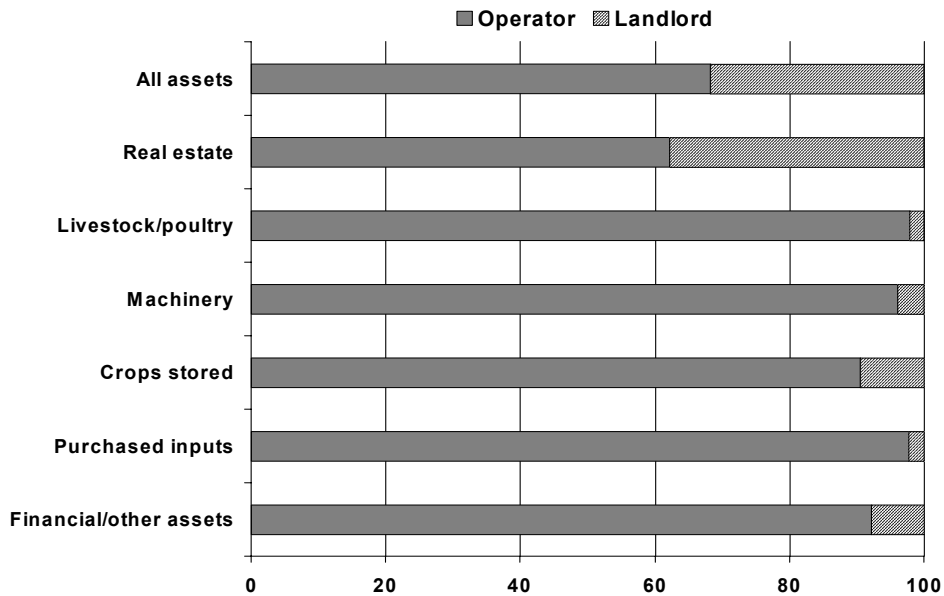
	1997	1998	1999	2000	2001F	2002F
			\$ billion			
Farm assets	1,053.0	1,065.3	1,140.9	1,188.3	1,230.4	1,239.5
Real estate	808.2	840.4	886.4	929.5	971.3	981.0
Livestock and poultry ^{1/}	67.1	63.4	73.2	76.8	76.3	75.9
Machinery and motor vehicles ^{2/}	90.4	91.7	92.3	92.0	92.5	93.6
Crops stored ^{3/}	32.7	29.9	28.5	27.9	28.5	28.4
Purchased inputs	4.9	5.0	4.0	4.9	4.6	4.6
Financial assets	49.7	54.8	56.6	57.1	57.1	56.0
Total farm debt ^{4/}	165.4	172.9	176.4	184.0	182.8	196.5
Real estate	85.4	89.6	94.2	97.5	103.1	104.6
Nonreal estate	80.1	83.2	82.2	86.5	89.8	91.9
Farm equity	887.6	912.4	964.4	1,004.3	1,037.5	1,042.9
			Percent			
Selected ratios:						
Debt-to-equity	18.6	18.9	18.3	18.3	18.6	18.8
Debt-to-asset	15.7	15.9	15.5	15.5	15.7	15.9

Farm Sector Assets, December 31, 2002F



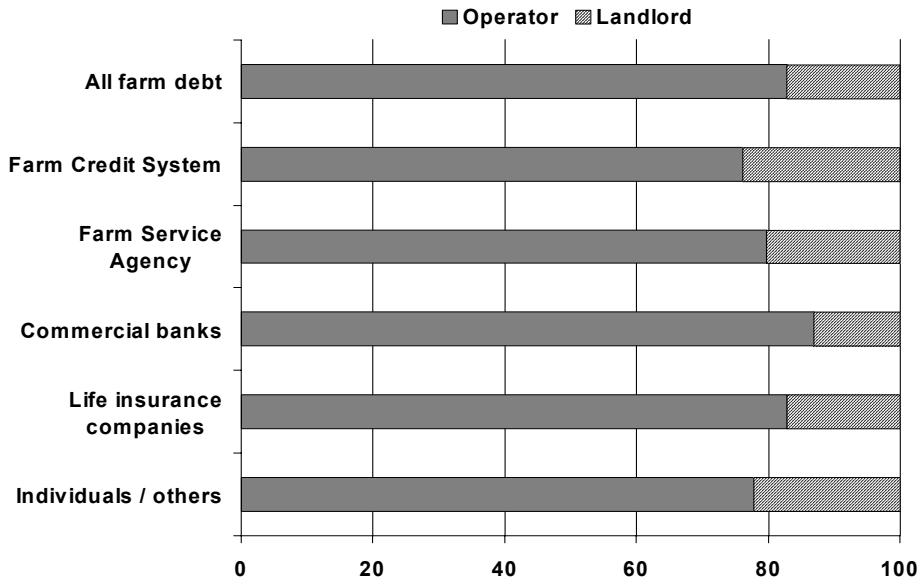
Source: USDA/ERS

Operator and Landlord Shares of Farm Assets, 1999



Source: Agricultural Economics and Land Ownership Survey, 1999

Operator and Landlord Shares of Farm Debt, 1999

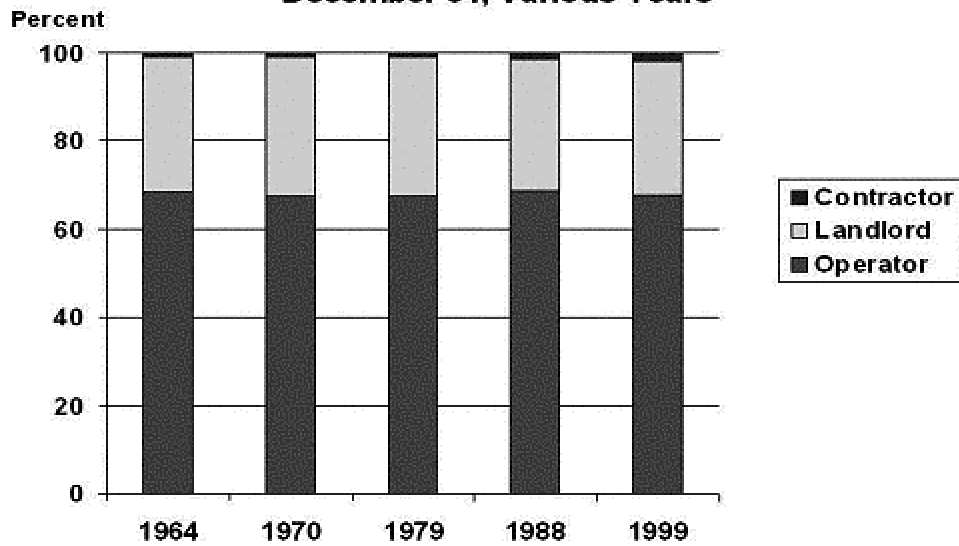


Source: Agricultural Economics and Land Ownership Survey, 1999

Partitioned Farm Balance Sheet, 1999

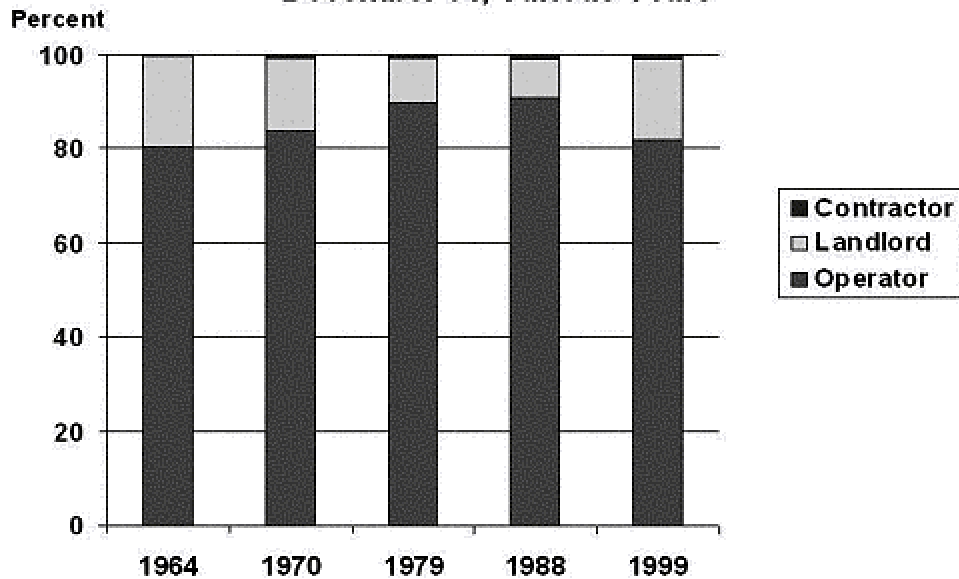
Item	Total	Operator	Landlord	Contractor
		\$ million		
Farm assets	1,140,784	771,419	346,927	22,437
Real estate	886,405	551,528	334,877	0
Livestock and poultry	73,177	50,142	1,083	21,953
Machinery/motor vehicles	92,329	88,682	3,647	0
Crops stored	28,273	25,323	2,667	283
Purchased inputs	4,026	3,823	201	201
Financial assets	56,574	52,121	4,452	0
Total farm debt	176,476	145,153	30,336	987
Real estate	94,226	75,569	18,657	0
Nonreal estate	82,250	69,584	11,680	987
Farm equity	964,308	626,266	316,591	21,450
		Percent		
Selected ratios:				
Debt-to-equity	18.3	23.2	9.6	4.6
Debt-to-asset	15.5	18.8	8.7	4.4

Distribution of Farm Business Assets, December 31, Various Years



Source: USDC/USDA, Census Surveys (Farm Finance and AELOS)

Distribution of Farm Business Debt, December 31, Various Years



Source: USDC/USDA, Census Surveys (Farm Finance and AELOS)

Summary

Adapting ERS Income Analyses to reflect impacts on agriculture's participants:

- **Improved data sources**
 - **AELOS**
 - **2002 Census**
 - **Agricultural Resource Management Survey**

 - **Enable Development of Estimates of Income and Other Measures of Financial Performance**
 - **Households**
 - **Businesses**
 - **Other Resource Providers**
-
-

Future Extensions

Benchmark Balance Sheet to Census Surveys:

- **Partition using Census data**
 - **Farm Finance--1964, 1970, 1979**
 - **AELOS--1988 and 1999**

Mover System Between Census Surveys:

- **Continuous data series, 1970-2002**

Prepare Partitioned State Balance Sheets:

- **Benchmark and Mover**
 - **State data series, 1970-2002**
-
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Slide 1

A BAYESIAN EXAMINATION OF FINANCIAL CONSTRAINTS AND FARM INVESTMENT

Chad Hart and Sergio H. Lence
Iowa State University

Slide 2

BACKGROUND

- Large literature exploring effect of financial constraints on firm investment
 - Seminal work by Fazzari, Hubbard, and Petersen (1988)
 - Recent review by Hubbard (1998)

Slide 3

Q MODEL OF (UNCONSTRAINED) INVESTMENT

$$*Inv./K = \alpha_0 + \alpha_1 Q + error*$$

Slide 4

Q MODEL OF FINANCIALLY CONSTRAINED INVESTMENT

$$*Inv./K = \alpha_{0G} + \alpha_{1G} Q*$$
$$*+ \alpha_{2G} Liquidity + error*$$

**G: Financial market imperfection
group**

EXAMPLE: Iowa, 1991-1998

Farm Type	Q	NCF	R ²
Low Equity	0.014 (0.065)	0.096 (0.014)	0.09
Middle Eq.	-0.019 (0.039)	0.1029 (0.0086)	0.24
High Equity	0.142 (0.063)	0.065 (0.018)	0.05

ISSUES

- **Ad-Hoc Sample Groups**
 - Theory provides no guidance to separate groups according to probability of facing financial market imperfections (“sample selection bias”)

ISSUES

- **Typically, firms separated into groups**
 - **But a firm’s probability of facing financial market imperfections may change from one year to the next.**

ADVOCATED SOLUTION

- **“Invert” typical procedure using Bayesian approach:**
 - **Estimate 2 alternative investment regression models (“constrained” and “unconstrained”), letting each firm-year observation fall into either model**
 - **Calculate probability that each firm-year observation will fall into either model**
 - **Analyze characteristics of observations more likely to be “constrained” as opposed to “unconstrained”**

ALTERNATIVE MODELS

Financially Unconstrained:

$$Inv./K = \alpha_{0U} + \alpha_{1U} Q + error_U$$

Financially Constrained:

$$Inv./K = \alpha_{0C} + \alpha_{1C} Q + \alpha_{2C} CA/K + error_C$$

ALTERNATIVE MODELS

- Each firm-year observation assigned 50% *prior* probability of being unconstrained or constrained.

DATA

- **Balanced panel of 366 Iowa farms from 1991 through 1998 (2196 farm-year observations).**

RESULTS

Financially Unconstrained:

$$\mathbf{Inv./K = 0.308 + 0.287 Q + error_U}$$

(0.252, 0.381) (0.146, 0.827)

$$\mathbf{StDev(error_U) = 0.177}$$

(0.149, 0.236)

RESULTS

Financially Constrained:

$$Inv./K = -0.011 + 0.089 Q$$

(-0.024, 0.005) (0.022, 0.257)

$$+ 0.006 CA/K + error_C$$

(0.001, 0.011)

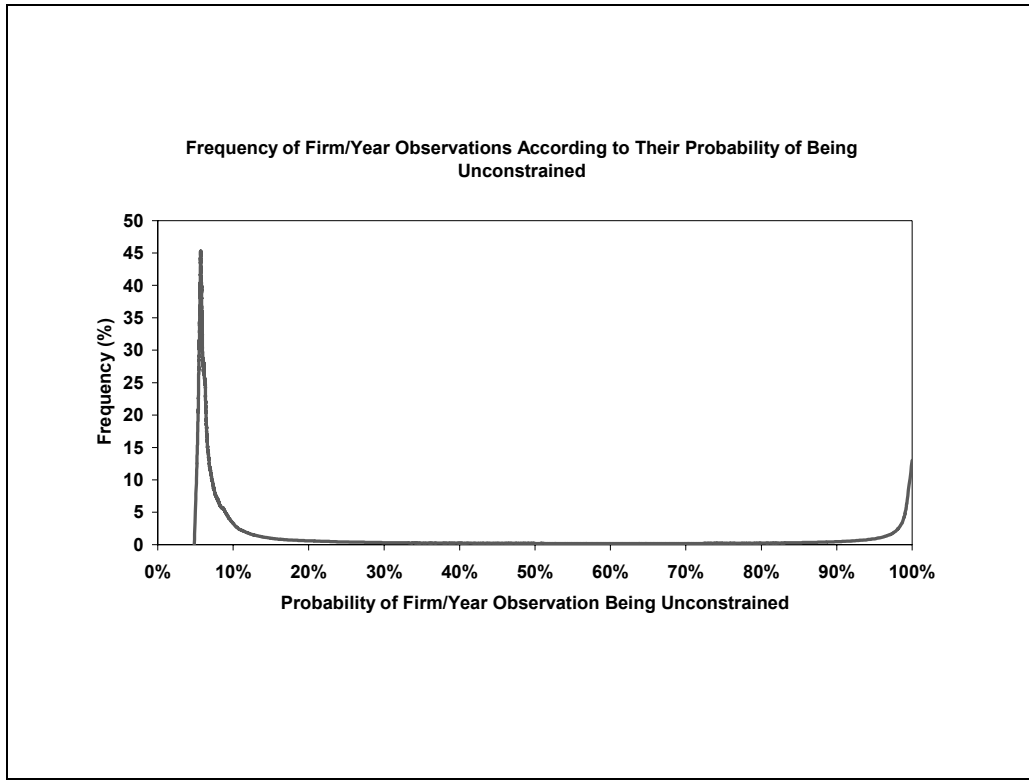
$$StDev(error_C) = 0.010$$

(0.008, 0.013)

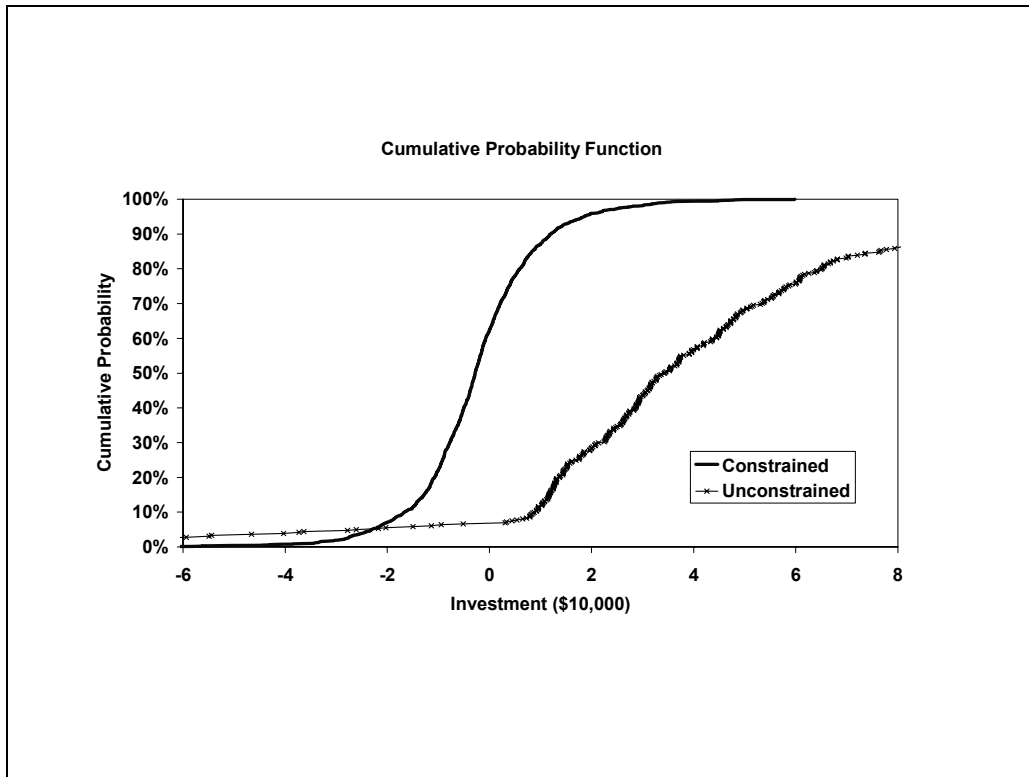
RESULTS

- **25.2% median posterior probability of being unconstrained**
- **74.8% median posterior probability of being constrained.**

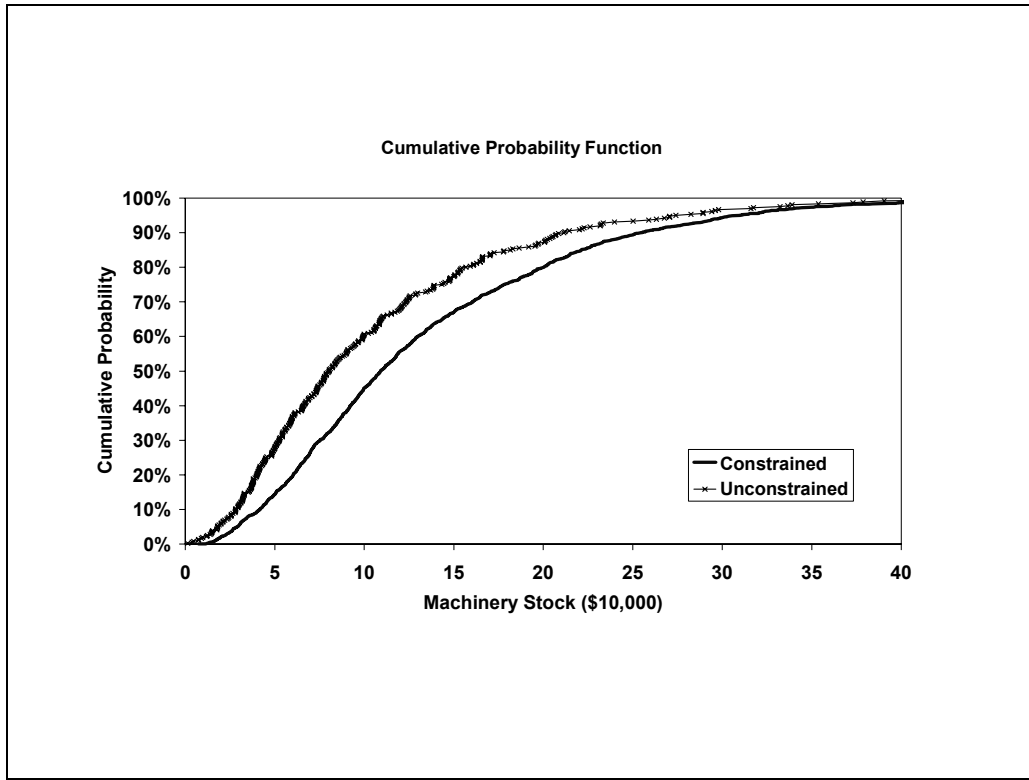
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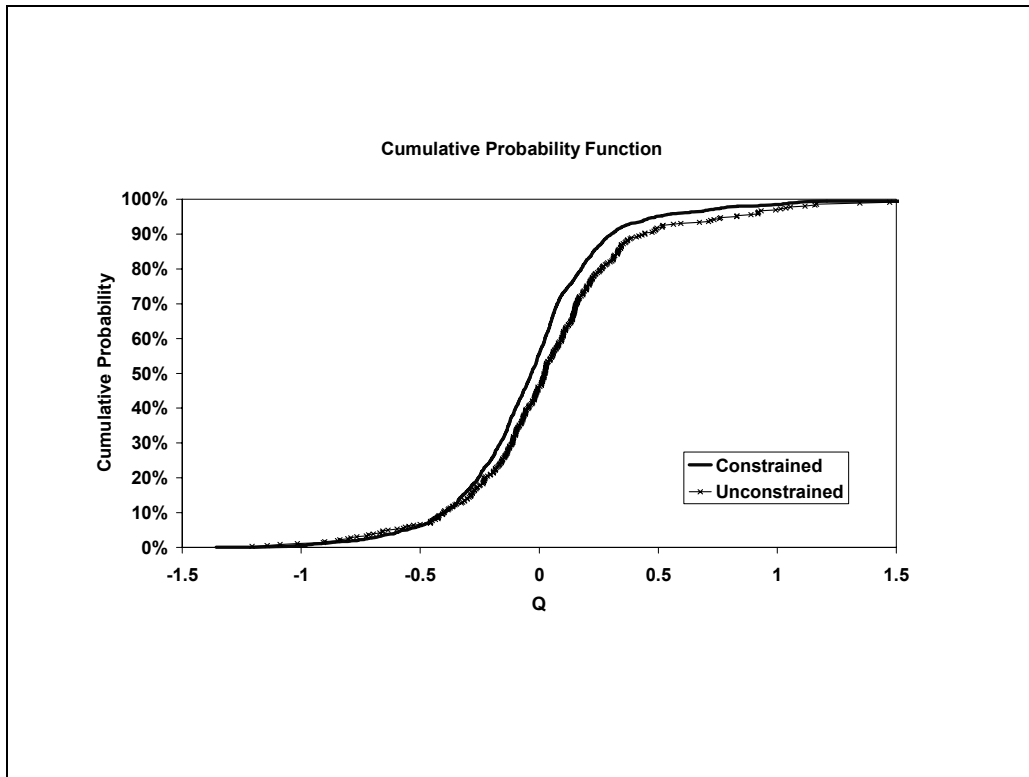
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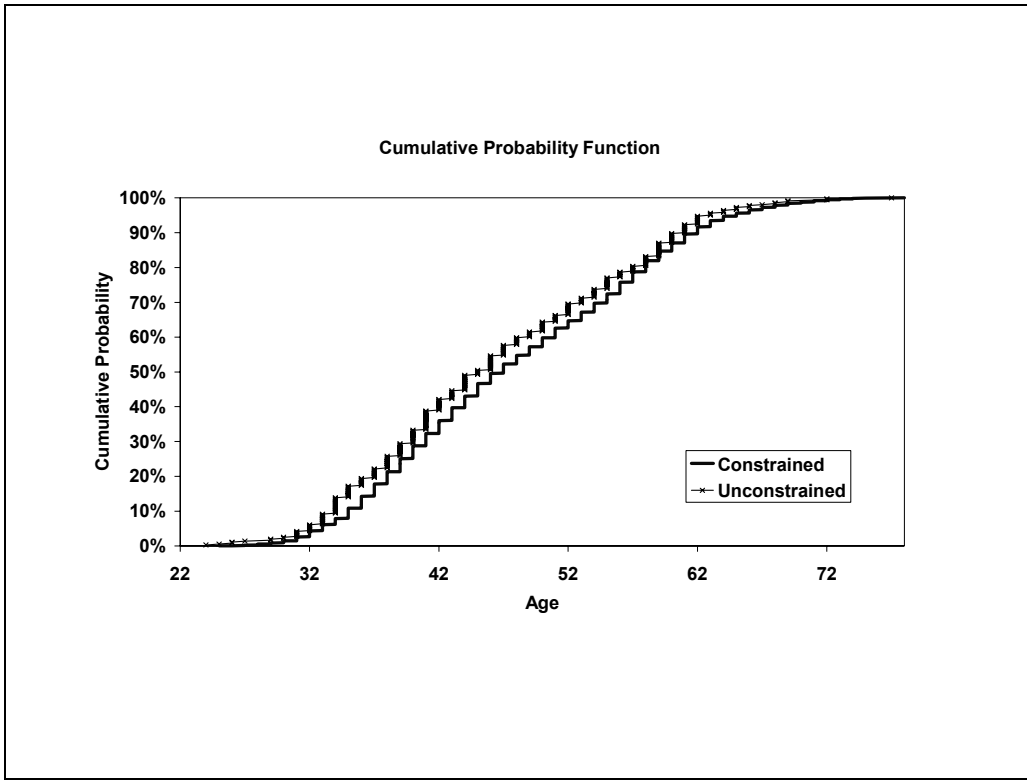
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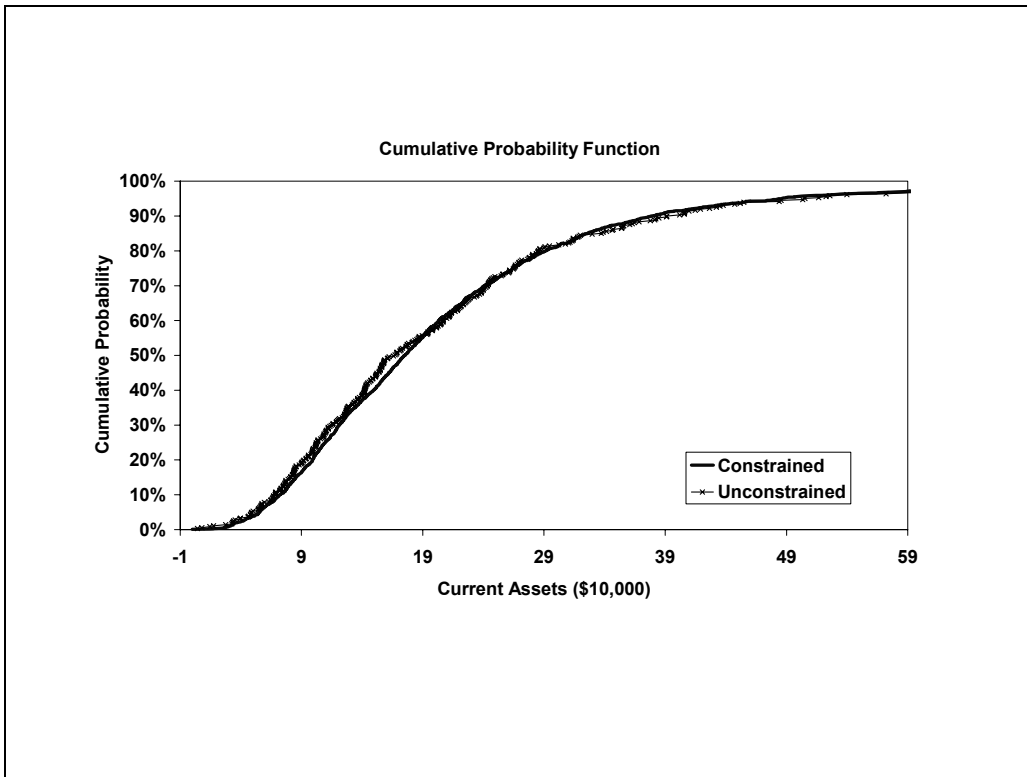
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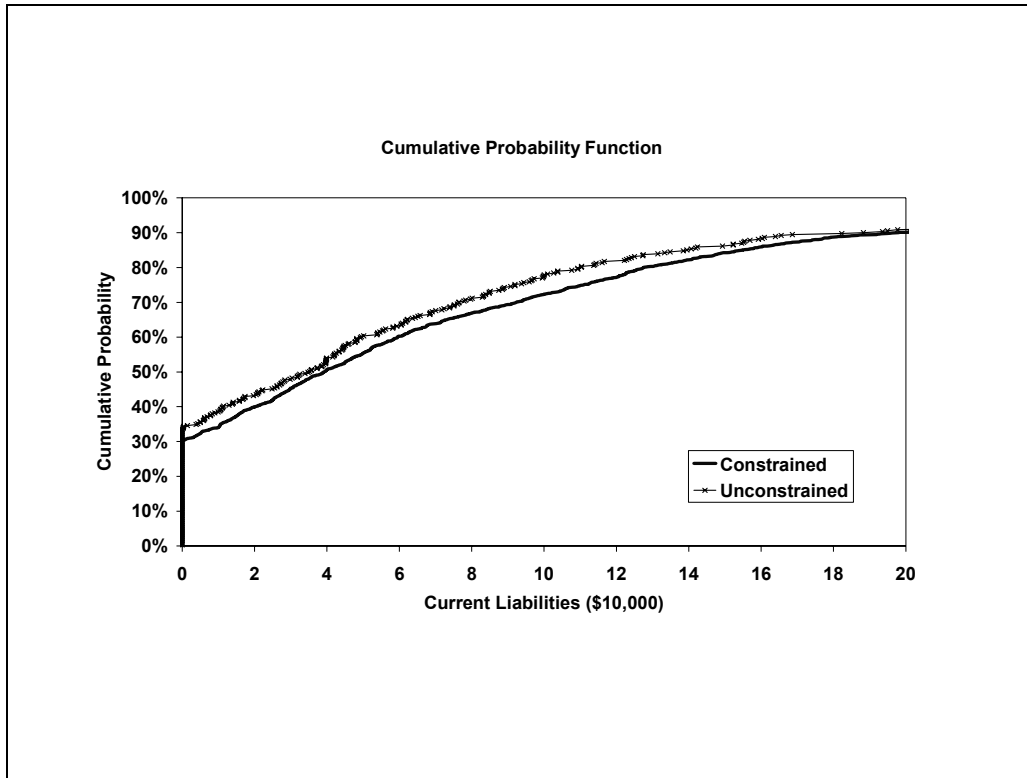
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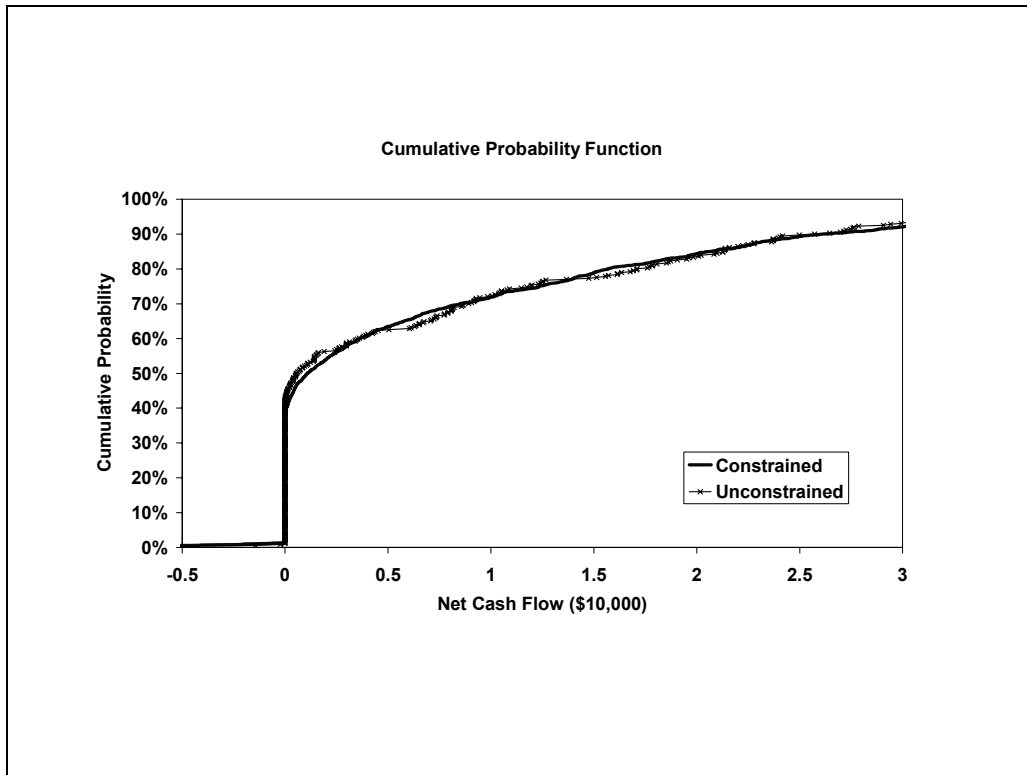
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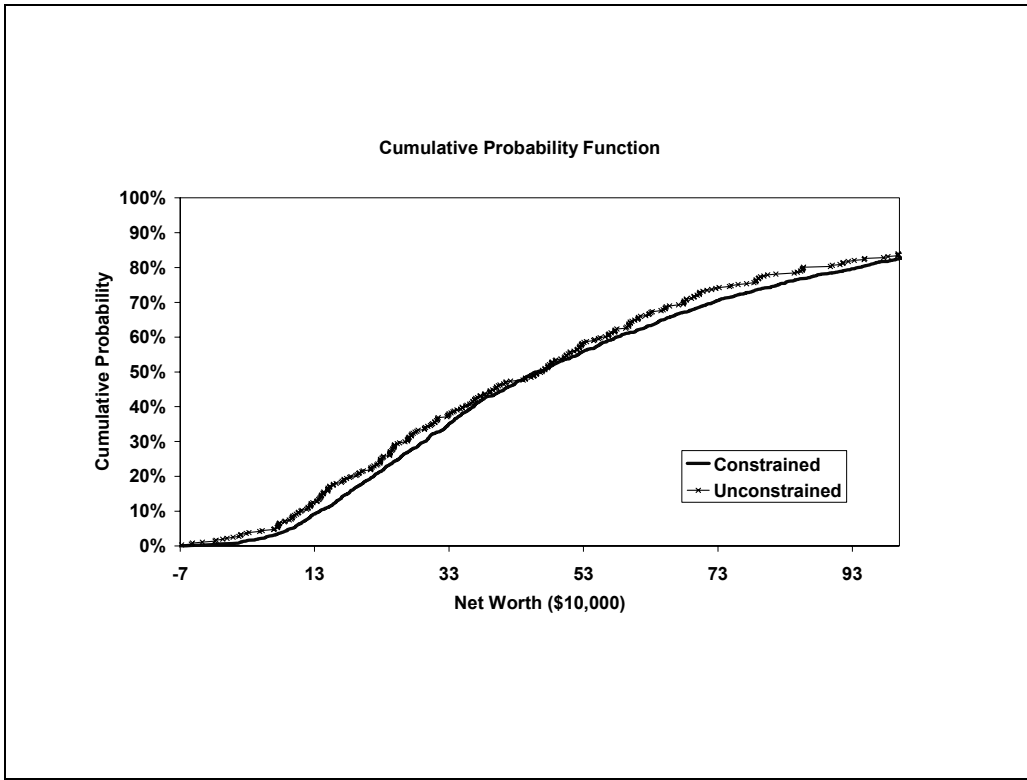
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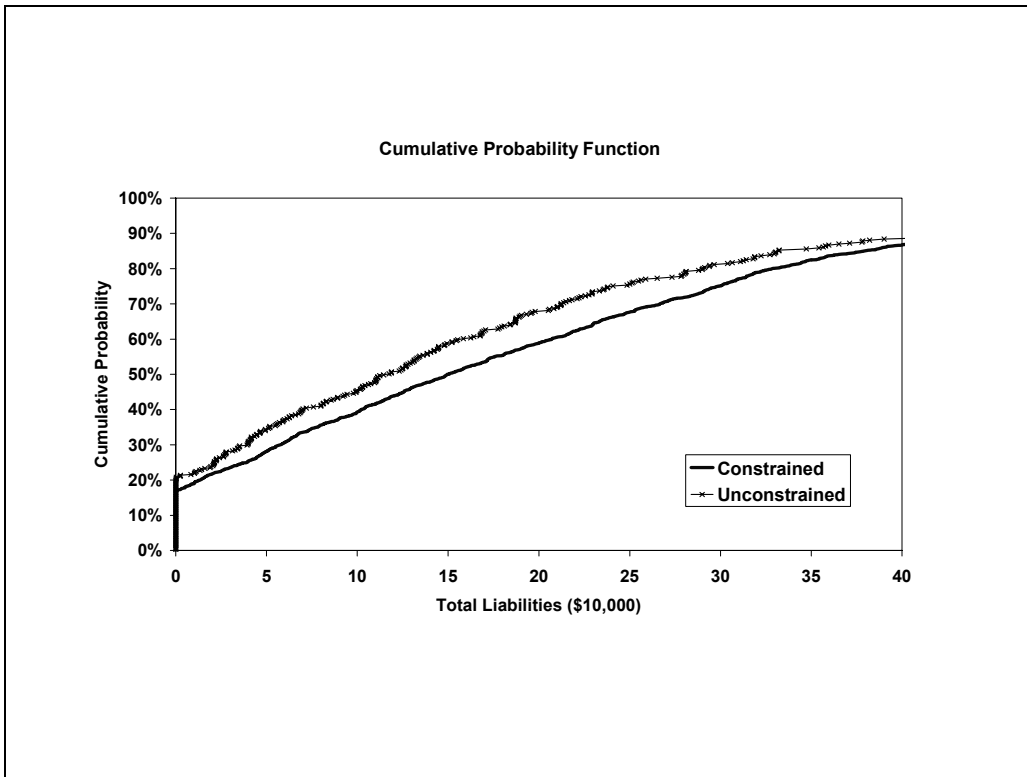
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Slide 23



Slide 24



CONCLUSIONS

- Bayesian analysis can be used to overcome sample selection problems
- Analysis of sample of Iowa farms over 10 years reveals that 75% of farm/year observations had some evidence of liquidity affecting investment (for a 50% prior)

CONCLUSIONS

- Firm/year observations more likely to be constrained display different:
 - Investment
 - Machinery
 - Q
 - Age?
 - Current Liabilities
 - Total Liabilities

But similar:

- CA
- NCF