

Risk and Contracting in Agriculture

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The views expressed herein are my own, and not those of the Economic Research Service or the U.S. Department of Agriculture



Contracts Are Used Widely to Govern Agricultural Production in the US

- An effective tool of risk management for producers
- But contracts have other functions: they can speed the spread of innovation and ease access to credit
- They can also introduce new risks for producers



Contract Types in Our Surveys

- Marketing contract: agreement reached before harvest; sets pricing formula and outlet; producer owns commodity & makes production decisions
- Production contract: agreement reached before production commences; sets compensation formula and commitments for each side; contractor owns commodity and provides some inputs.



I'll Focus on Three Topics

- Traditional price and production risks, and the use of marketing contracts as one risk management tool
- Production contracts, primarily in livestock, and some emerging risks in hog and poultry contracting
- Contracts and the structure of agriculture
 - Production shifting to larger farms
 - Widens range of risk-management strategies
 - Does their financial structure create liquidity risks?



I Draw Heavily on ARMS Data

- Agricultural Resource Management Survey
 - USDA's primary source of farm finance information
 - Annual representative sample of farmers in 48 States
 - About 32,000 farms/22,000 useable records.
 - For contracts, finances, farm & operator attributes
- Other USDA sources for prices

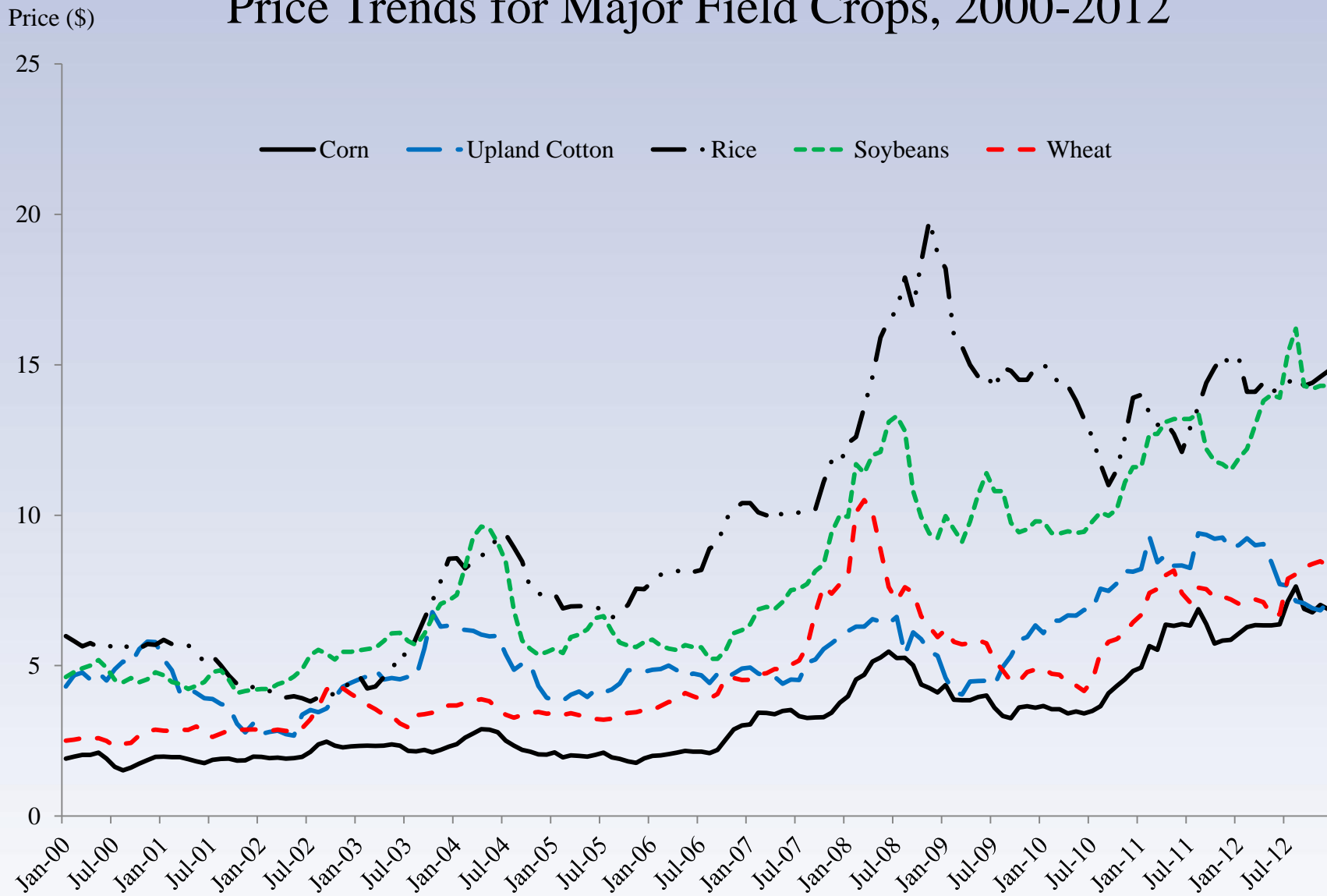


I. Commodity Price & Production Risks

- And the use of marketing contracts



Price Trends for Major Field Crops, 2000-2012

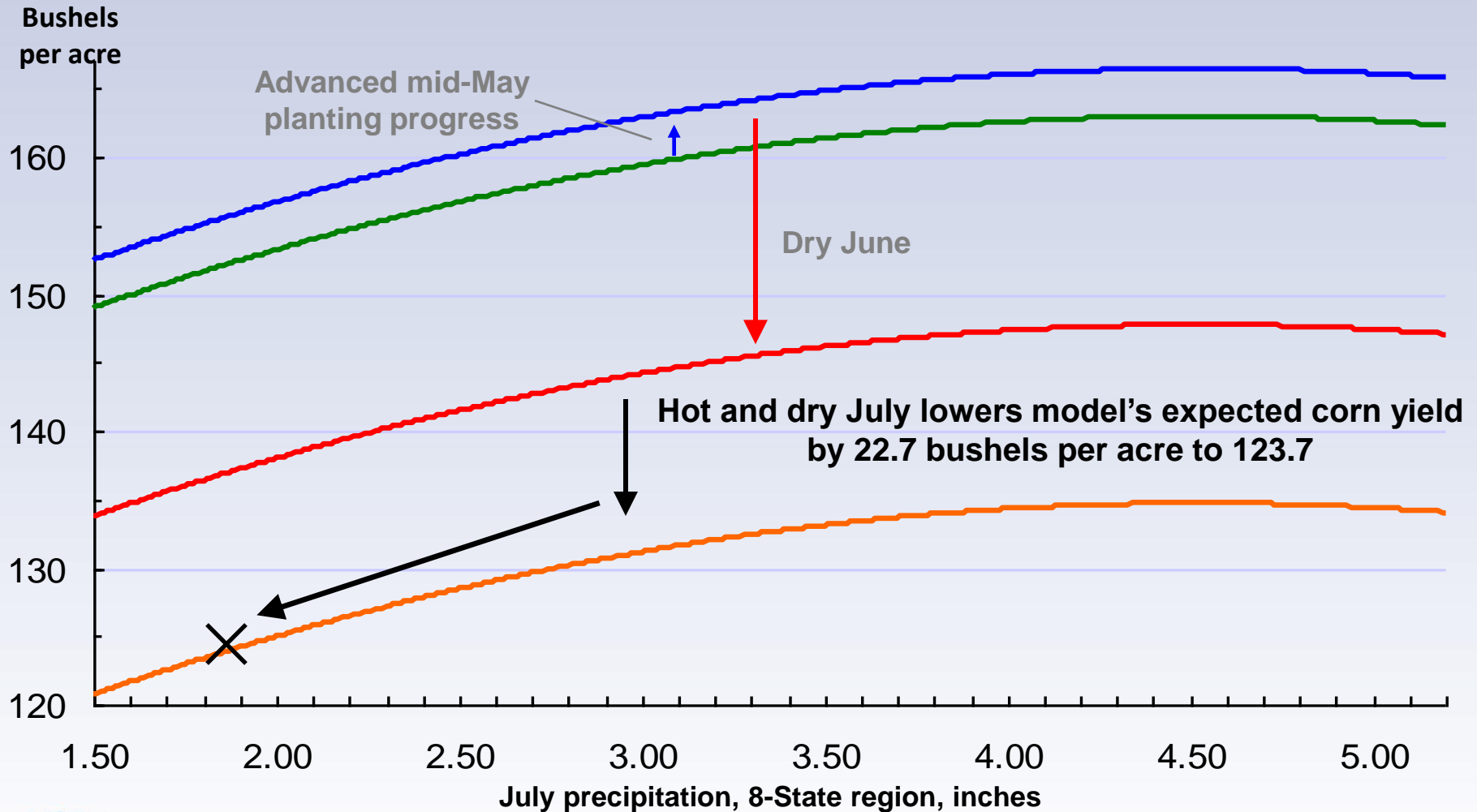


Source: USDA/NASS Monthly Prices Received. Prices are per bushel, except for cotton, which is per 10 pounds.



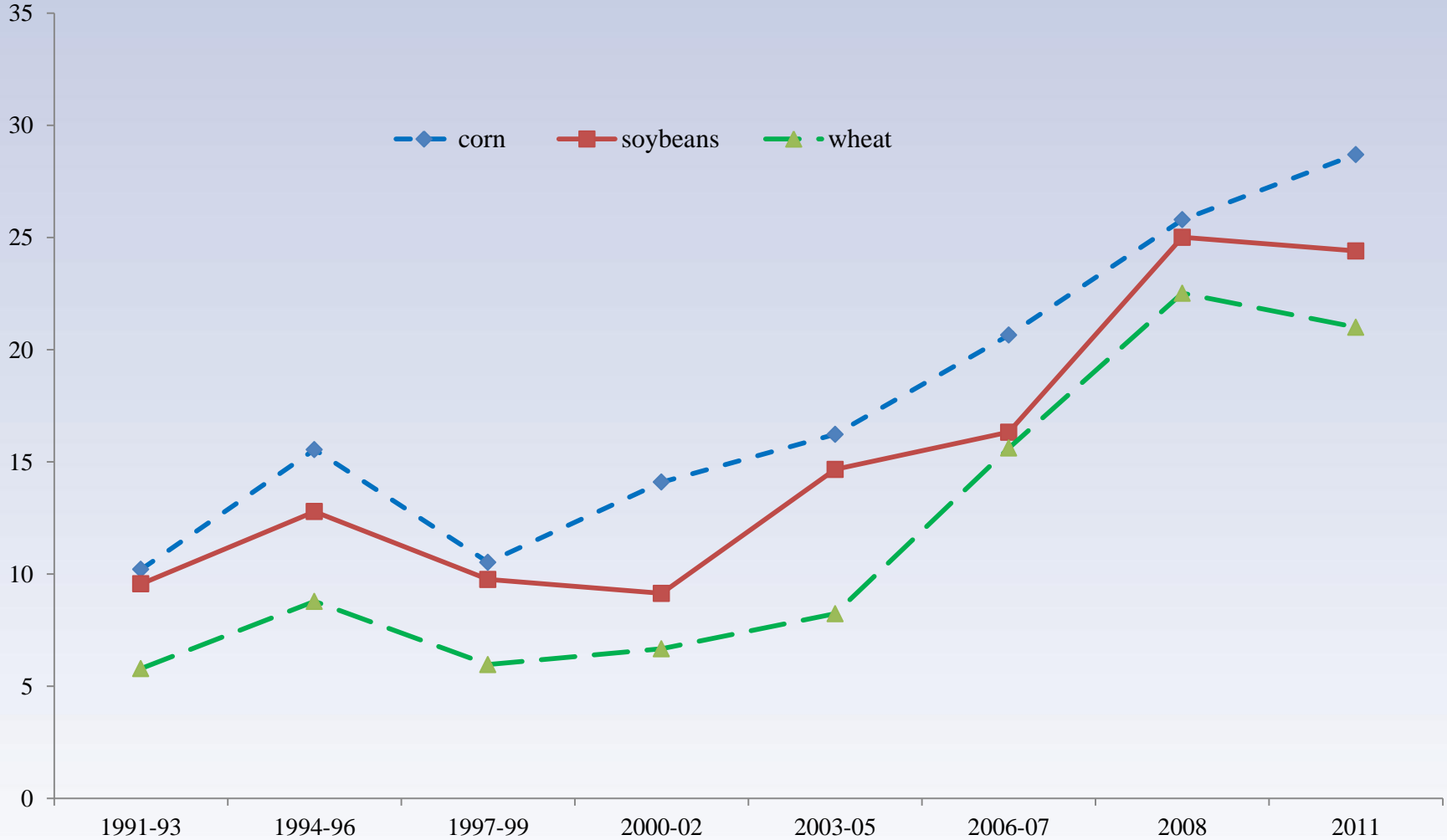
United States Department of Agriculture, Economic Research Service

Recent Production Risks: the 2012 Drought (an ERS model of the impacts on corn yield)



Shares of Corn, Soybeans, and Wheat Marketed Under Contract, 1991-2011

Percent of value of production



Source: USDA Farm Costs and Returns Survey (1991-1995); USDA Agricultural Resource Management Survey (1996-2011)



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What Do Marketing Contracts Do?

- Provide an outlet
- Secure payment for costly attributes
- Set a pricing formula, with some protection against price risks
- Can introduce a commitment risk



Contracting field crop farms are larger

Crop and Contract Status	Whole Farm Attributes			Share Under Contract	
	Farmland acres	Value of Production (\$)	Reference Crop Acres	Reference Crop	Other Crops
-Mean values-					
Corn					
Contract	911	690,148	409	53.6	40.7
Noncontract	545	338,795	208	0	4.7
Cotton					
Contract	1,593	1,271,321	669	81.6	56.9
Noncontract	1,276	812,944	413	0.0	16.3
Rice					
Contract	1,587	1,234,746	593	85.7	52.6
Noncontract	1,197	767,206	413	0.0	29.9
Soybeans					
Contract	920	652,975	380	56.3	43.1
Noncontract	513	320,672	196	0.0	5.3
Wheat					
Contract	468	872,068	468	59.7	45.9
Noncontract	271	484,596	271	0.0	11.0

Corn, soybean, & wheat producers contract part of the crop

Source: 2011 USDA Agricultural Resource Management Survey.



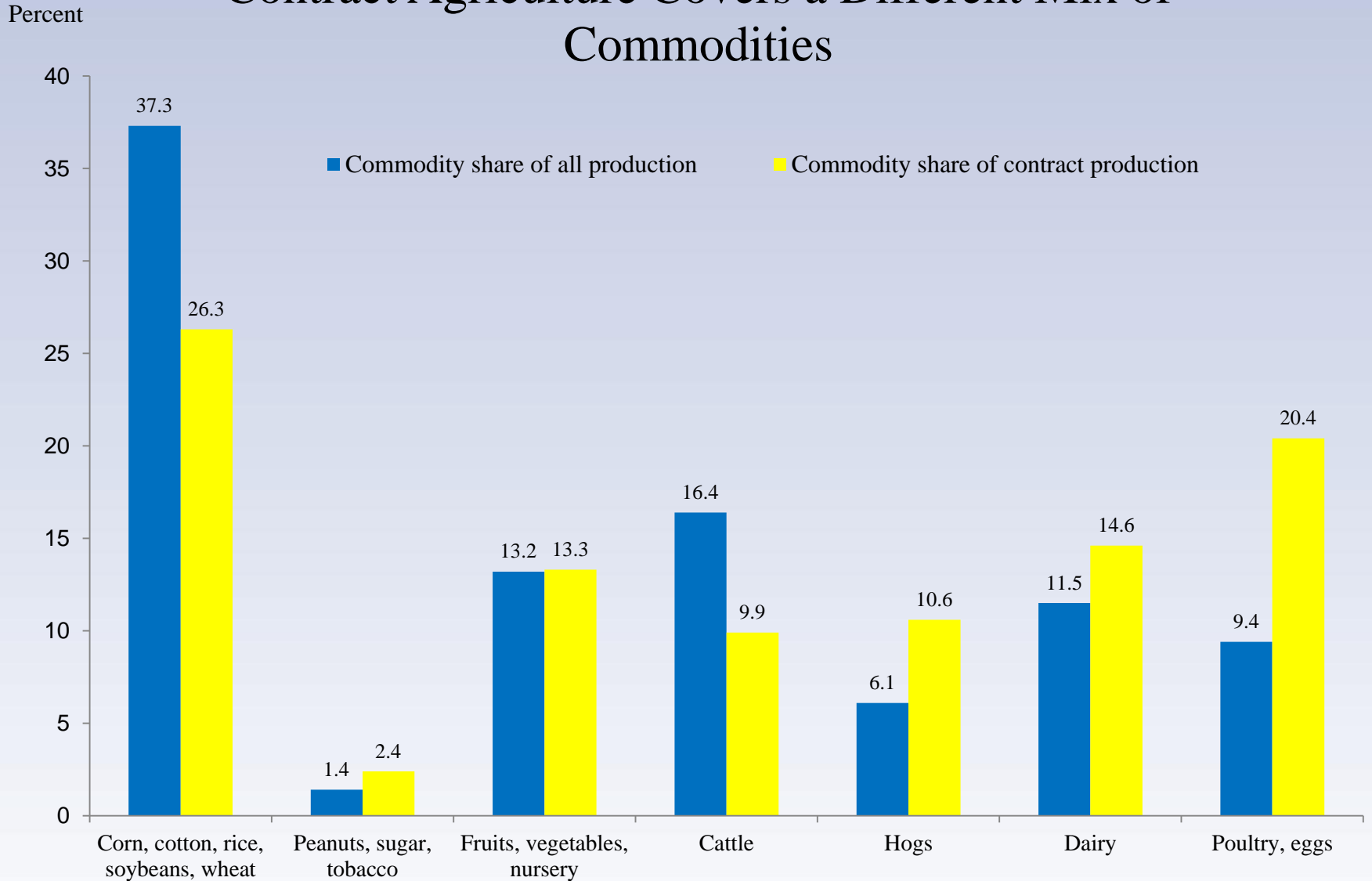
Contracting Farms Use Multiple Marketing Strategies

Commodity and Contract Status	Marketing and Risk Management Strategies					
	Options	Futures	On-farm Storage	Farmer- Owned Cooperative	Spot Markets Only	Forward- contract inputs
-Percent of Farms Using Strategy-						
Corn						
Contract	15.1	29.2	64.1	61.9	0.0	64.7
Noncontract	6.3	9.1	54.5	39.9	55.2	35.3
Soybeans						
Contract	13.8	28.5	63.2	54.8	0.0	63.8
Noncontract	7.1	9.1	51.1	43.1	52.6	30.6
Wheat						
Contract	13.3	29.2	56.9	55.1	0.0	52.8
Noncontract	6.6	11.3	48.7	42.9	51.1	30.7

“Spot markets only” are farms that do not use marketing contracts, options, futures, or farmer-owned cooperatives.
Source: USDA 2008 Agricultural Resource Management Survey, Version 1.



Contract Agriculture Covers a Different Mix of Commodities



Source: USDA 2011 Agricultural Resource Management Survey



II. What Do Production Contracts Do? (Hogs & poultry)

- Shift input and output price risks to integrators
 - And, can shift some common production risk
- Shift marketing tasks/efforts to integrators
- Allow for ↑ system throughput, efficiency
- Introduce some new risks for growers
 - “League effects”
 - Commitment/placement risks

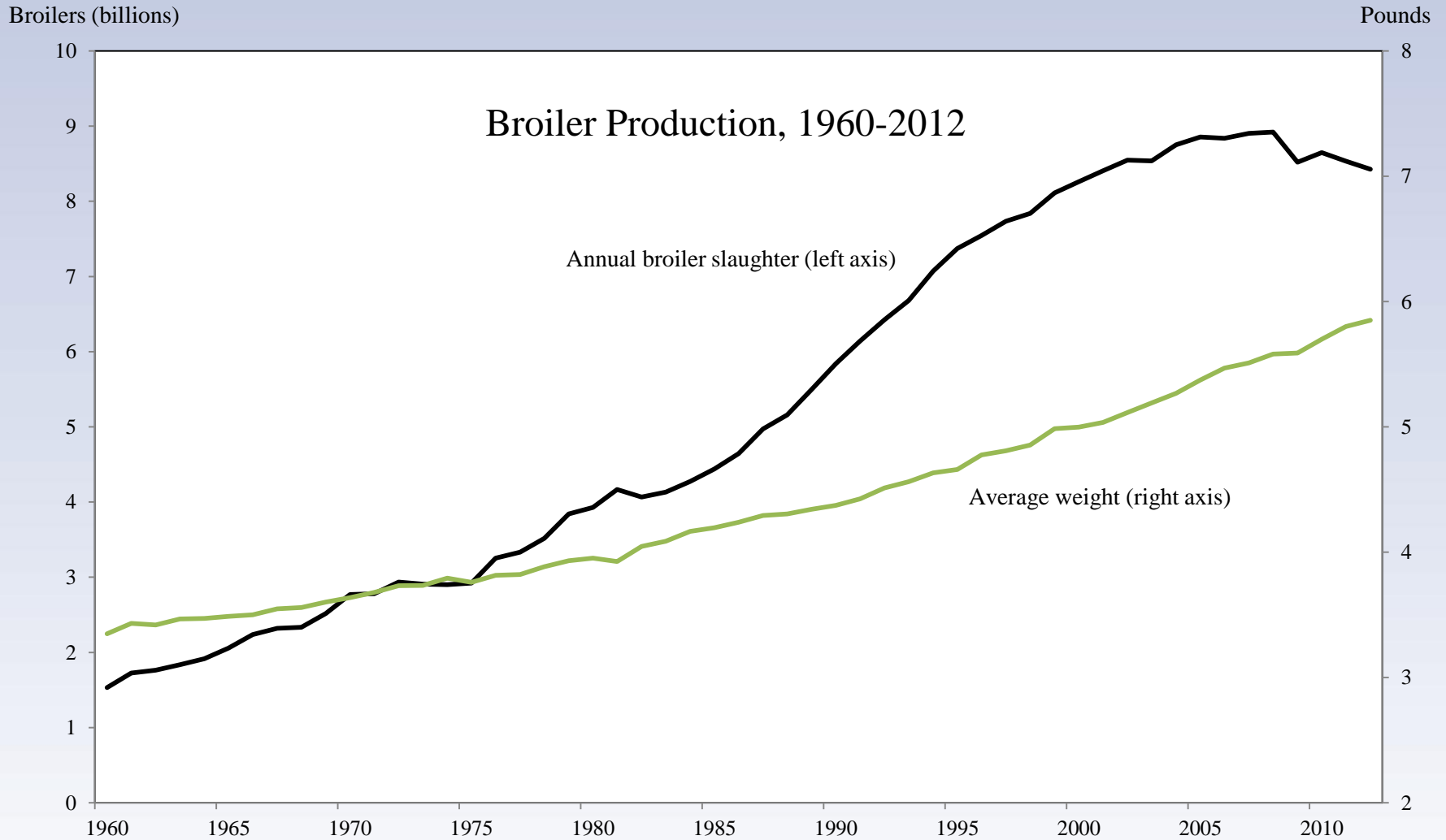


Commitment Risks

- Contract growers make significant housing investments (commitment from grower)
- Financial performance, and willingness to expand, depends on steady flows of chick or pig placements (commitment from integrator)
- Are there emerging risks for growers and integrators?



Will Slowing Growth Strain Placements & Grower Relations?



Source: USDA National Agricultural Statistics Service



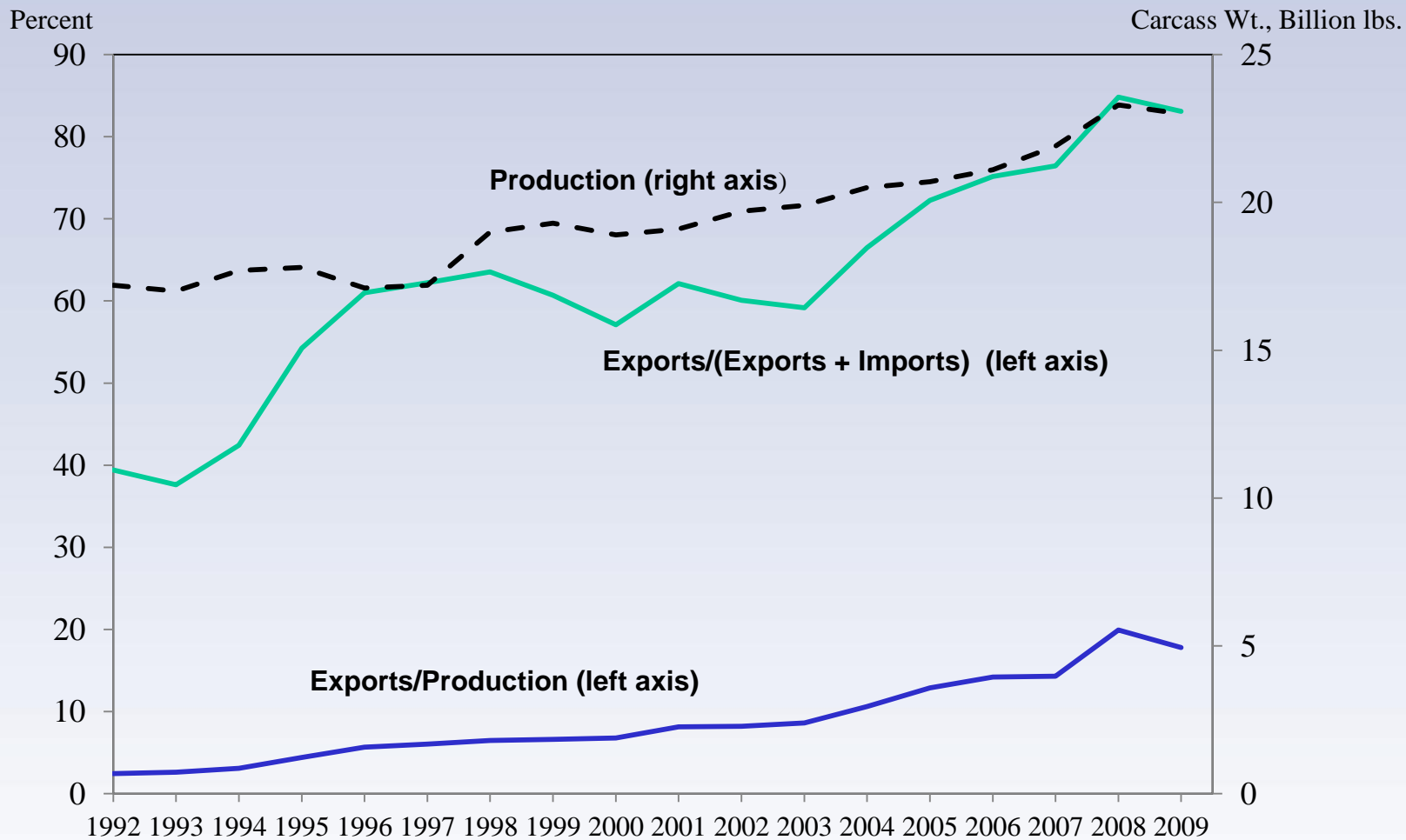
Steady Growth Eased Risks for Broiler Growers

- Assured of flock placement, capacity utilization
- Integrator expansions & new complexes meant more opportunities to shift buyers
- Does slow/declining production growth raise risks of investing in new facilities?
- One thing we do see is contract incentives targeted to new growers



Hogs: Growing Production Driven by Trade & Competitiveness

U.S. pork exports increased substantially from 1992 to 2009, suggesting that increased productivity enhanced the competitive position of U.S. producers.

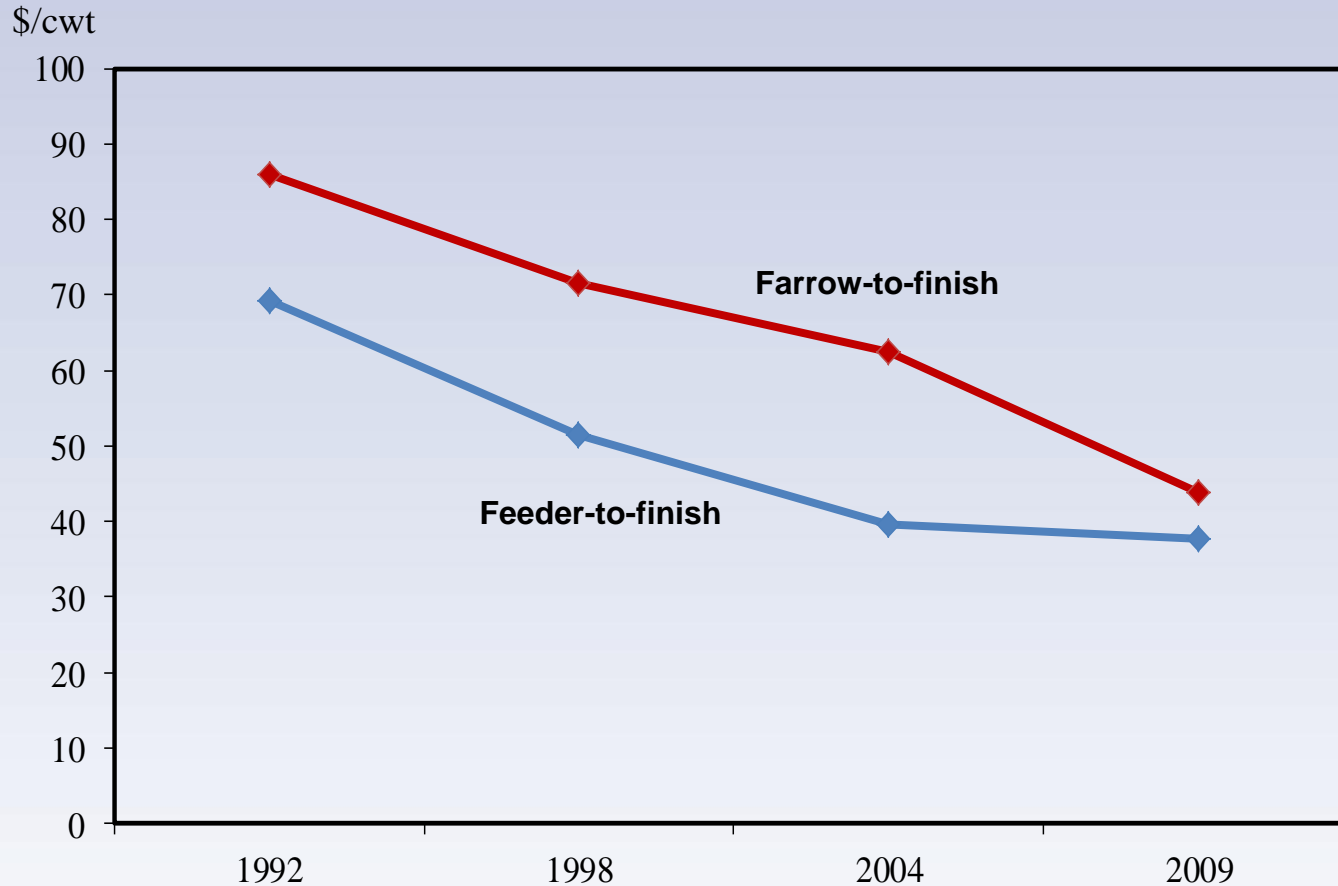


Source: USDA Economic Research calculations using data from the U.S. Department of Commerce, Bureau of the Census.



In turn, high productivity growth drove competitiveness

Real hog production costs per cwt (2009 dollars)



Source: 1992 Farm Costs and Returns Survey; 1998, 2004, and 2009 Agricultural Resource Management Survey.



Is that Era Over?

- Scale economies appear largely realized
- Innovations have been widely diffused
- Productivity growth has slowed sharply

- Will prices now largely reflect feed costs?
 - There was a clear wedge in 1990's and 2000's
- Will that reduce international competitiveness?
- Will we see slower growth, & placement risks?



Are Contracts Only About Risk?

- Do they encourage the spread of innovations?
- Do they ease access to credit?



Does Contracting Allow Easier Access to Credit?

Contract Farms Use More Debt, per \$ of Net Worth

<i>Farms, by commodity specialization</i>	<i>Net worth quartiles</i>			
	Q1	Q2	Q3	Q4
	<i>Debt per \$ of Net Worth, Contract/noncontract</i>			
All farms	3.8	3.9	3.0	2.7
Grains, oilseeds	1.8	2.2	1.6	2.0
Cotton	0.5	1.4	2.1	1.6
Vegetables	0.9	1.1	5.7	4.4
Fruits	1.1	1.0	1.9	1.5
Hogs & pigs	1.9	1.8	4.3	1.7
Dairy	17.0	1.5	1.7	0.9
Cattle	2.5	6.1	3.7	3.8
Poultry	18.8	7.2	3.3	2.5

Note: Bolded cells are those for which contract farms have lower ratio
 Source: USDA Agricultural Resource Management Survey, 2011.



III. Shifts of Farm Size

- Production has been shifting to larger farms in most commodities, most States
- Still heavily concentrated in family farms
- Implications for risk & risk management?



Production is Shifting to Larger Field Crop Operations

Harvested Acres

1987 1997 2007



The midpoint farm size: half of all harvested acreage is on larger farms, and half is on smaller

Source: ERS calculations, from unpublished Census of Agriculture records



Production is Shifting to Larger Livestock Operations

Commodity	Midpoint farm size		
	1987	1997	2007
	<u>Annual Head Removed or Sold</u>		
Livestock			
Broilers	300,000	480,000	681,600
Hogs	1,200	11,000	30,000
Fattened Cattle	17,532	38,000	35,000
Cattle, <500 lbs.	50	65	128
	<u>Milk Cow Inventory</u>		
Dairy	80	140	570

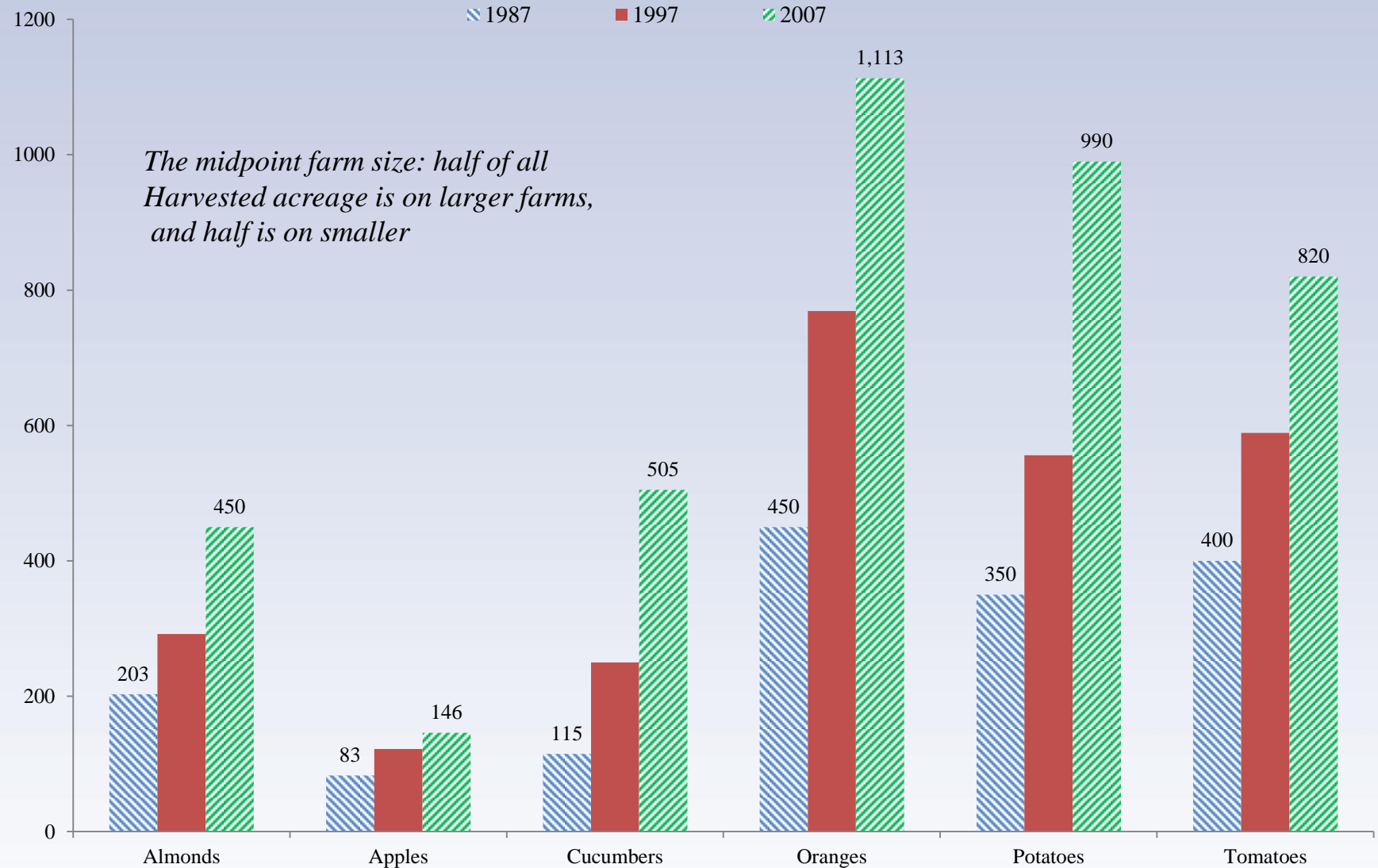
Note: At the midpoint farm size, half of all head sold or in inventory are on larger farms, and half are on smaller farms.

Source: ERS calculations from unpublished Census of Agriculture records



Production Shifts to Larger Fruit & Vegetable Operations

Harvested Acres



The midpoint farm size: half of all Harvested acreage is on larger farms, and half is on smaller

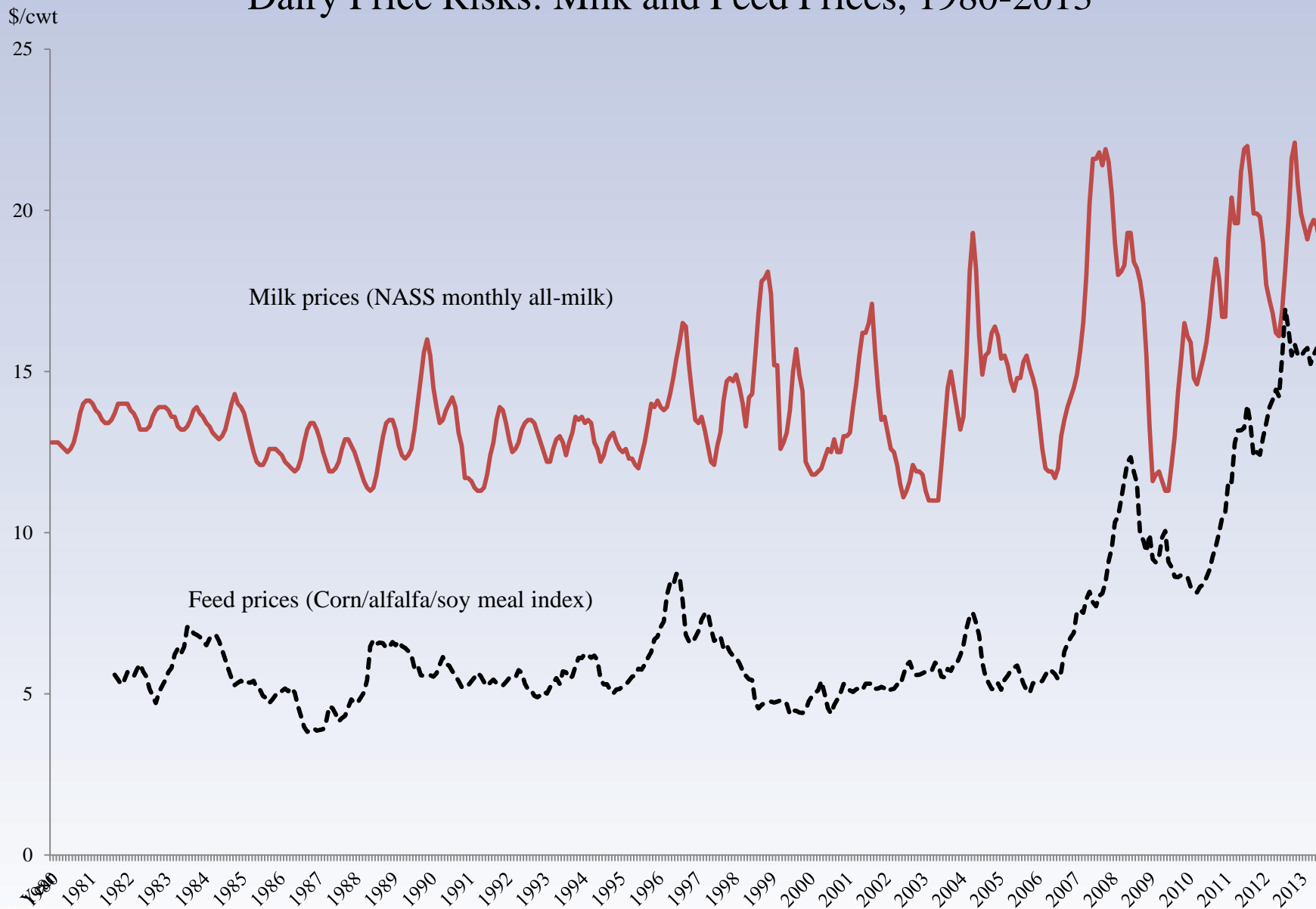


Implications of Size Shifts

- Economies of size, and labor-saving
- Significant capital investment for a family
 - \$8 million in assets needed for 1,100 acre corn/soybean operation, or 1,000 head dairy with some cropping, or 600 acre irrigated fruit and vegetable operation
- A family's wealth will be tied up in the business, often with substantial debt as well
- Does this create liquidity risks?



Dairy Price Risks: Milk and Feed Prices, 1980-2013



Dairy Margins, Debt and Liquidity Risk, 2008-2010

	Mean Debt to Asset Ratio (Percent)			Percent with Debt Repayment Capacity Less than Zero		
	2008	2009	2010	2008	2009	2010
All farms	13	17	16	19	31	21
All production	27	34	34	20	41	15
Herd Size (milk cows)						
1-49	10	11	11	14	22	26
50-99	11	16	16	12	32	14
100-199	17	20	17	23	32	15
200-499	27	22	25	24	46	25
500-999	33	29	35	30	49	16
1000-1999	34	48	36	18	62	22
>1999	32	49	44	19	52	13

Source: USDA Agricultural Resource Management Survey, 2008-2010

*Strong cost incentives for dairy producers to get large;
but do some face significant liquidity risks?
Does this extend to other large operations?*



Large Operations Use Multiple Routes for Acquiring and Managing Assets & Risks

- Renting land, leasing equipment, hiring custom services, using contracts
- Will we see adjustments in how financing is provided?



Large Farms Add Flexibility & Expertise with Input Strategies

Practice and commodity	-Harvested Acres-					
	Less than 100	100-249	250-499	500-999	1,000 -1,999	2000 or more
-Percent of farms using practice-						
Custom Work						
Corn	49.6	51.8	48.3	49.0	46.7	48.7
Soybeans	49.9	46.3	40.3	44.8	41.9	45.8
Wheat	31.3	40.7	45.7	49.9	52.8	60.0
Contract Labor						
Corn	2.9	3.0	6.7	6.8	13.1	11.8
Soybean	1.9	3.2	4.5	5.7	9.8	17.5
Wheat	12.8	11.7	9.4	10.3	14.1	14.0
Leased Capital						
Corn	7.9	7.2	14.6	17.5	23.4	37.9
Soybeans	4.6	12.1	12.7	12.8	12.6	23.9
Wheat	6.9	10.1	12.8	18.8	17.2	28.6

Source: USDA Agricultural Resource Management Survey, 2008-2011 pooled



Use of Hired & Leased Inputs on Fruit and Vegetable Operations

Practice and Commodity	-Harvested Acres-						
	Less than 10	10-49	50-99	100-249	250-499	500-999	1000 or more
-Percent of farms using a practice-							
Custom Work							
Fruits/Nuts	25.8	41.7	56.5	56.7	63.1	70.3	71.6
Vegetables	10.9	16.0	9.2	31.1	42.2	54.5	64.7
Contract Labor							
Fruits/Nuts	31.3	47.7	52.0	59.4	64.8	70.3	79.5
Vegetables	3.1	13.8	17.6	29.0	36.0	33.3	56.3
Leased Capital							
Fruits/Nuts	7.2	9.8	21.3	22.4	30.6	39.0	44.6
Vegetables	3.7	4.4	4.9	25.5	43.2	39.9	59.2

Source: Agricultural Resource Management Survey, Phase III all versions, 2008-2011 pooled.



Summary

- Every reason to expect significant price volatility to continue in the future, along with weather-related production risks.
- Marketing & production contracts provide tools to shift and manage risks.
 - They can introduce commitment risks, and some specific ones may be emerging
- Farm structure elements: do large family farms face liquidity risks, and how do they manage them?



References for Slides

- McBride & Key, *Trends and Developments in U.S. Hog Production 1992 to 2009: Technology, Reorganization and Productivity Growth*, ERS Economic Research Report ERR-158, October, 2013
- MacDonald, Korb, & Hoppe, *Farm Size and the Organization of U.S. Crop Farming*, ERS Economic Research Report ERR-152, August 2013.
- Westcott & Jewison, *Weather Effects on Expected Yields*, ERS Feed Outlook No (FDS-13G-01), July 2013.
- MacDonald & Korb, *Agricultural Contracting Update: Contracts in 2008*, ERS Economic Information Bulletin EIB-72, February, 2011.

