

U.S. Ethanol Expansion: Overview of USDA's Long-term Projections and Related Modeling Issues

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Presentation Overview

- USDA long-term agricultural projections to 2016
 - <http://www.ers.usda.gov/publications/oce071>
 - <http://www.ers.usda.gov/briefing/projections>
- Highlights of projections
 - Ethanol expansion
 - Crop adjustments
 - Livestock adjustments
 - Potential market variability
 - Retail food price projections
- Focus on distillers grains
 - Modeling and data issues
 - Corn and soybean meal feed use substitutions
 - Livestock sector uses
- Other ethanol-related issues

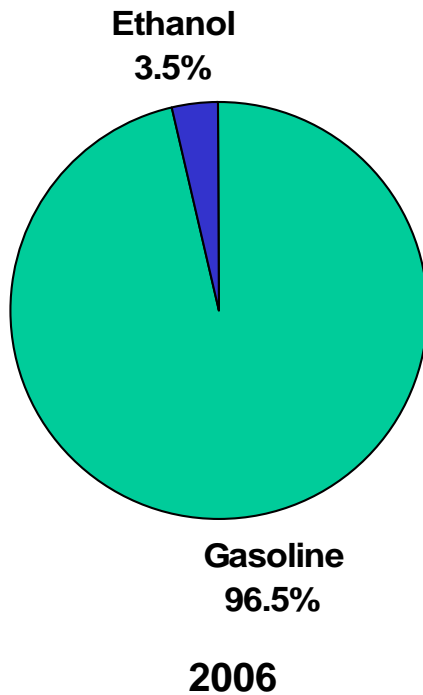
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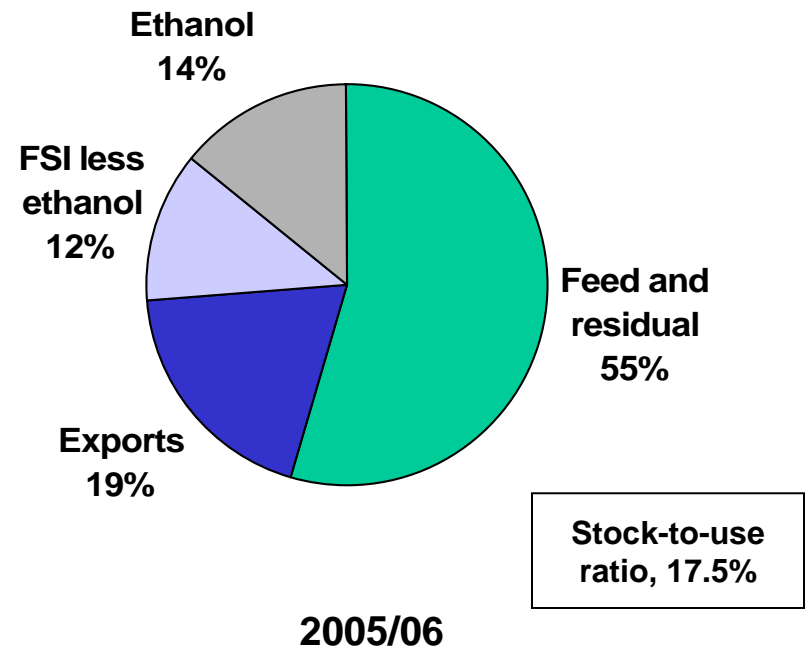
U.S. ethanol expansion

Ethanol's role in gasoline and corn markets: An asymmetric relationship

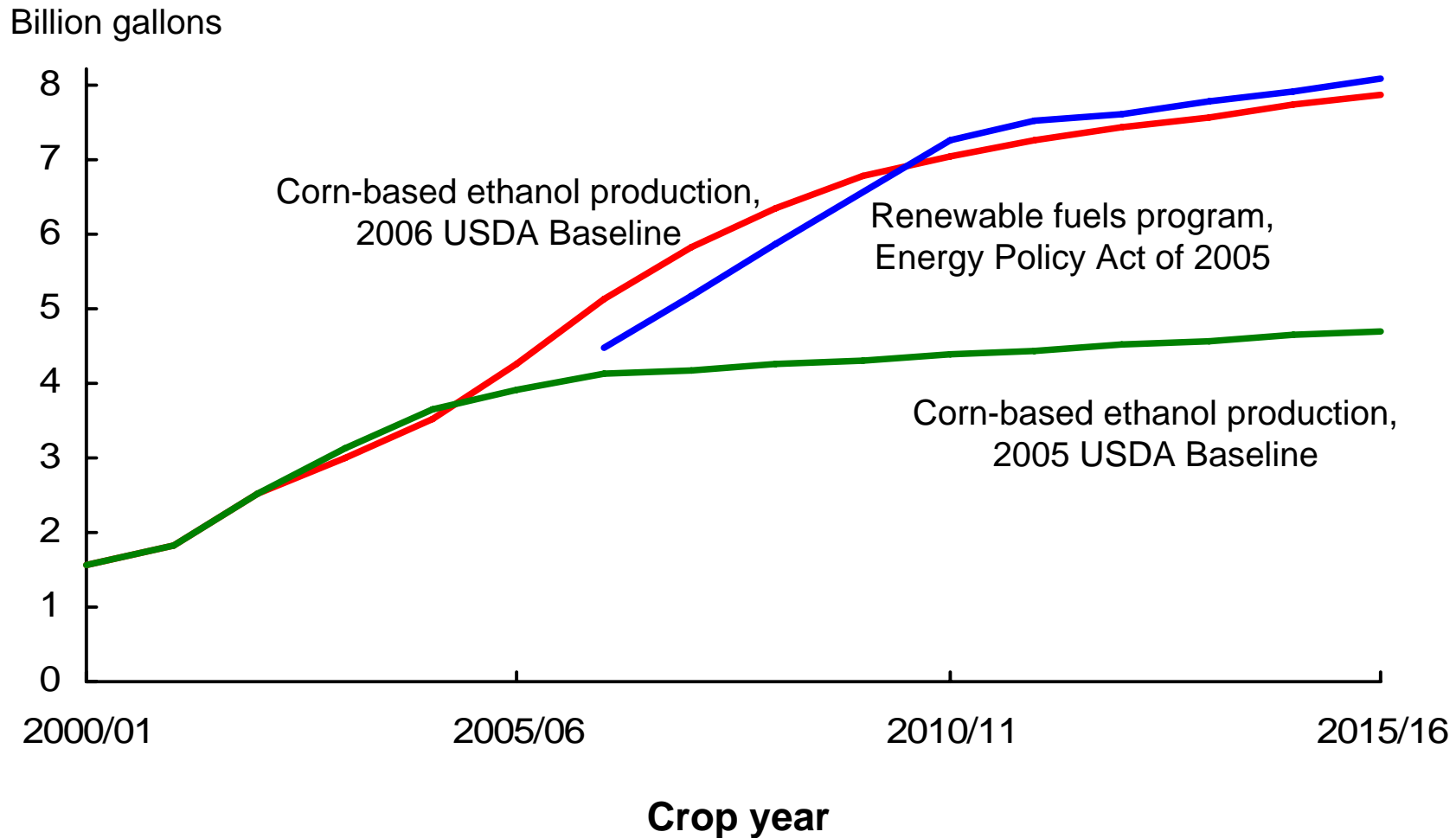
**Ethanol is small
relative to overall
gasoline use**



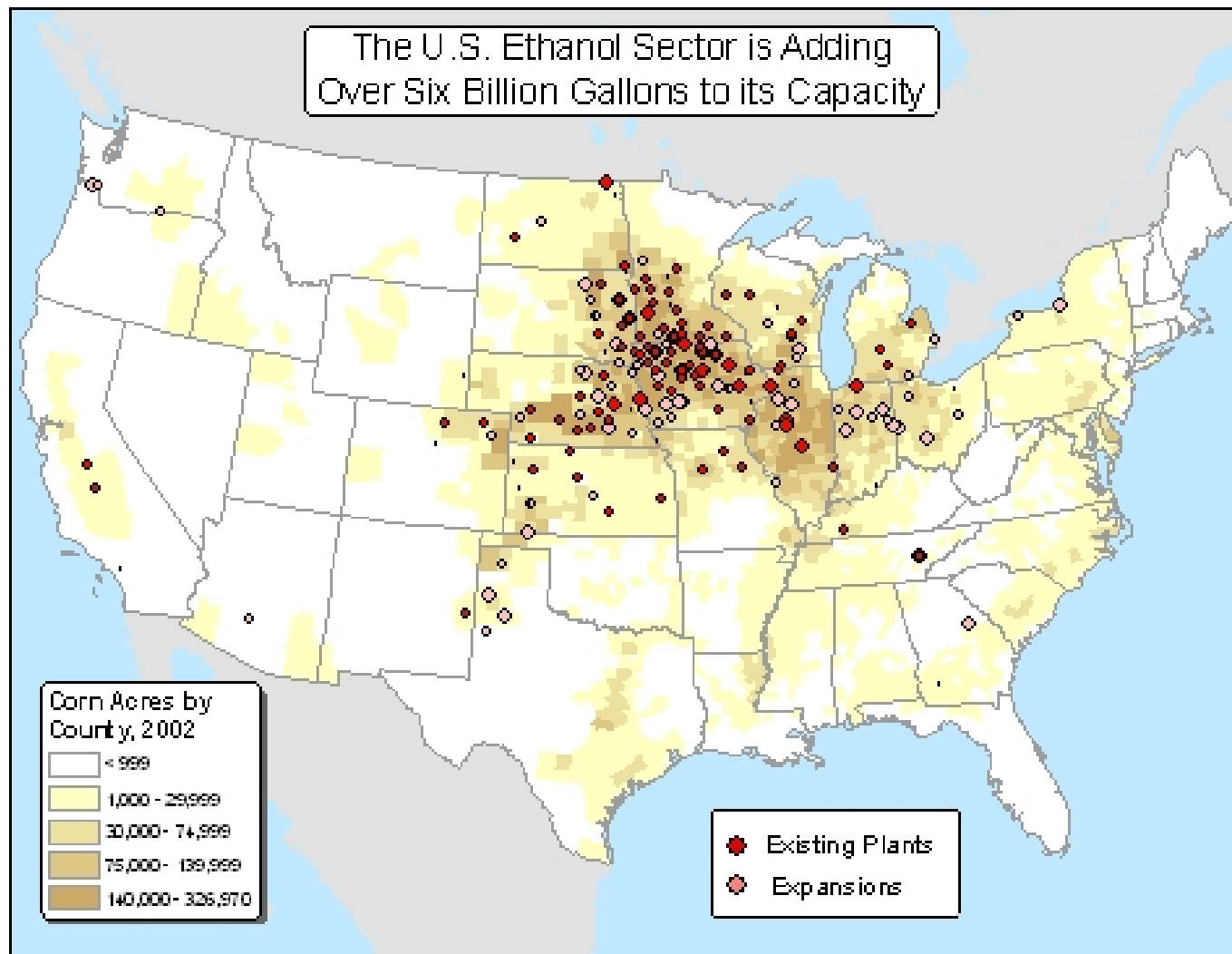
**But ethanol accounts
for a large and growing
share of corn use**



Policy component important for 2006 Baseline: Renewable fuels program & corn-based ethanol production

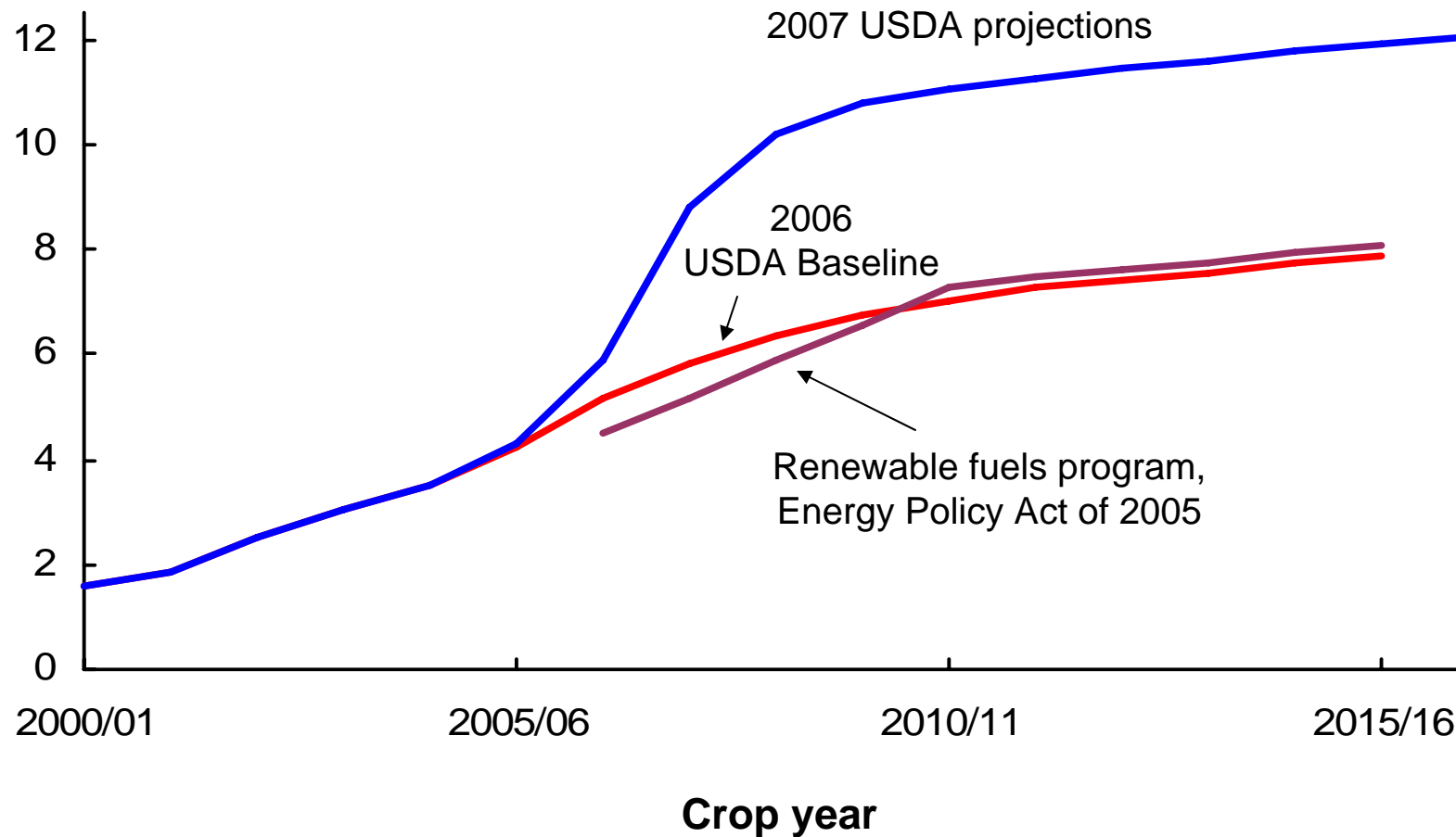


U.S. ethanol capacity growing rapidly



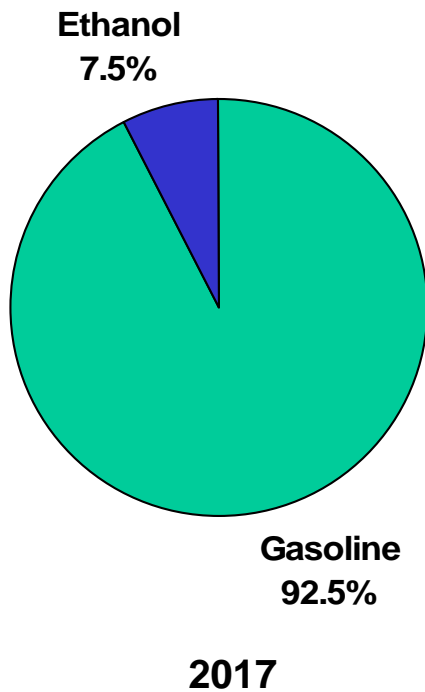
Corn-based ethanol production projections exceed renewable fuels program mandate

Billion gallons

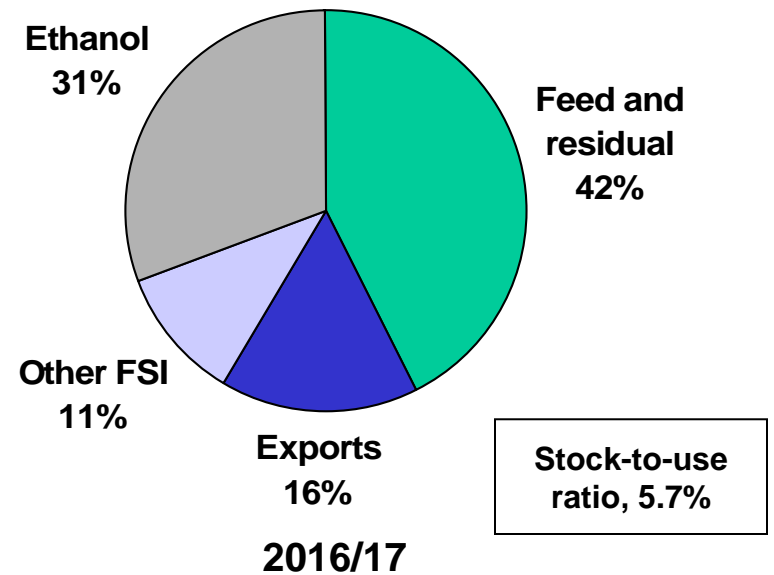


Ethanol's role in gasoline and corn markets: Projected relationships in 10 years

**Ethanol still small
relative to overall
gasoline use**



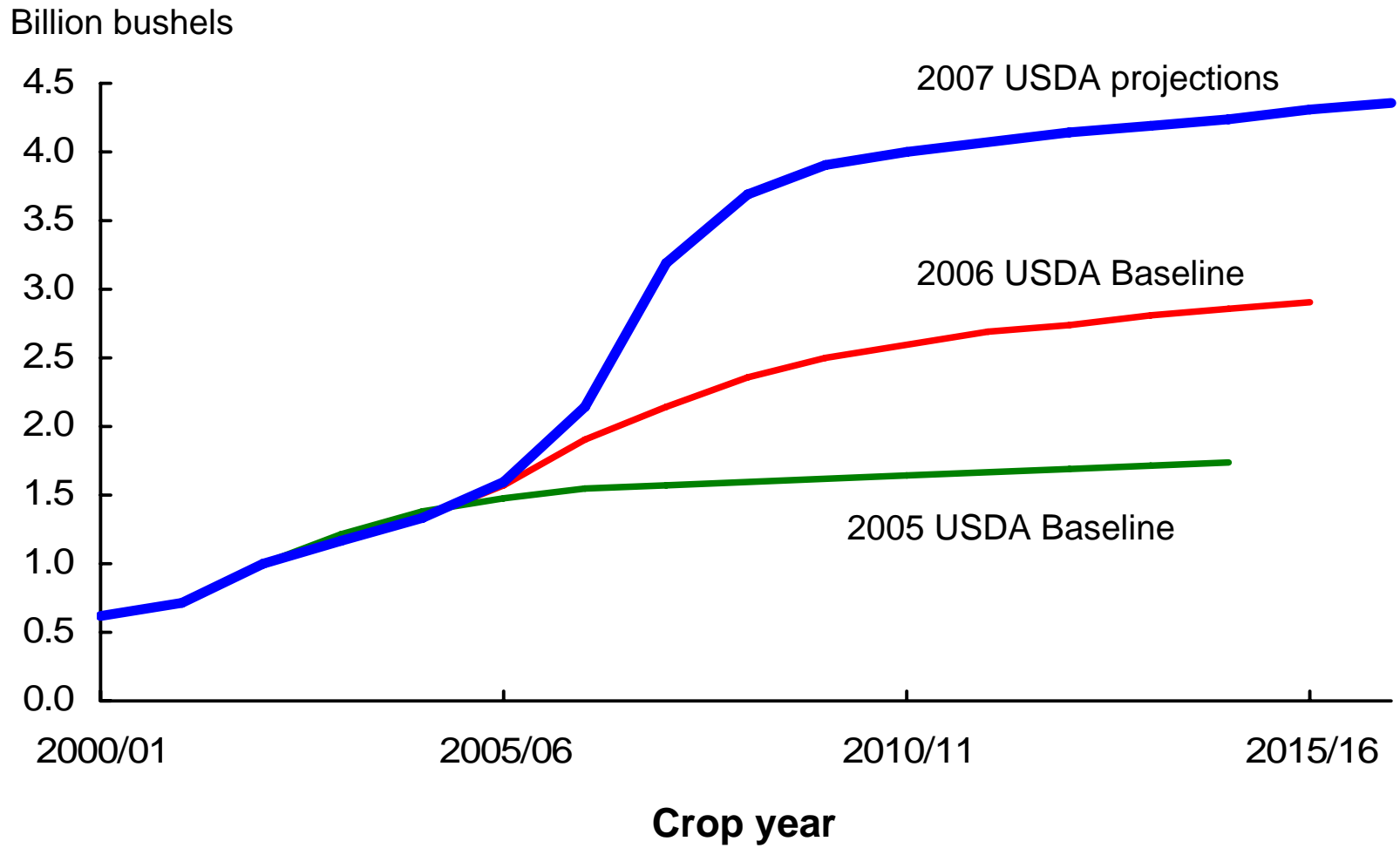
**Ethanol accounts for
over 30% of corn use**



Crop comparisons

Corn use projections, ethanol production

Larger front end expansion in 2007 projections

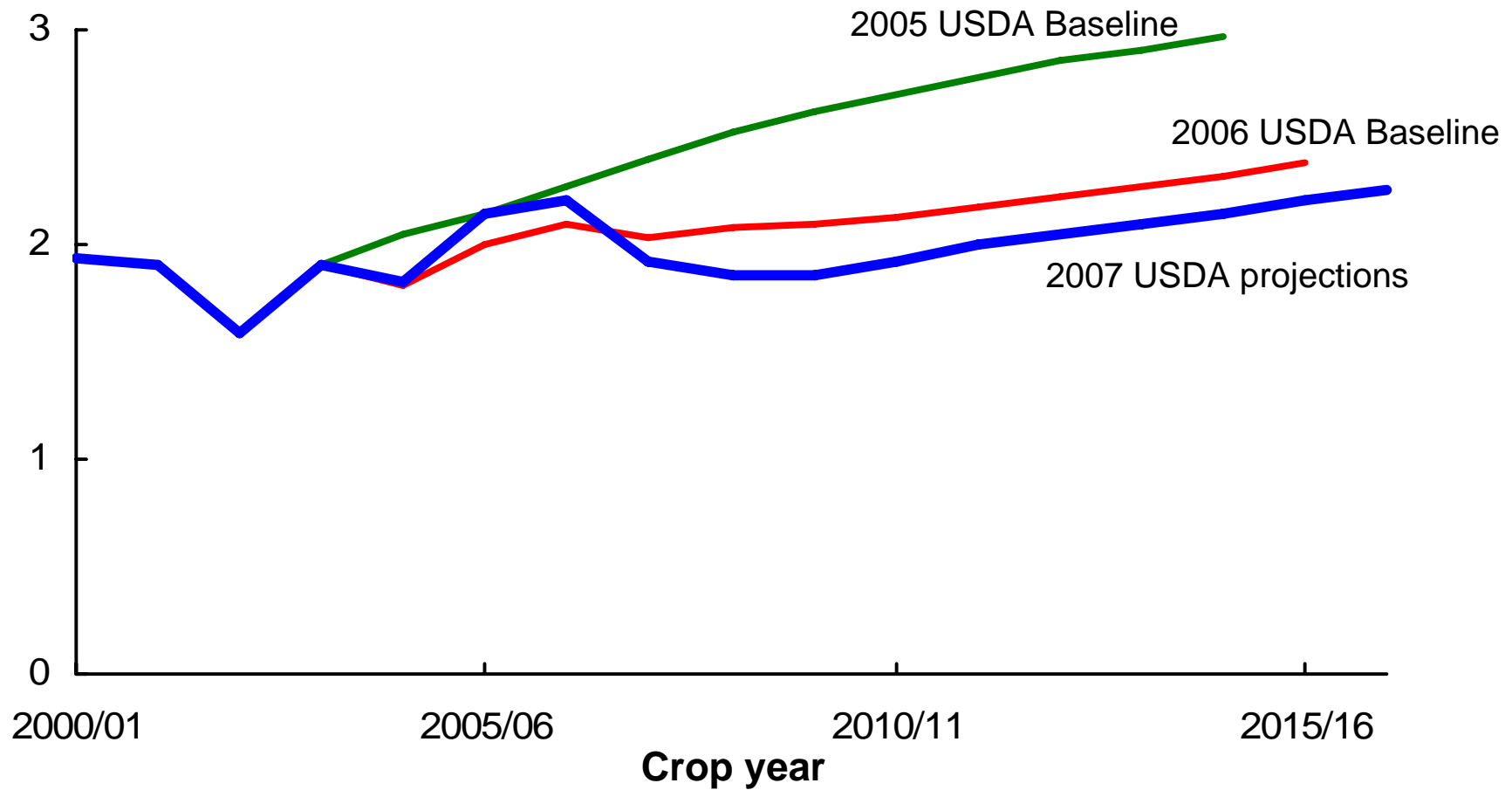


Crop sector effects of ethanol expansion

- Corn
 - Higher prices
 - Reduced exports and domestic use
 - Lower stocks
 - Increased acreage
- Soybeans
 - Lower acreage for competing crops, particularly soybeans
 - Reduced exports, domestic use, and stocks
 - Higher prices

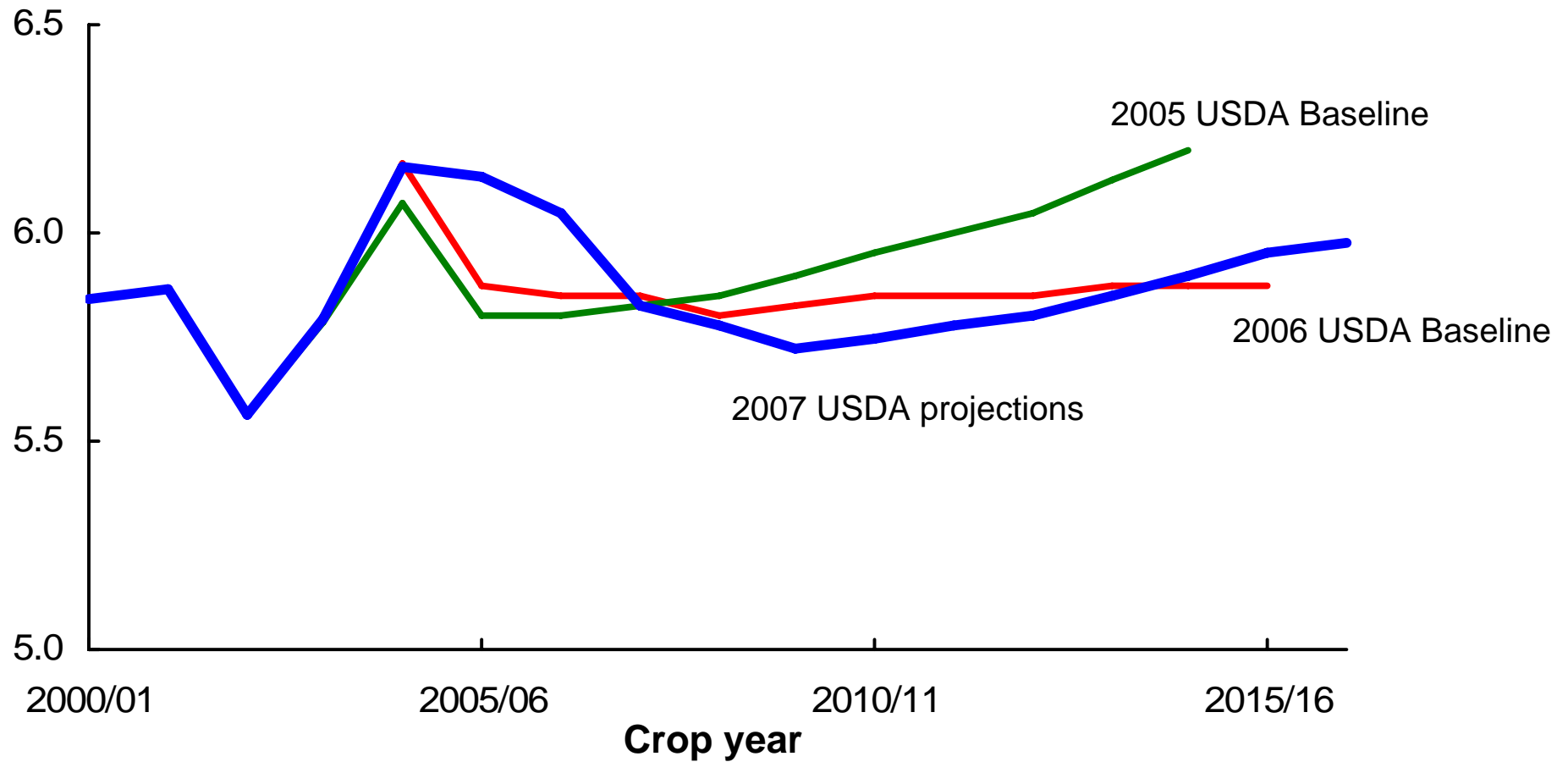
Corn use projections, exports

Billion bushels



Corn projections, feed use*

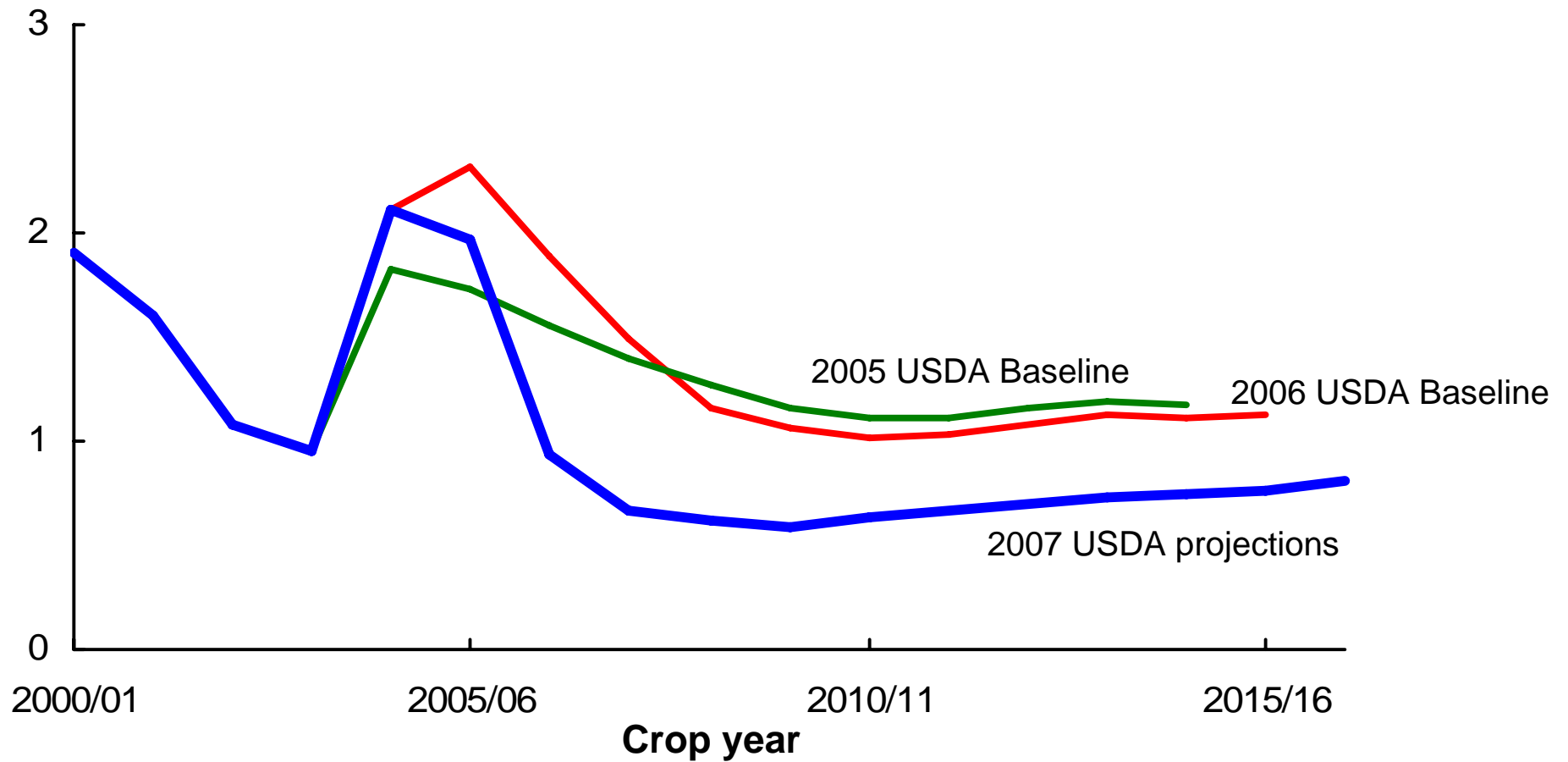
Billion bushels



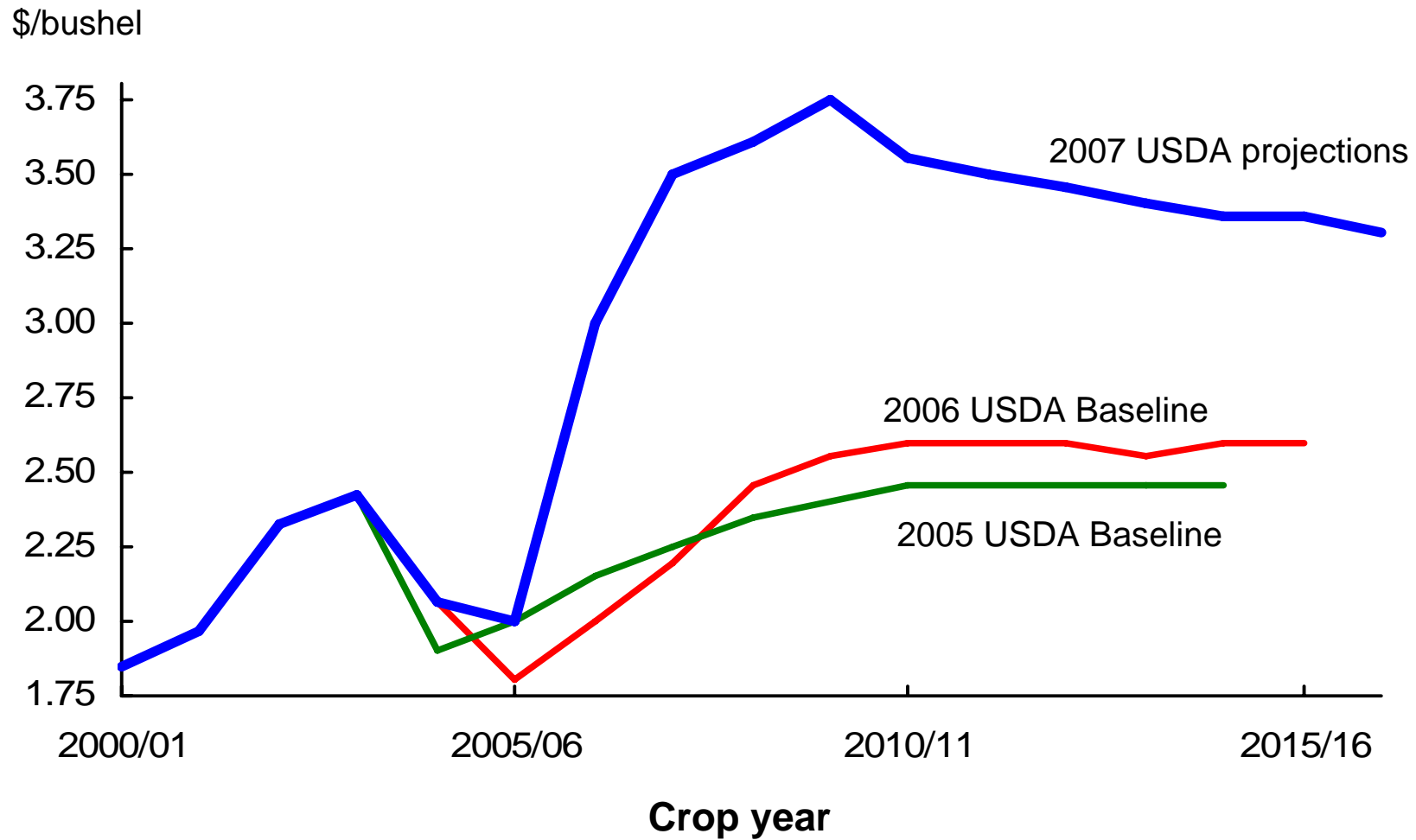
* Includes statistical "residual"

Corn projections, ending stocks

Billion bushels

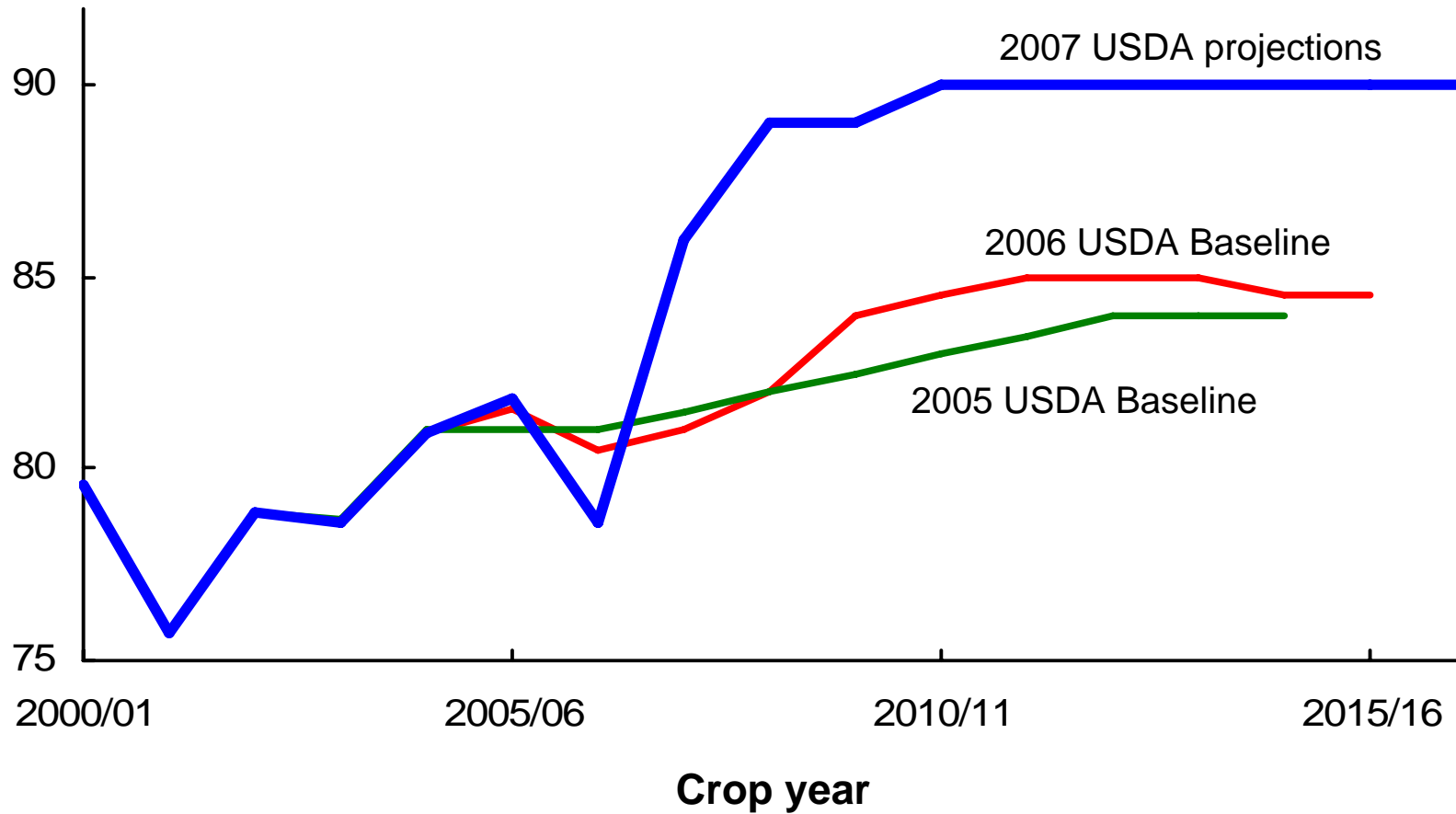


Corn price projections



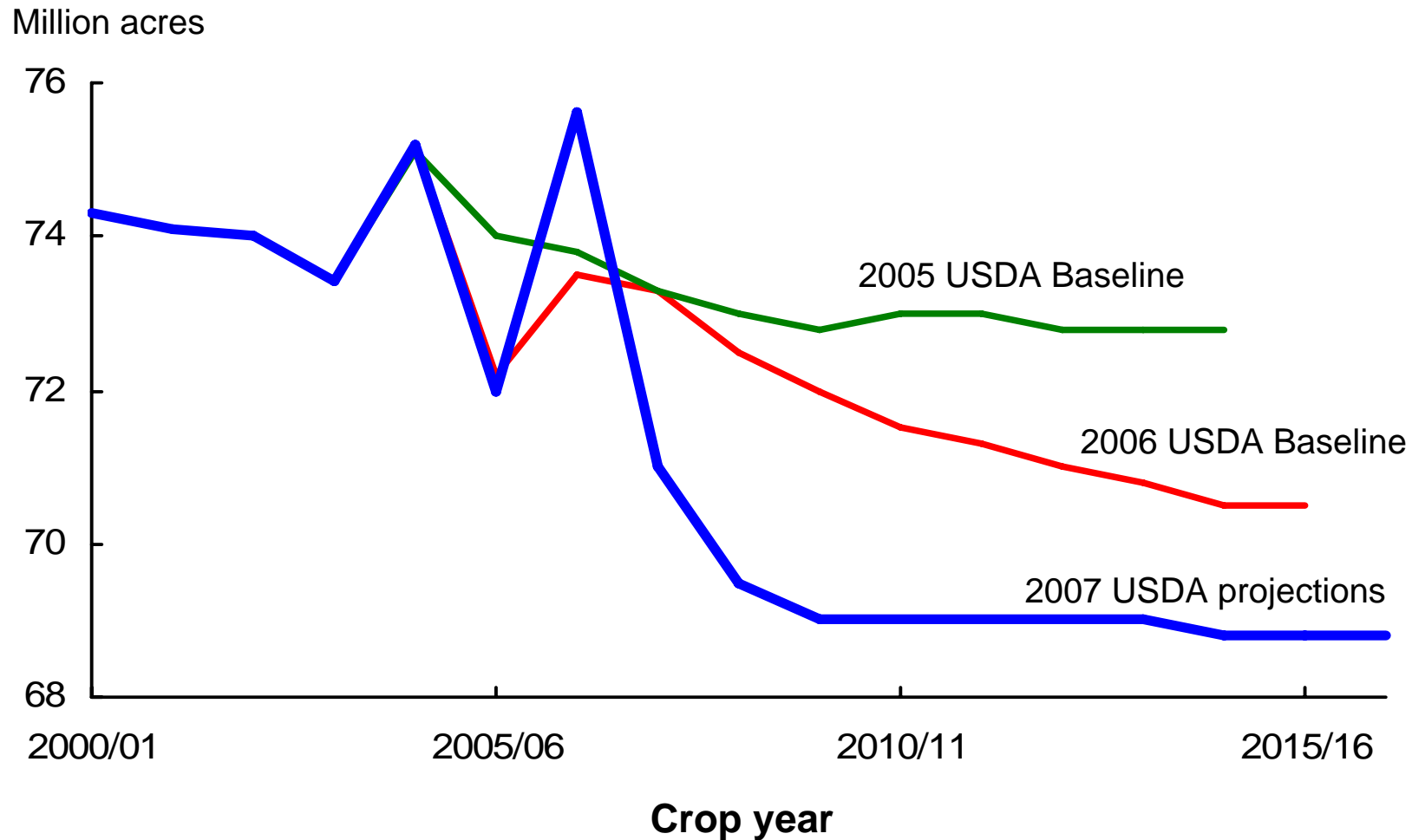
Corn projections, planted area

Million acres

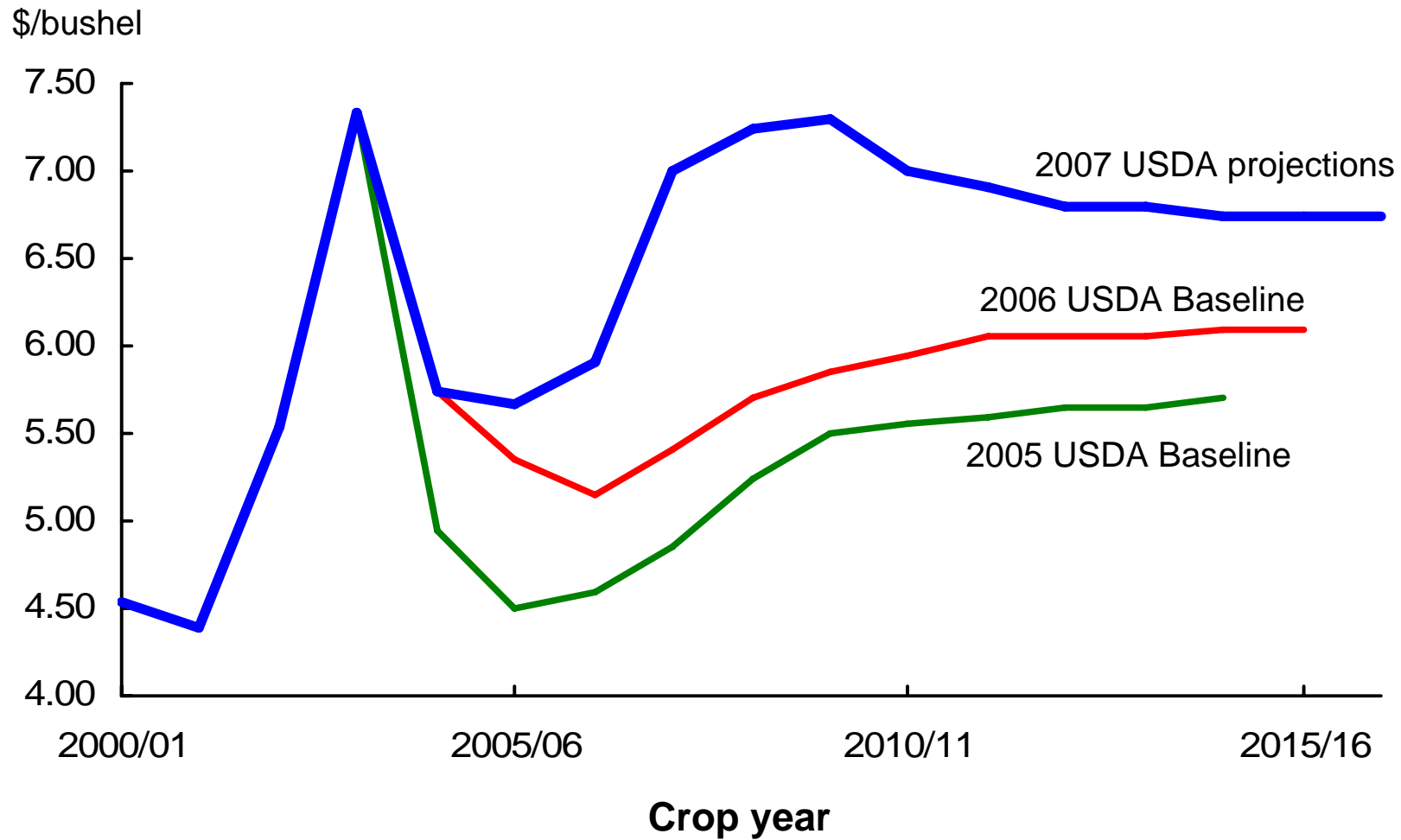


Soybean projections, planted area

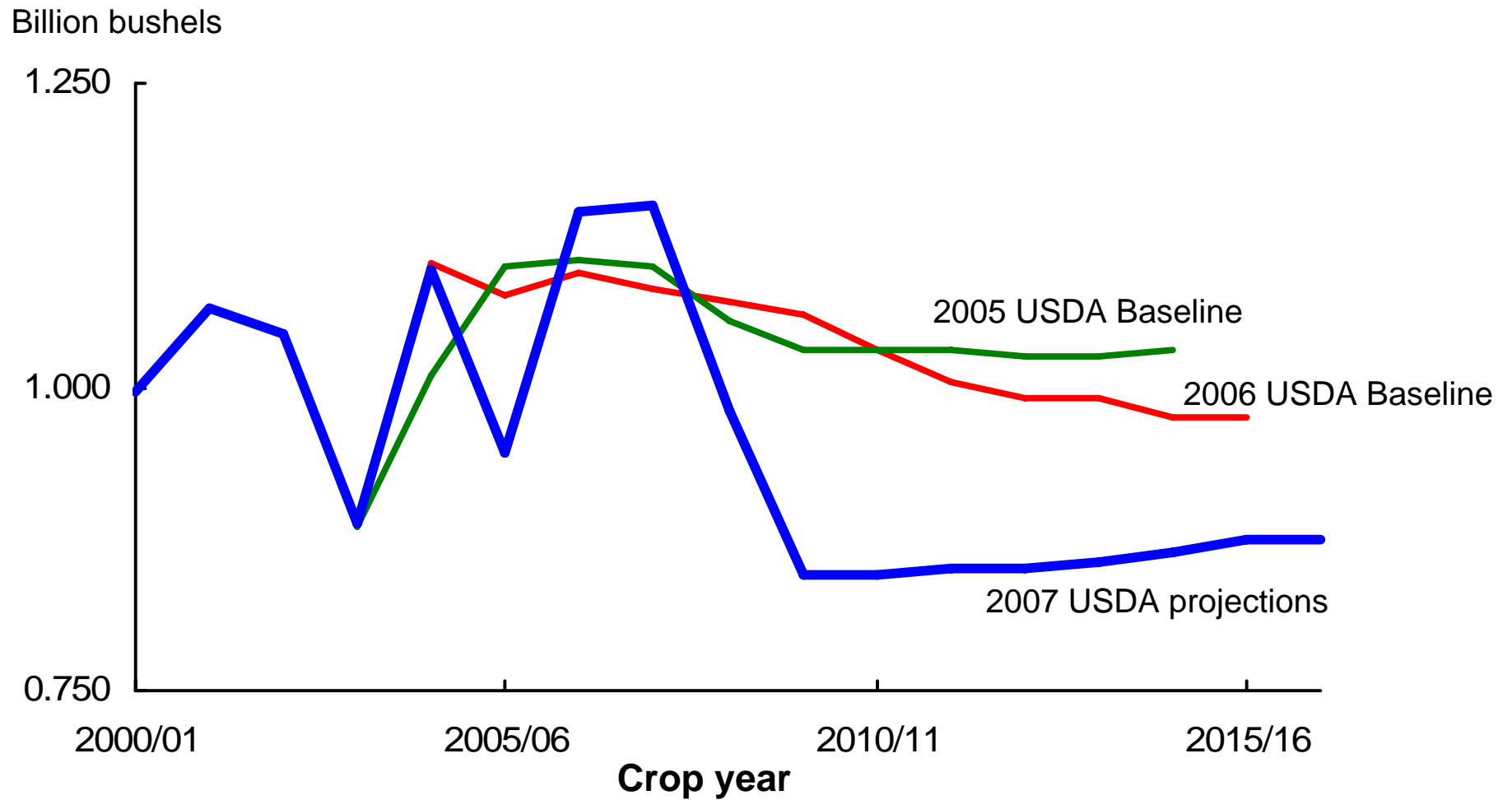
Part of corn area expansion comes from soybeans



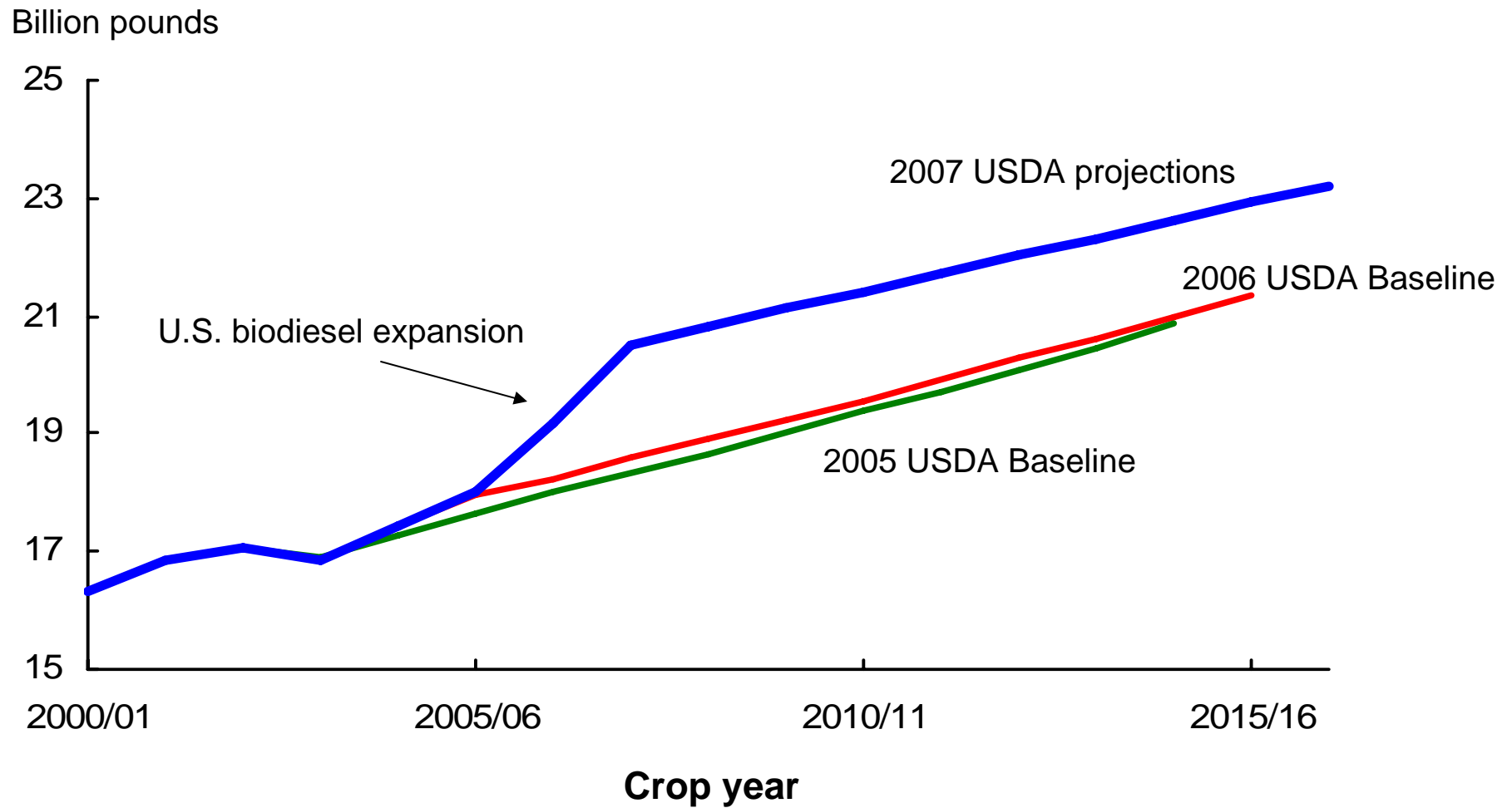
Soybean price projections



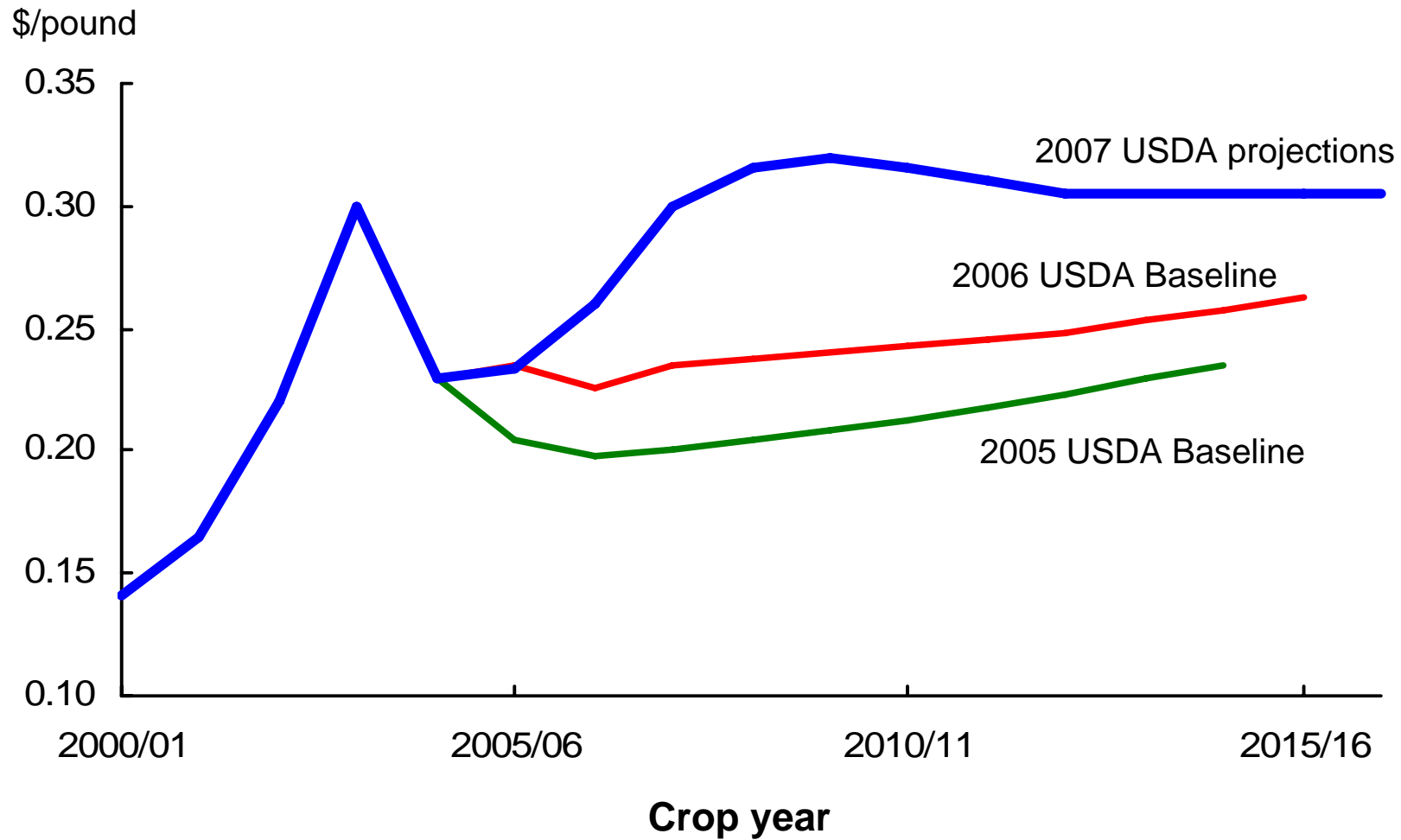
Soybean use projections, exports



Soybean oil, domestic use



Soybean oil price projections



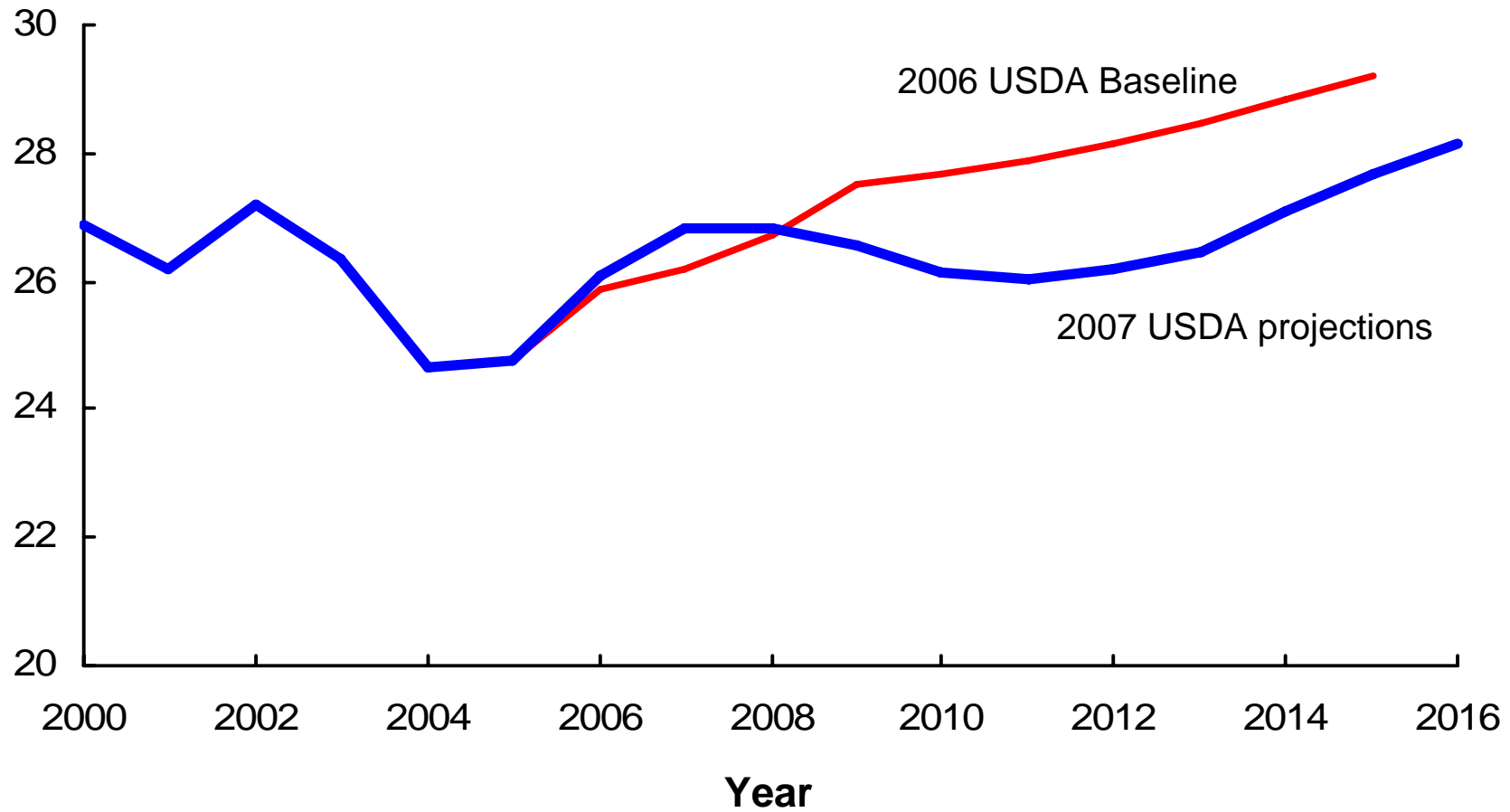
Livestock comparisons

Livestock sector effects of ethanol expansion

- Higher corn prices
- Greater availability of ethanol production coproducts
 - Distillers grains from dry mill ethanol production
- Different effects across livestock types
- Lower production for all meats

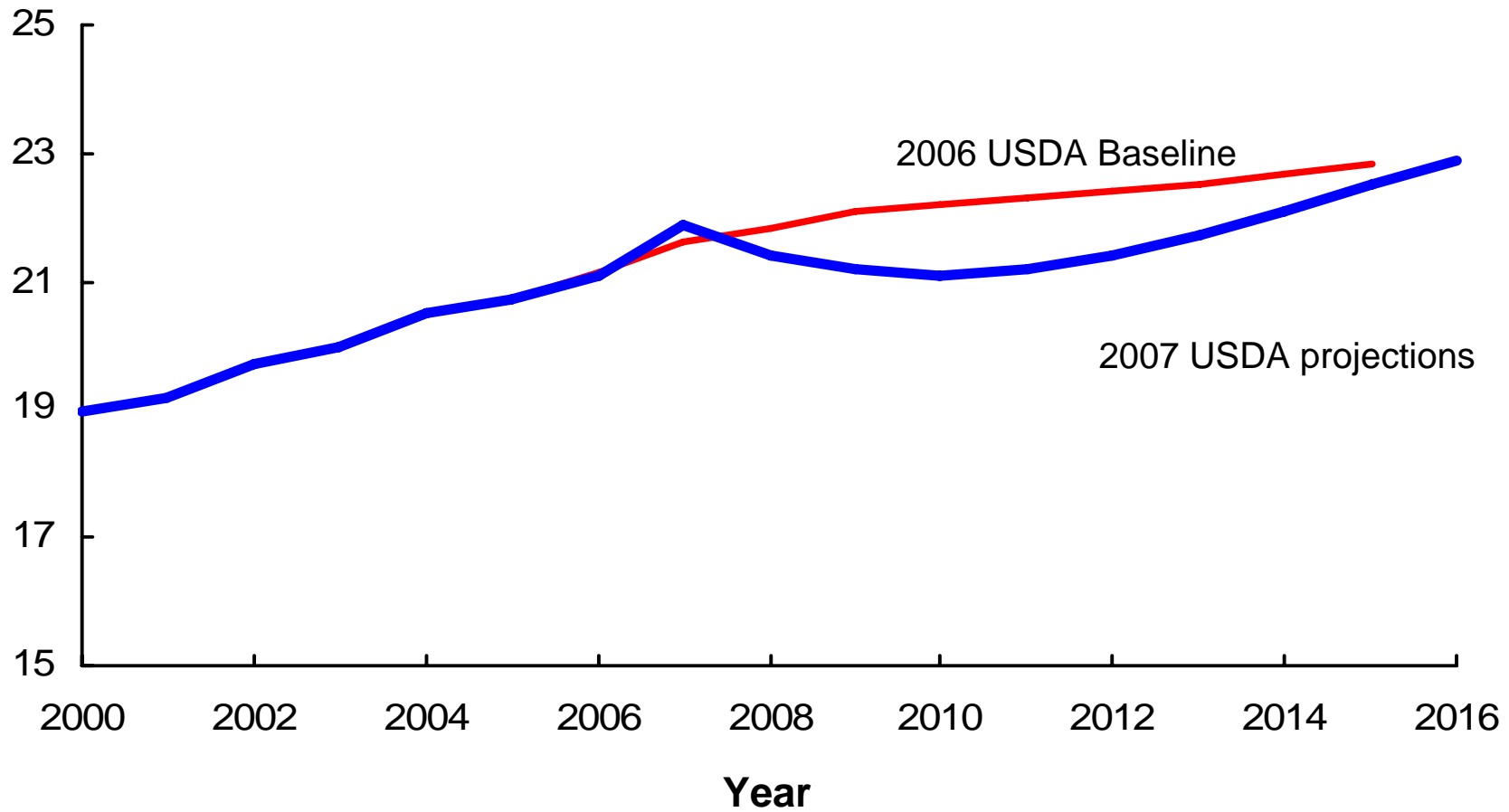
Beef production

Billion pounds



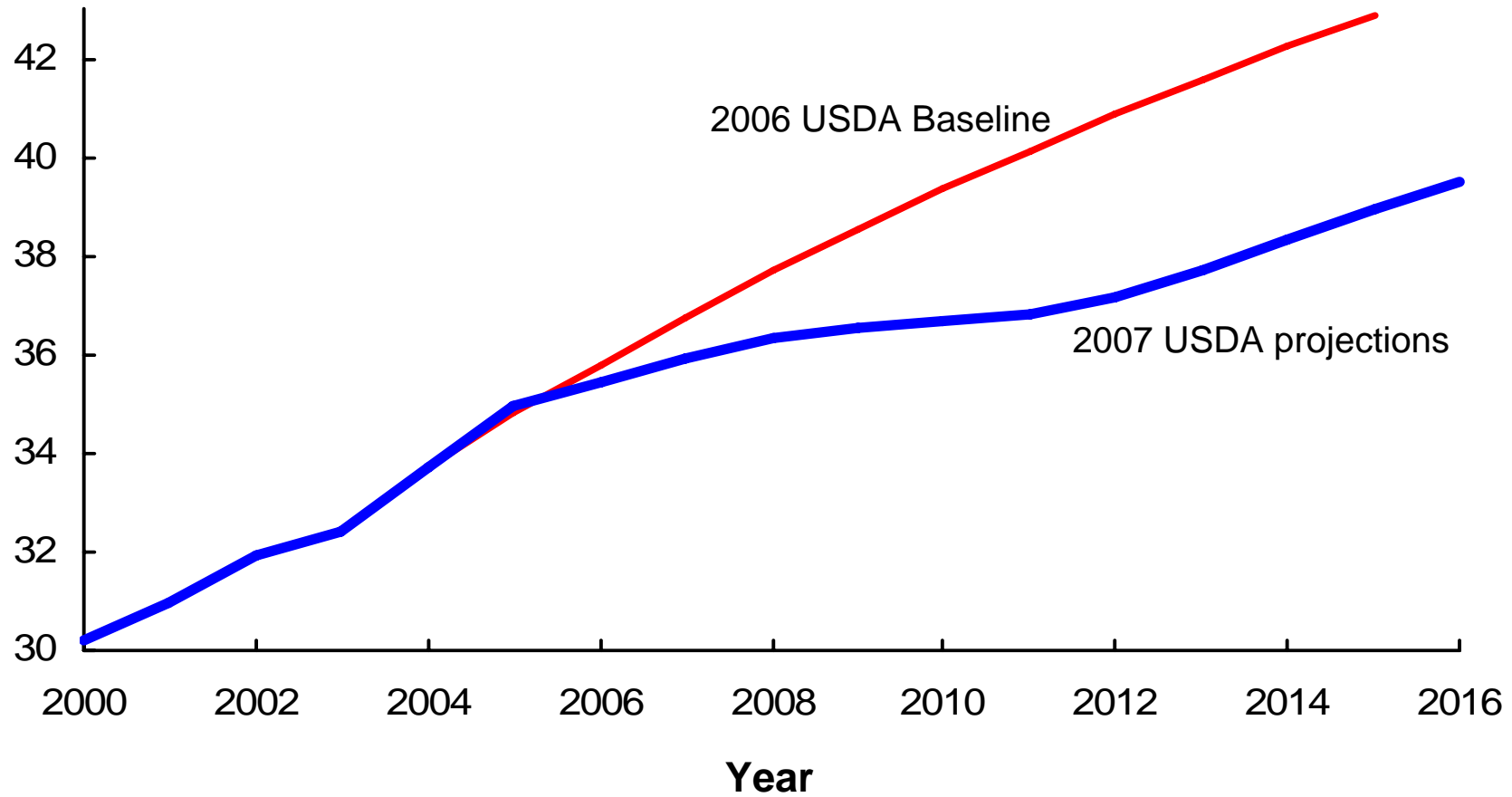
Pork production

Billion pounds



Young chicken production

Billion pounds

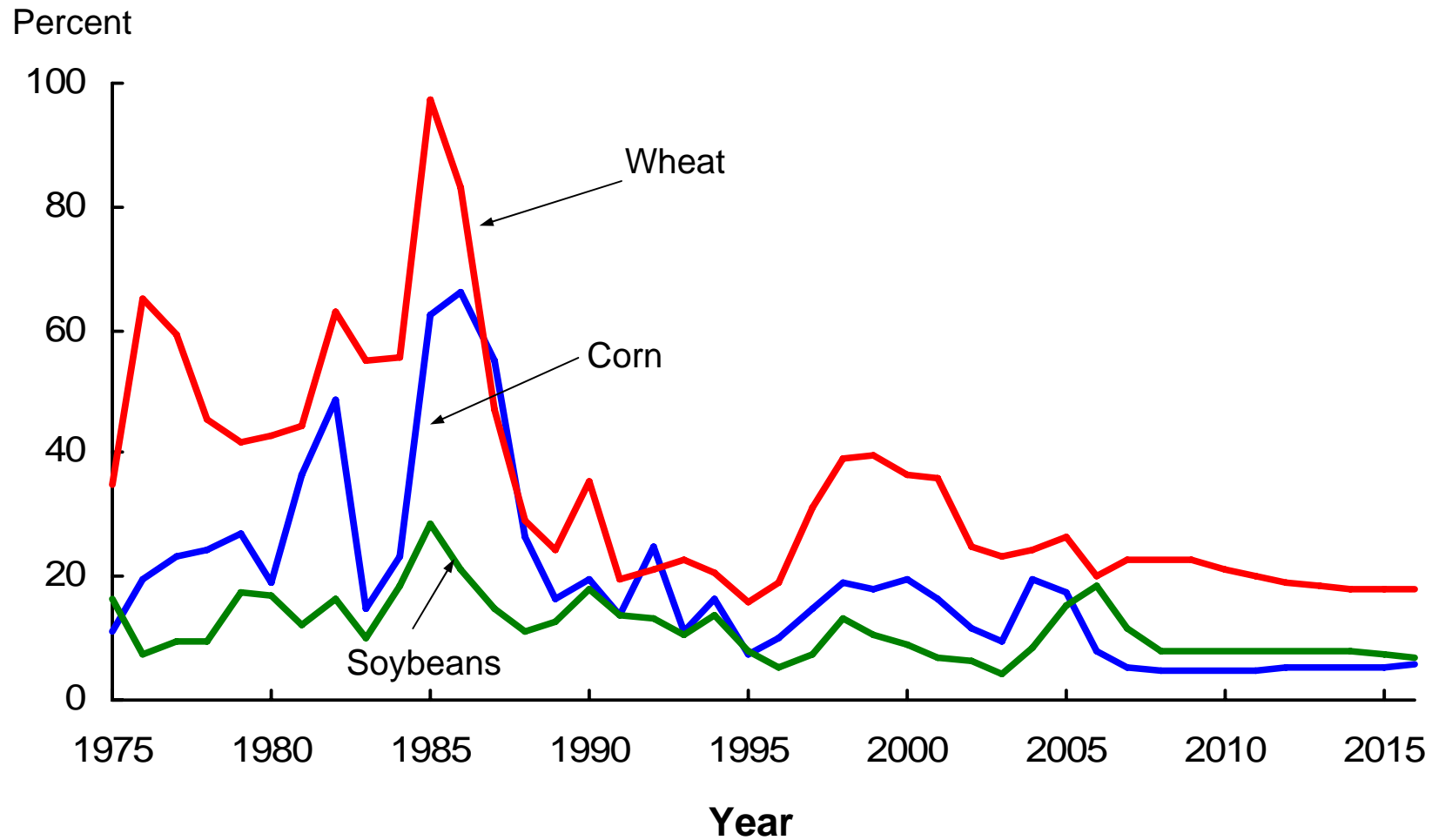


Potential market volatility

Potential market volatility

- Corn demand for ethanol production is inelastic
- Growing share of demand for corn is more inelastic
- Vulnerability to corn production shortfalls with increasingly inelastic demands
 - Near-term--relatively high beginning corn stocks have helped in 2006/07
 - Longer-term--lower corn stocks provide less buffer
- Stocks are also low for wheat and soybeans

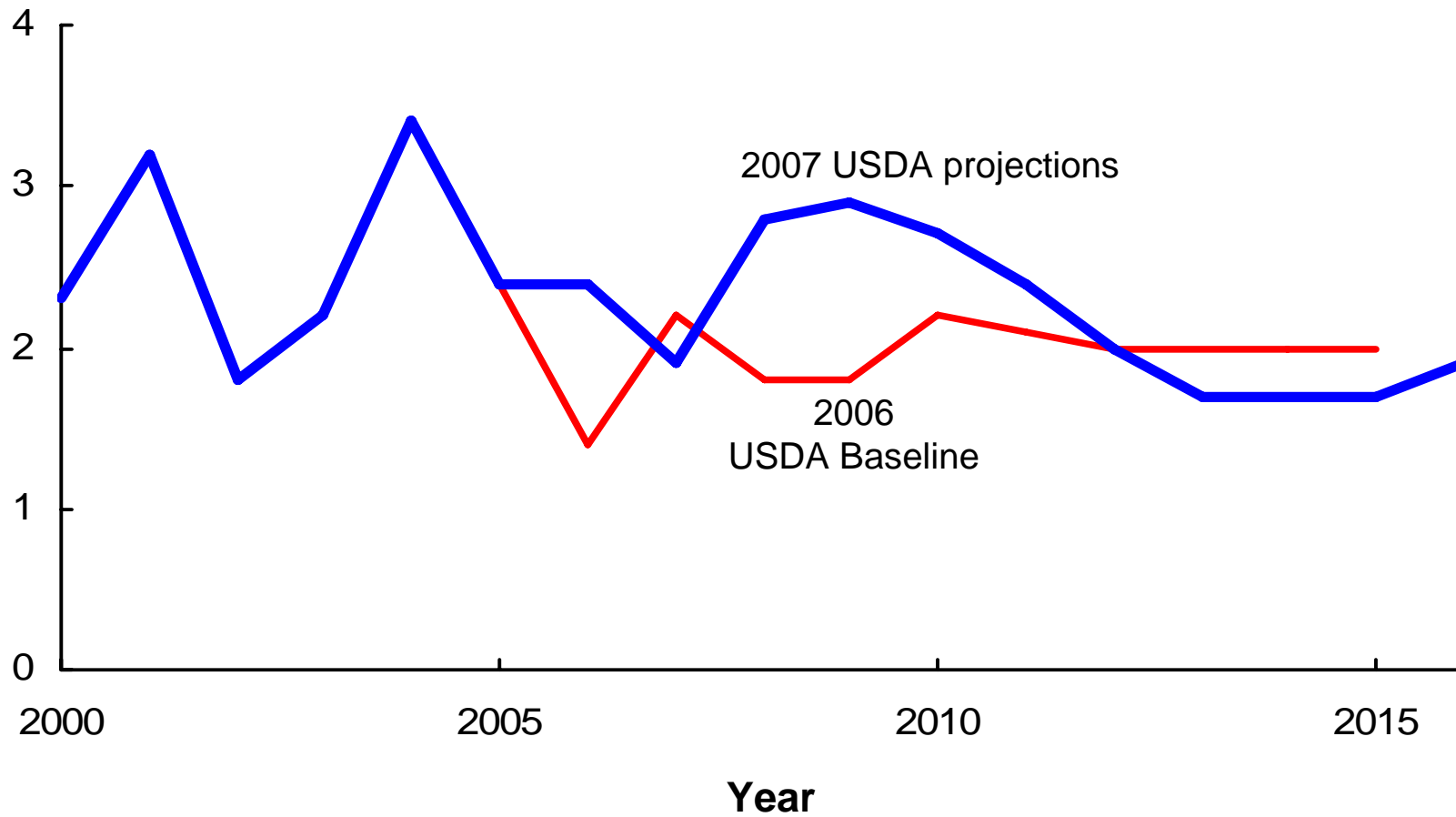
Stocks-to-use ratios: Corn, wheat, and soybeans



Retail food prices

Food price inflation

Percent change



Distillers grains:
Livestock sector uses and
implications for feed use of corn and soybean meal

Distillers grains use questions

- How does use of distillers grains affect direct corn feed use and soybean meal use?
 - How much of distillers grains go to livestock vs. exports and other uses???
 - How much go to each livestock sector???
 - How much of the ration for the different livestock sectors can be replaced by distillers grains???
 - What are the substitutions of distillers grains for corn and soybean meal in rations???
- What are the implications for livestock feed costs?

Distillers grains information

- 17.5 pounds of distillers grains from 56 pound bushel of corn (roughly a third)
- Our focus is on how distillers grains are used in rations for their energy and protein content (relative to corn and soybean meal)
- However, other nutrients in distillers grains are about 3 times the concentration as in corn
- Use of distillers grains for energy and/or protein means rebalancing ration for those other nutrients
- Favors use by ruminants relative to monogastric animals

Distillers grains/livestock references

- Anderson, J. L., D. J. Schingoethe, K. F. Kalscheur, and A. R. Hippen. “Evaluation of dried and wet distillers grains included at two concentrations in the diets of lactating dairy cows,” *Journal of Dairy Science*, 2006, Volume 89, pp. 3133-42.
- Lumpkins, B. S., A. B. Batal, and N. M. Dale. “Evaluation of Distillers Dried Grains with Solubles as a Feed Ingredient for Broilers,” *Poultry Science*, 2004, Volume 83, pp. 1891-96.
- Shurson, Jerry, Mindy Spiehs, Jennifer Wilson, and Mark Whitney. “Value and use of ‘new generation’ distiller’s dried grains with solubles in swine diets,” *Alltech’s 19th International Feed Industry Symposium Proceedings*, May 2003.
- Vander Pol, Kyle J., Galen E. Erickson, Terry J. Klopfenstein, Matt A. Greenquist, and Thomas Robb. “Effect of Dietary Inclusion of Wet Distillers Grains on Feedlot Performance of Finishing Cattle and Energy Value Relative to Corn,” *2006 Nebraska Beef Cattle Report*, pp. 51-53.

Distillers grains uses: Allocation assumptions

- 75% to livestock
- 10% exported
- 15% other

Distillers grains livestock uses: Allocation assumptions

- 80% to beef cattle
- 10% dairy
- 5% hogs
- 5% poultry

Grain Consuming Animal Units, 2005/06 feed year

Animal type	GCAU weights	Head	2005/06 GCAUs	GCAU Share
		1,000	Million units	Percent
Cattle				
Dairy				
Cows	1.0475	9,063	9.493	10
Heifers	0.1761	4,275	0.753	
Beef				
Cattle on feed	1.5323	14,132	21.654	24
Other	0.0547	69,232	3.787	
Hogs	0.2285	104,615	23.904	26
Poultry				
Layers	0.0217	345,338	7.494	8
Broilers *	0.0020	9,087,000	18.066	20
Pullets	0.0054	298,783	1.613	
Turkeys *	0.0155	264,874	4.072	4
Sheep	0.0194	6,230	0.121	
Horses and mules	0.2043	2,539	0.519	
Total			91.477	

* GCAUs for broilers and turkeys reflect weighted averages of current and lagged head numbers.

Updated February 2007.

Distillers grains livestock uses:

Maximum ration inclusion recommendations

- Beef cattle 40% *
- Dairy 20-25%
- Hogs 20%, growing, finishing, gilt development
- Poultry 15%, grower, finisher

Distillers grains livestock uses:

Ration substitutions for corn & soybean meal

- Beef cattle—100% corn; (protein source, urea)
- Dairy—45% corn; 55% soybean meal
- Hogs—85% corn; 15% soybean meal
- Poultry—55% corn; 45% soybean meal

Distillers grains livestock uses: Adding up for corn substitution

Distillers grains-corn substitution

- 0.75 to livestock *

[(0.80 beef cattle @ 100% corn substitution)

+(0.10 dairy @ 45% corn substitution)

+(0.05 hogs @ 85% corn substitution)

+(0.05 poultry @ 55% corn substitution)]

=0.686

- $0.686 * 17.5$ pounds distillers grains = 12 pounds
- $12 \text{ pounds} / 56 \text{ pound bushel} = 21$ percent (21 percent of corn bushel used for ethanol replaces corn feed use)

Distillers grains livestock uses:

Adding up for soybean meal substitution

Distillers grains-soybean meal substitution

- Since most distillers grains use in beef cattle rations, soybean meal substitution much less
- About 1.1 pounds soybean meal replaced in livestock rations for each 56 pound bushel of corn used for ethanol production

Distillers grains livestock uses: Adding up, other implications

Overall substitution of distillers grains in livestock rations

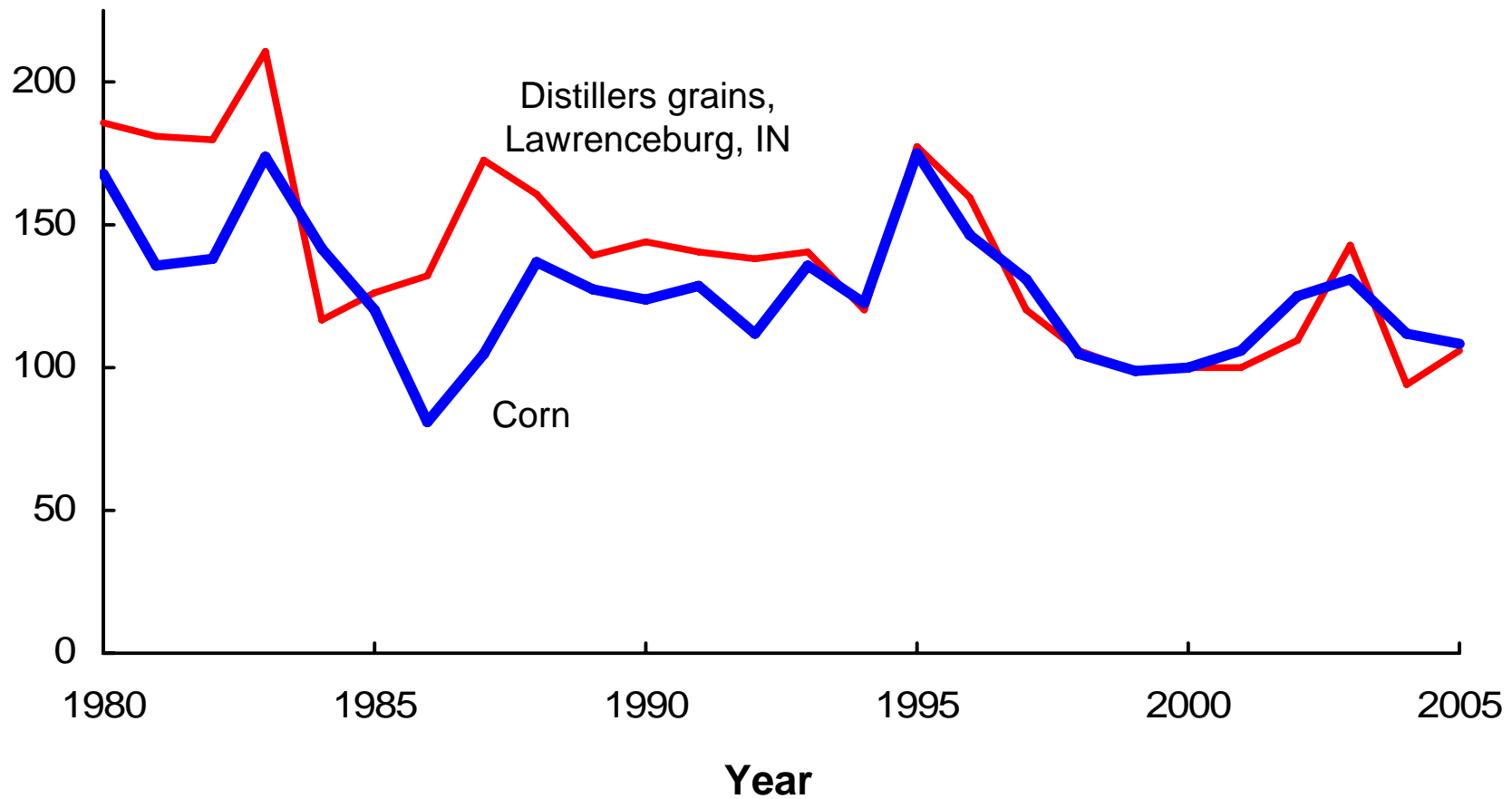
- 91.5 percent for corn
- 8.5 percent for soybean meal

Beef cattle feed cost adjustments with distillers grains

- Feed cost in model is based on corn price and soybean meal prices (proxy for urea)
- Derive a new “corn price”
 - Blend of the actual corn price and a discounted “corn-equivalent” of distillers grains price
 - Weighted average reflects market penetration
 - Discount of distillers grain price reflects market penetration
- Also lower cost to account for urea reduction
- Longer-term question—Will distillers grains be priced at a deeper discount?

Prices for corn and distillers grains

Index, 2000 = 100



<http://www.ers.usda.gov/data/feedgrains/>

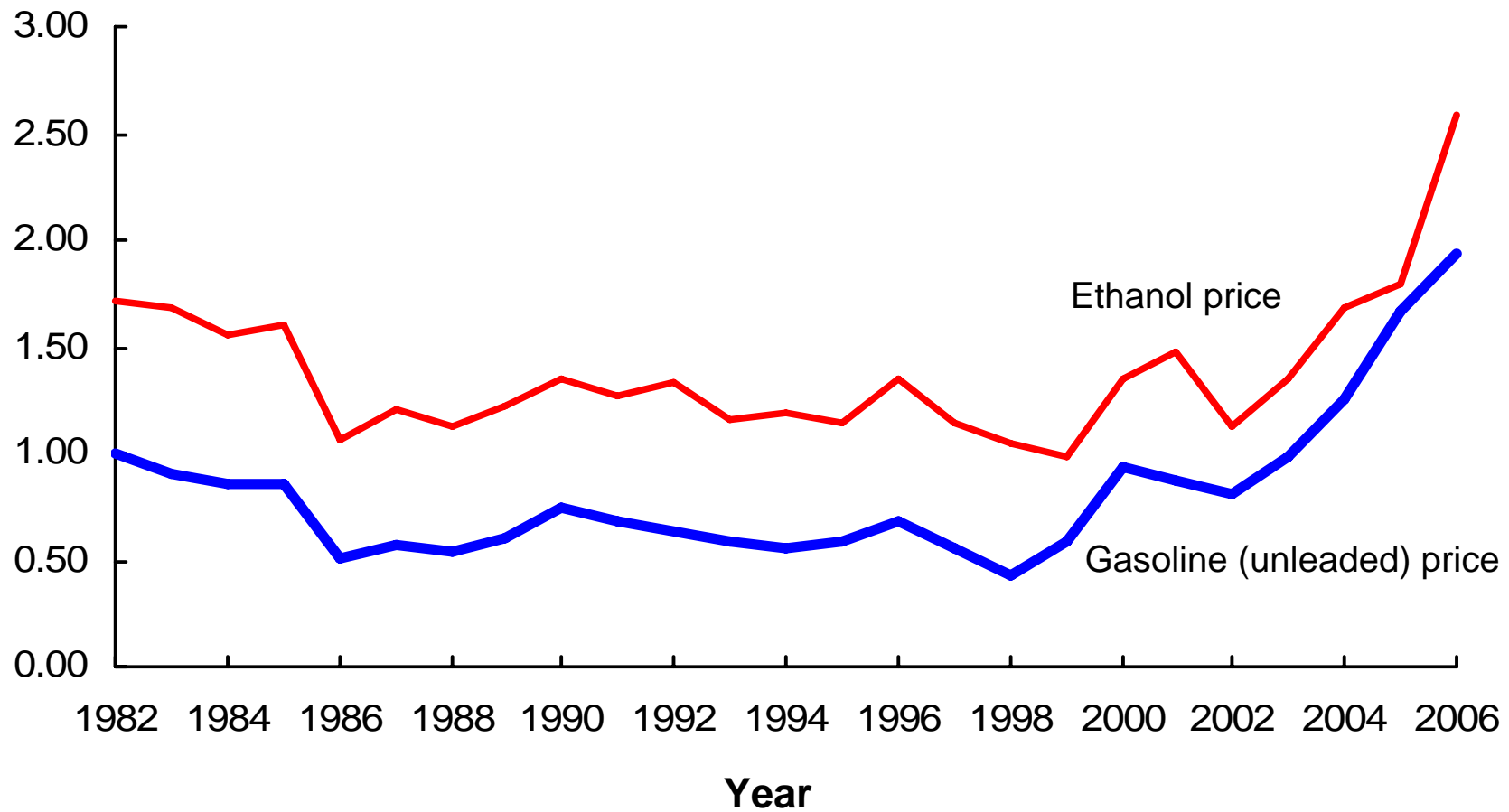
Other ethanol issues

Other ethanol issues

- Economics of ethanol production
 - Ethanol pricing
 - Distillers grains pricing
- Corn/ethanol conversion factor
- Distillers grains variability
- Infrastructure issue
 - Shipment and storage of corn, ethanol, and distillers grains
 - Vehicle fleet
- Government costs
- Water needs
- Environmental effects
- Cellulosic potential in the longer run

Ethanol and gasoline rack prices, Nebraska

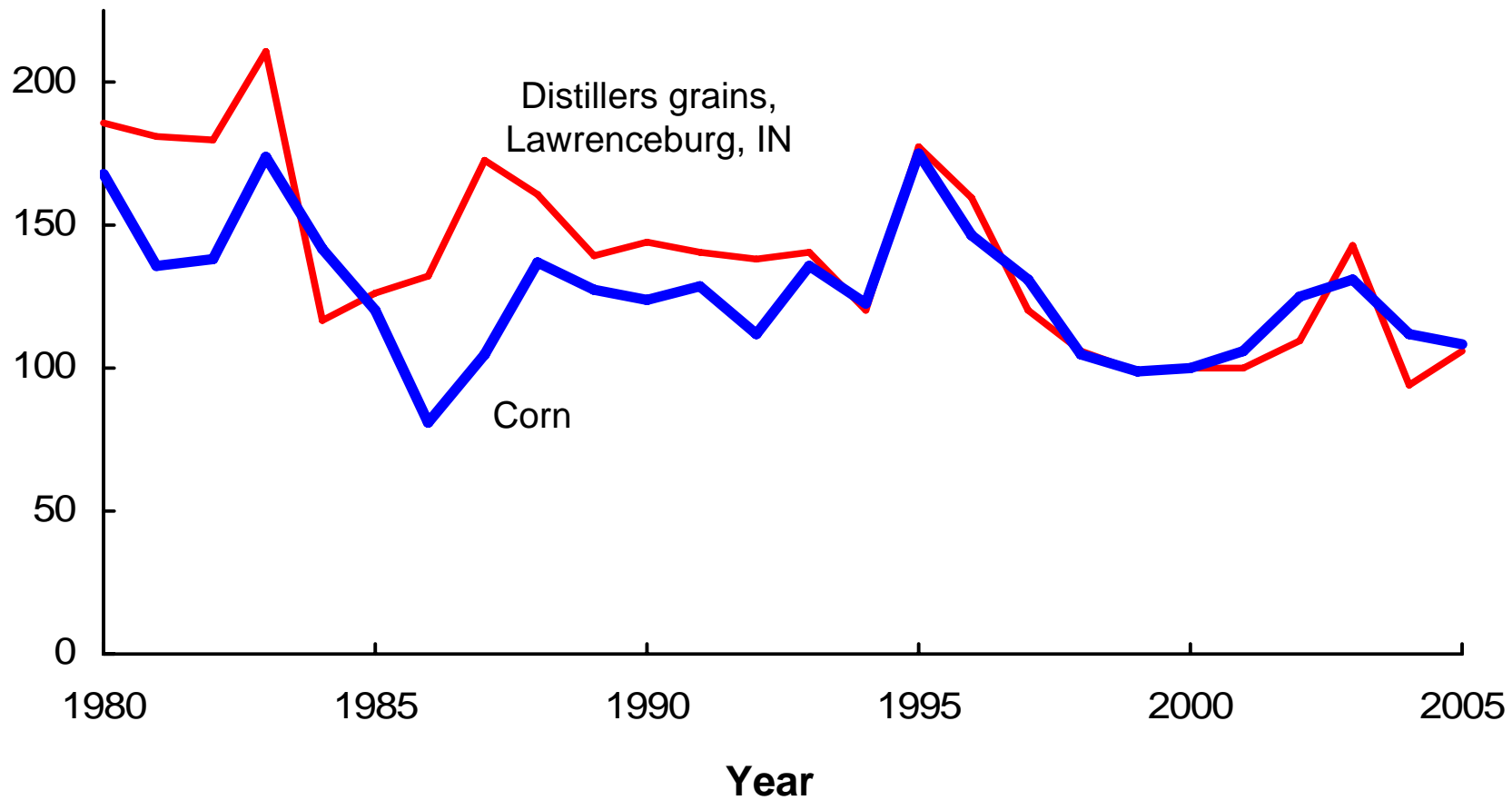
Dollars per gallon



<http://www.neo.state.ne.us/statshtml/66.html>

Prices for corn and distillers grains

Index, 2000 = 100



<http://www.ers.usda.gov/data/feedgrains/>

Corn/ethanol conversion factor: Gallons of ethanol per bushel of corn

	70%	73%	75%
	starch	starch	starch

Corn bushel, lbs.	56	56	56
Moisture content	0.15	0.15	0.15
Corn bushel, lbs., DM	47.6	47.6	47.6
Starch content, percent	70	73	75
Starch content, lbs.	33.320	34.748	35.700
Starch to glucose conversion factor	1.07	1.07	1.07
Glucose content, lbs.	35.652	37.180	38.199
Ethanol share	0.51	0.51	0.51
CO2 share	0.49	0.49	0.49
Ethanol, lbs.	18.183	18.962	19.481
CO2, lbs.	17.470	18.218	18.718
Ethanol, lbs per gallon	6.59	6.59	6.59
Ethanol, gallons	2.76	2.88	2.96

Distillers grains variability

- Variability of distillers grains increases the challenge of the livestock sector to use as a feed
- On the **supply side**, distillers grains considered an economic “by-product” by ethanol producers, since ethanol production has been so profitable
- Once ethanol margins narrow, ethanol producers will have more economic incentive to pay attention to distillers grains as an economic “coproduct”
- Suggests adjustments in production processes that reduce the variability of distillers grains
- On the **use side**, there is variability in other feeds, such as corn, but the livestock sector is used to dealing with that variability
- Distillers grains are new, so the livestock sector will learn how to manage some of the variability

Government costs

- Lower farm commodity program costs for price-sensitive programs
 - Marketing loans
 - Counter-cyclical payments
- Higher Conservation Reserve Program costs
 - Higher CRP rental rates
- Reduced tax revenues
 - Higher biofuel blender tax credits