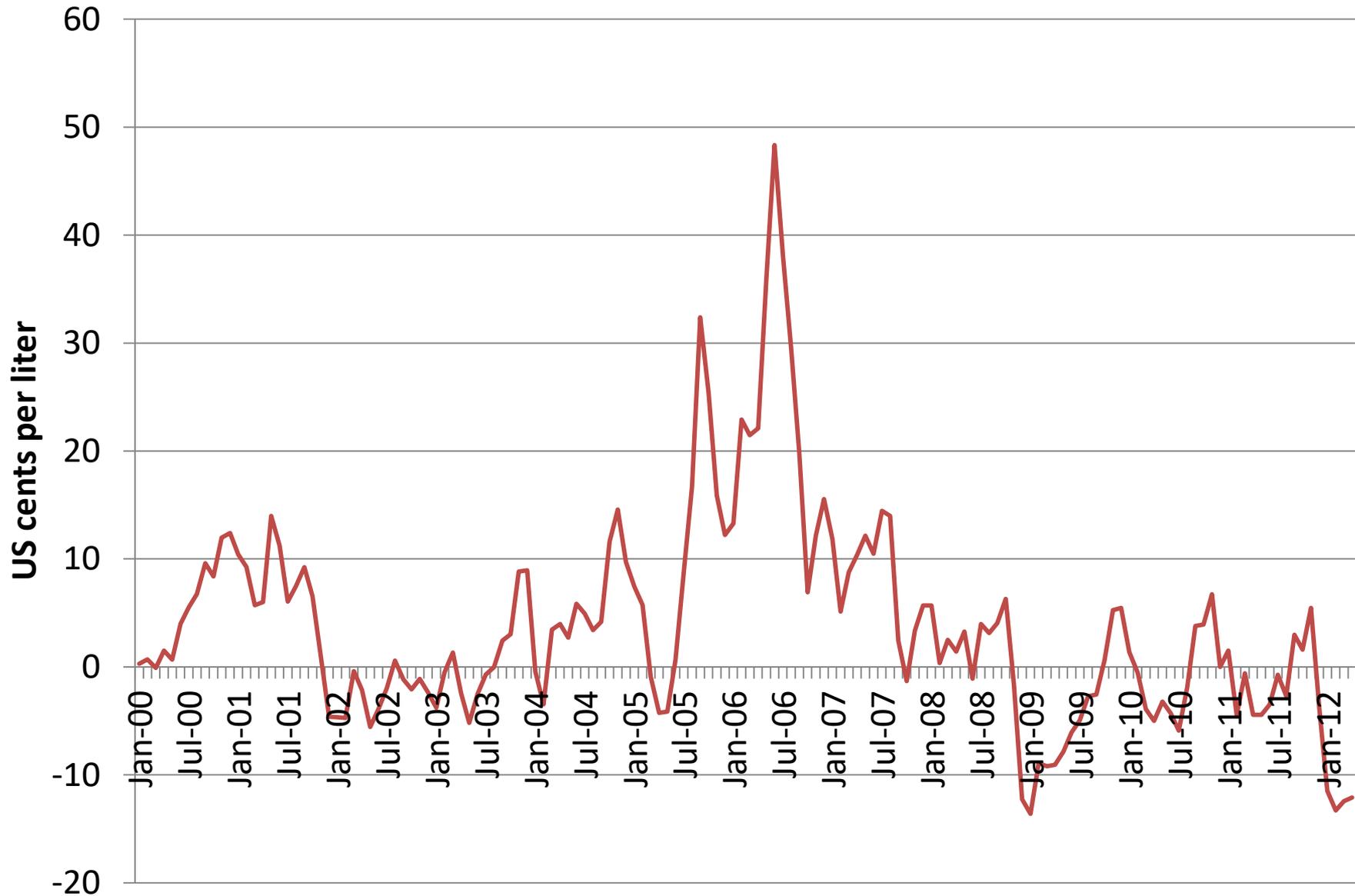


Current State of U.S. Ethanol

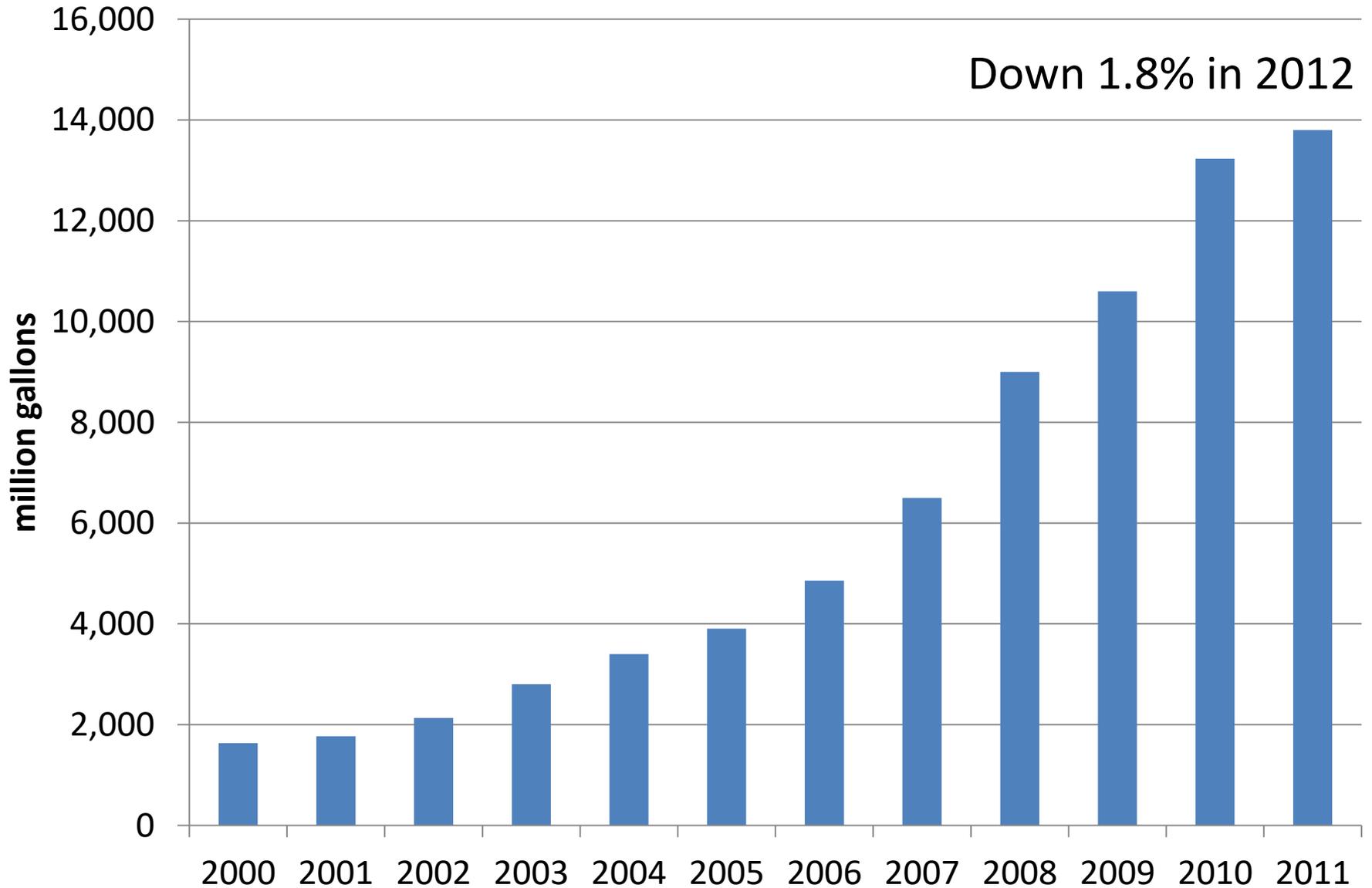
Bruce Babcock

Iowa State University

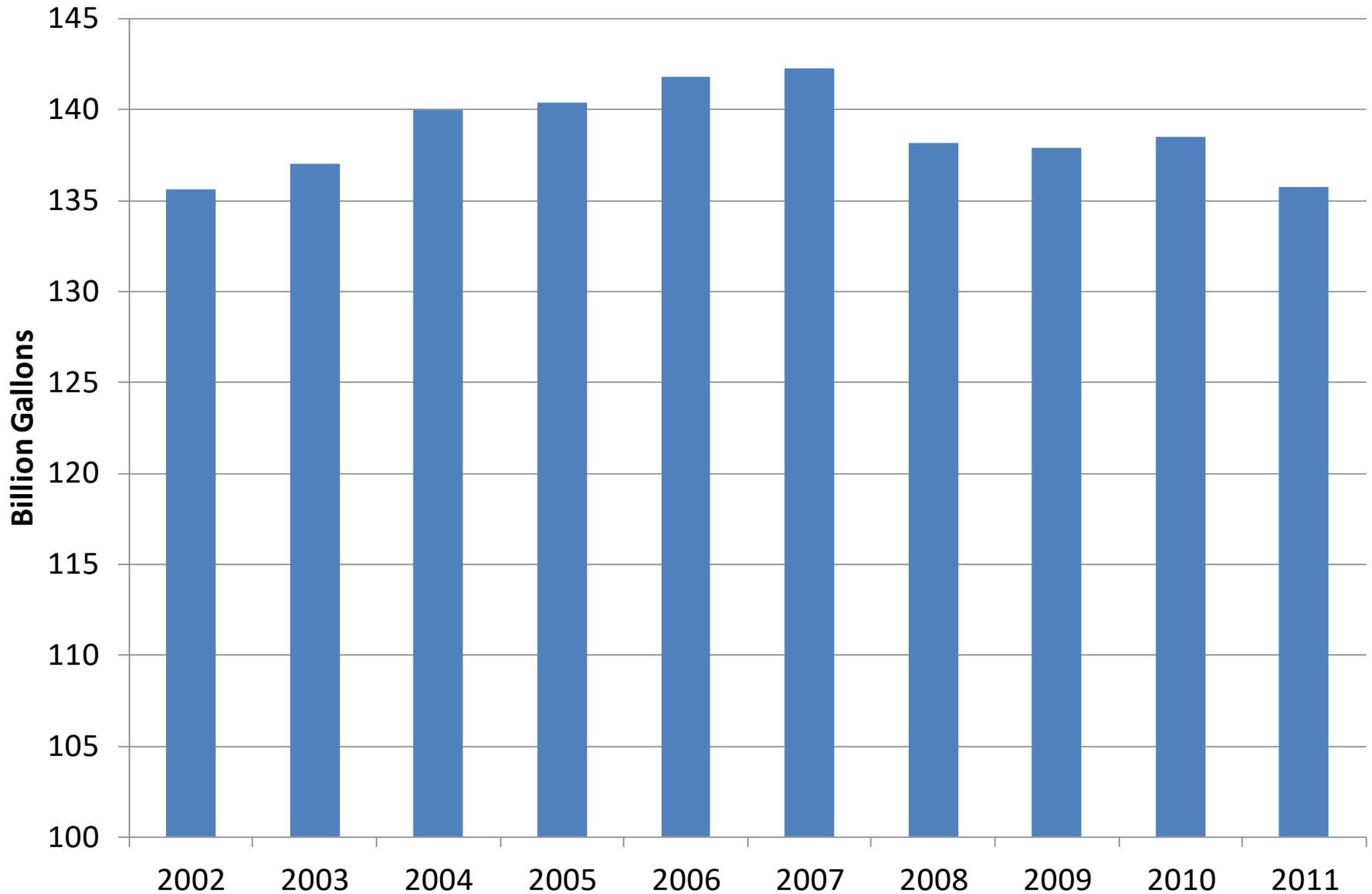
Returns over operating costs for a corn ethanol plant



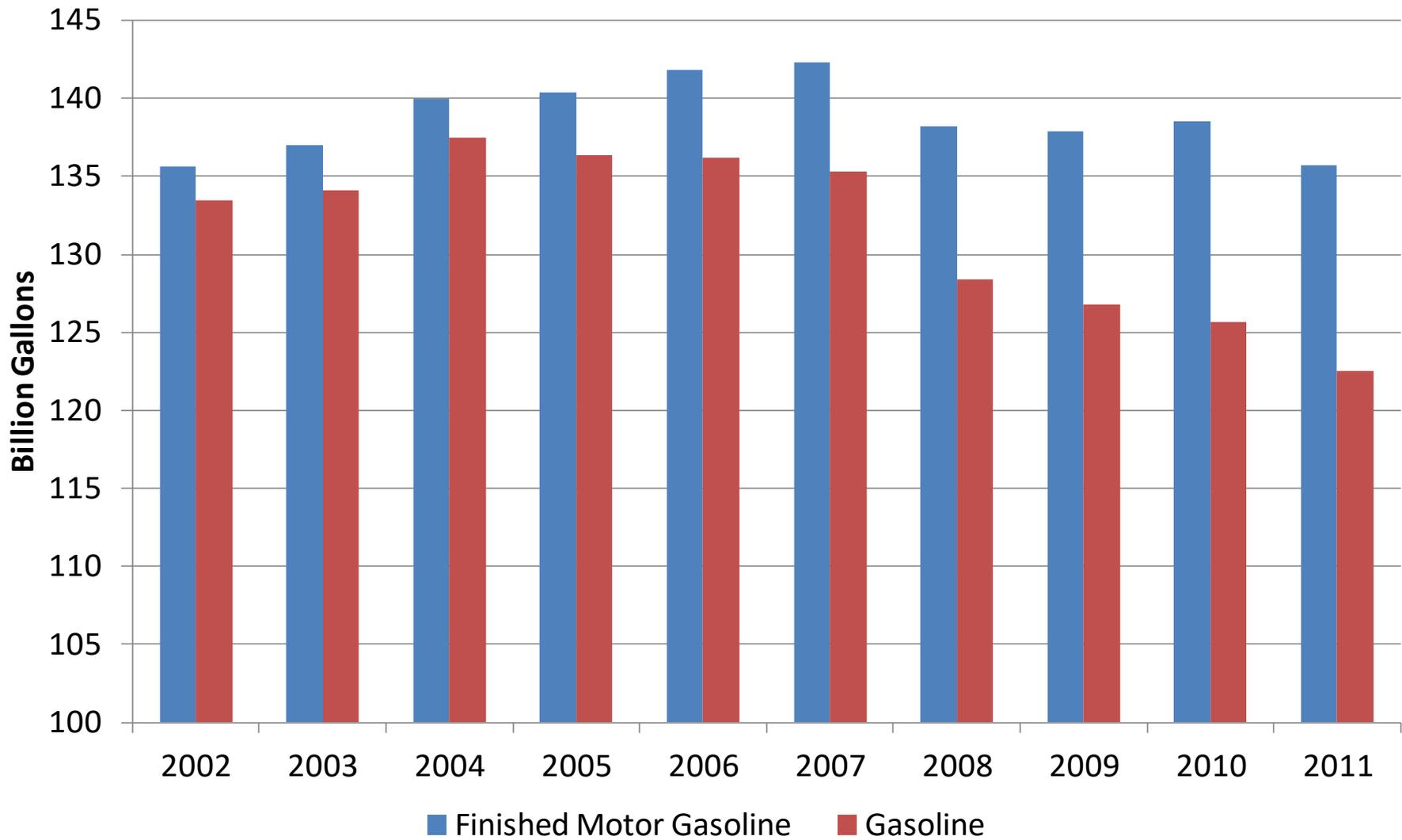
US Ethanol Production



US Finished Motor Fuel Consumption



US Gasoline Consumption Has Declined Substantially More than Fuel Consumption



Value Offered by Ethanol

- Source of energy to drive autos
 - Ethanol has 2/3rds the energy as gasoline
- Source of octane
 - Ethanol is a high octane (rating = 110) fuel
- Source of oxygenate
 - Allows fuel to burn more completely, thereby reducing emissions

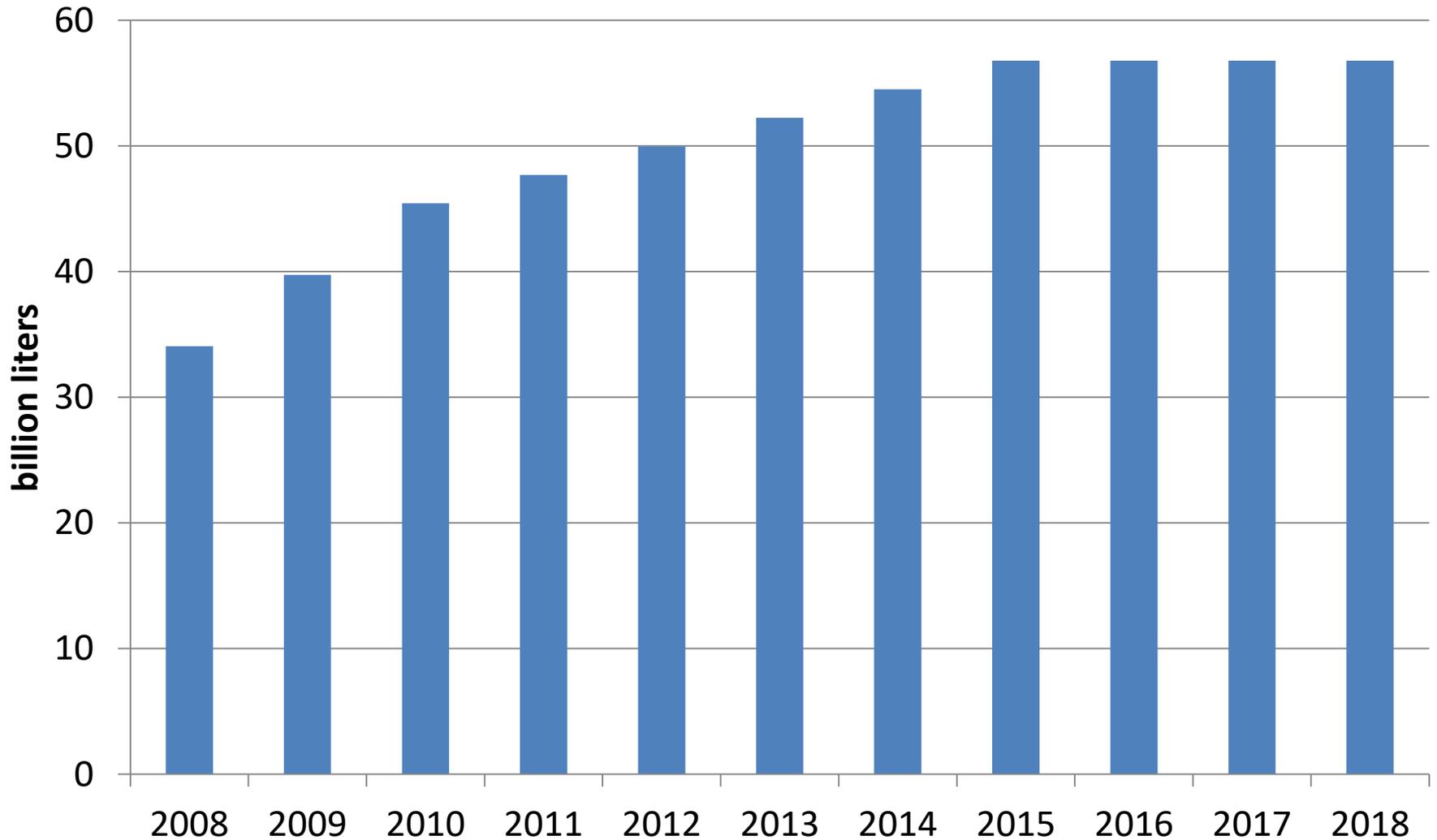
Willingness to Pay for Ethanol

- Source of energy?
 - 70% of the price of gasoline
- Source of octane?
 - Toulene costs \$4.00 per gallon
 - Production of toulene is 4 billion liters versus 50 billion liters of ethanol

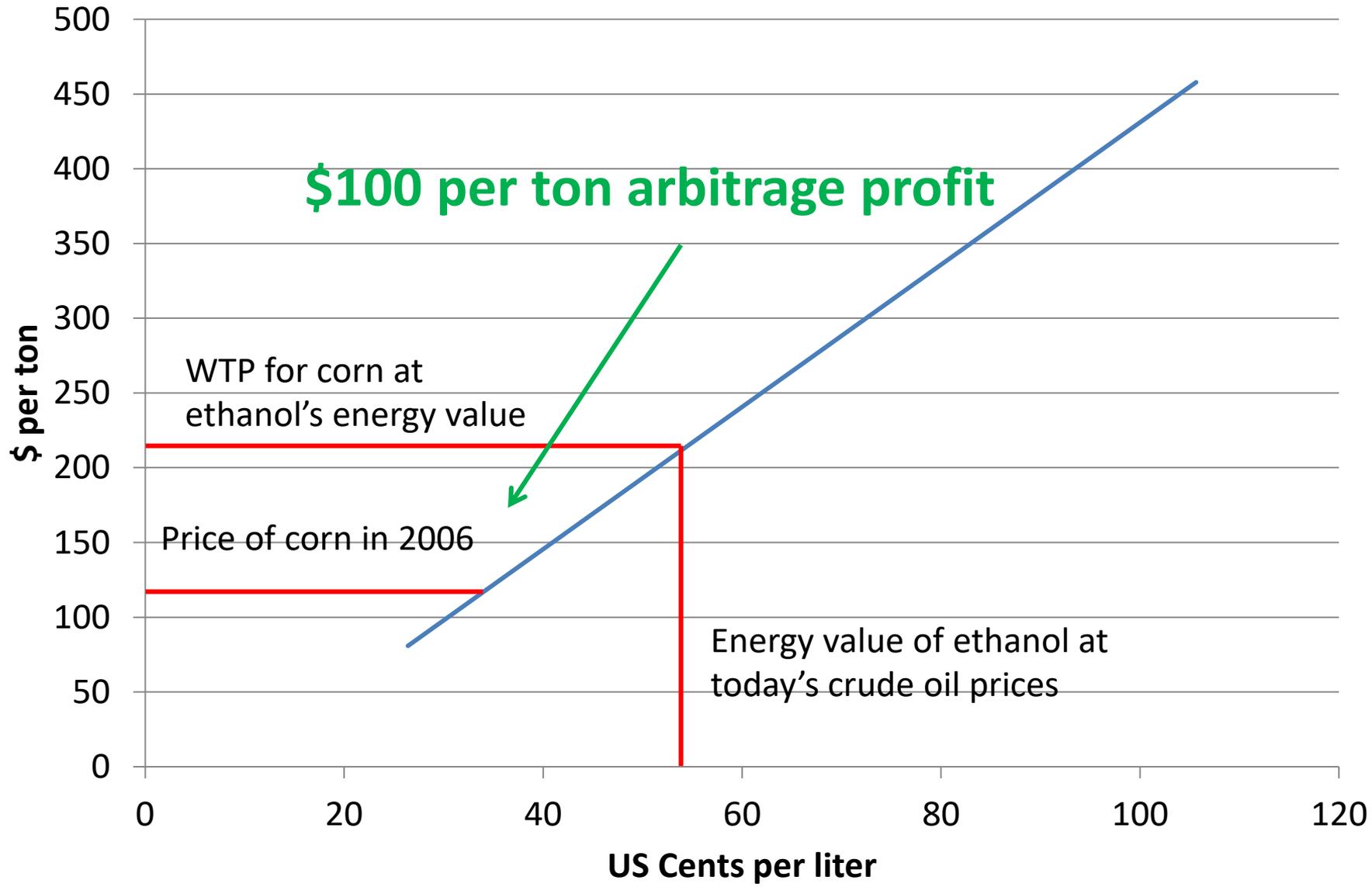
Willingness to Pay for Ethanol

- Ethanol is a high octane fuel (octane = 110)
- 90% blend of 84.4 octane gasoline plus 10% ethanol = “regular” US gasoline (87 octane)

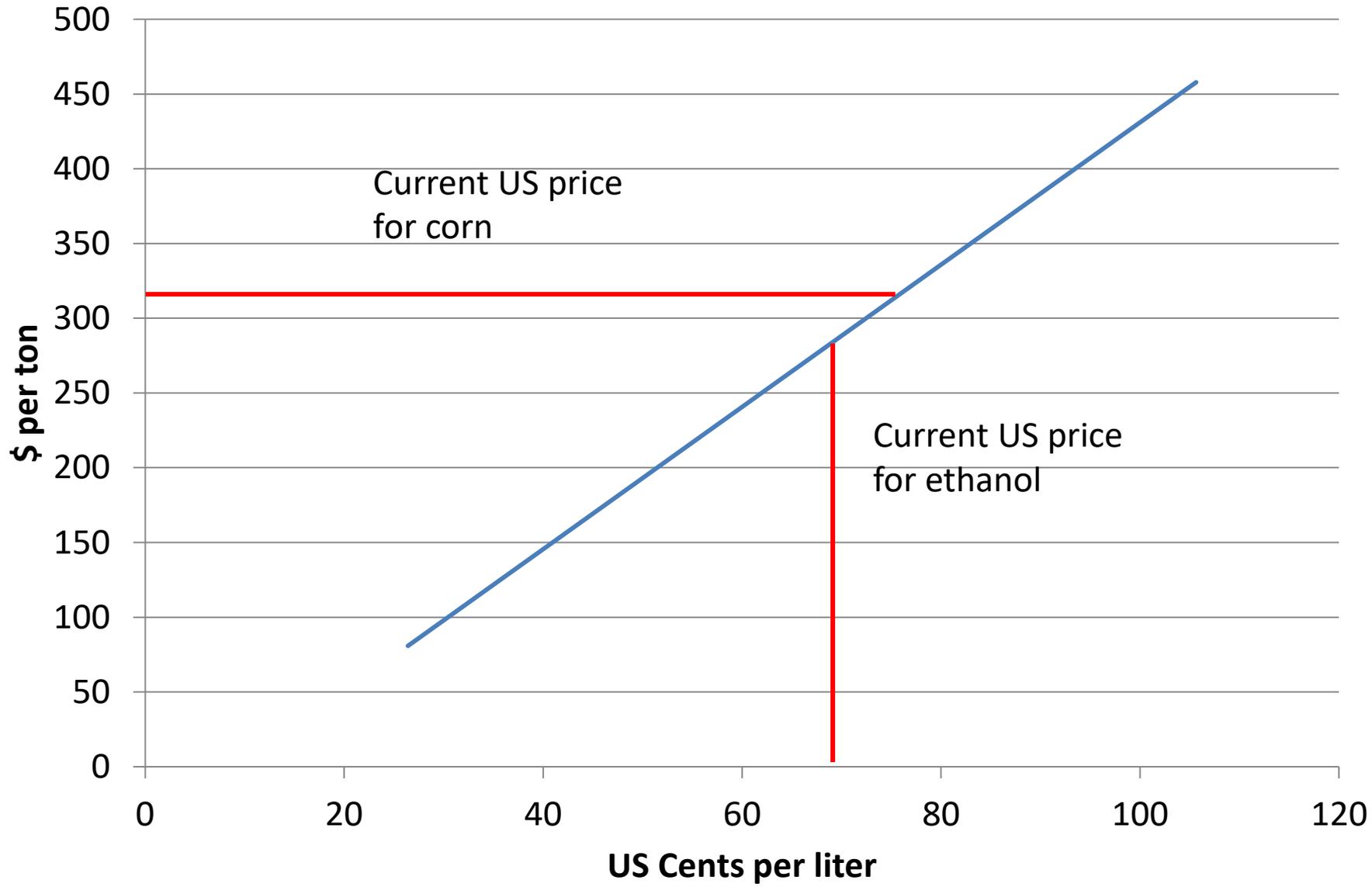
Cap on Corn Ethanol, Floor on Conventional Biofuels



Willingness to Pay for Corn by Ethanol Plants



Willingness to Pay for Corn by Ethanol Plants



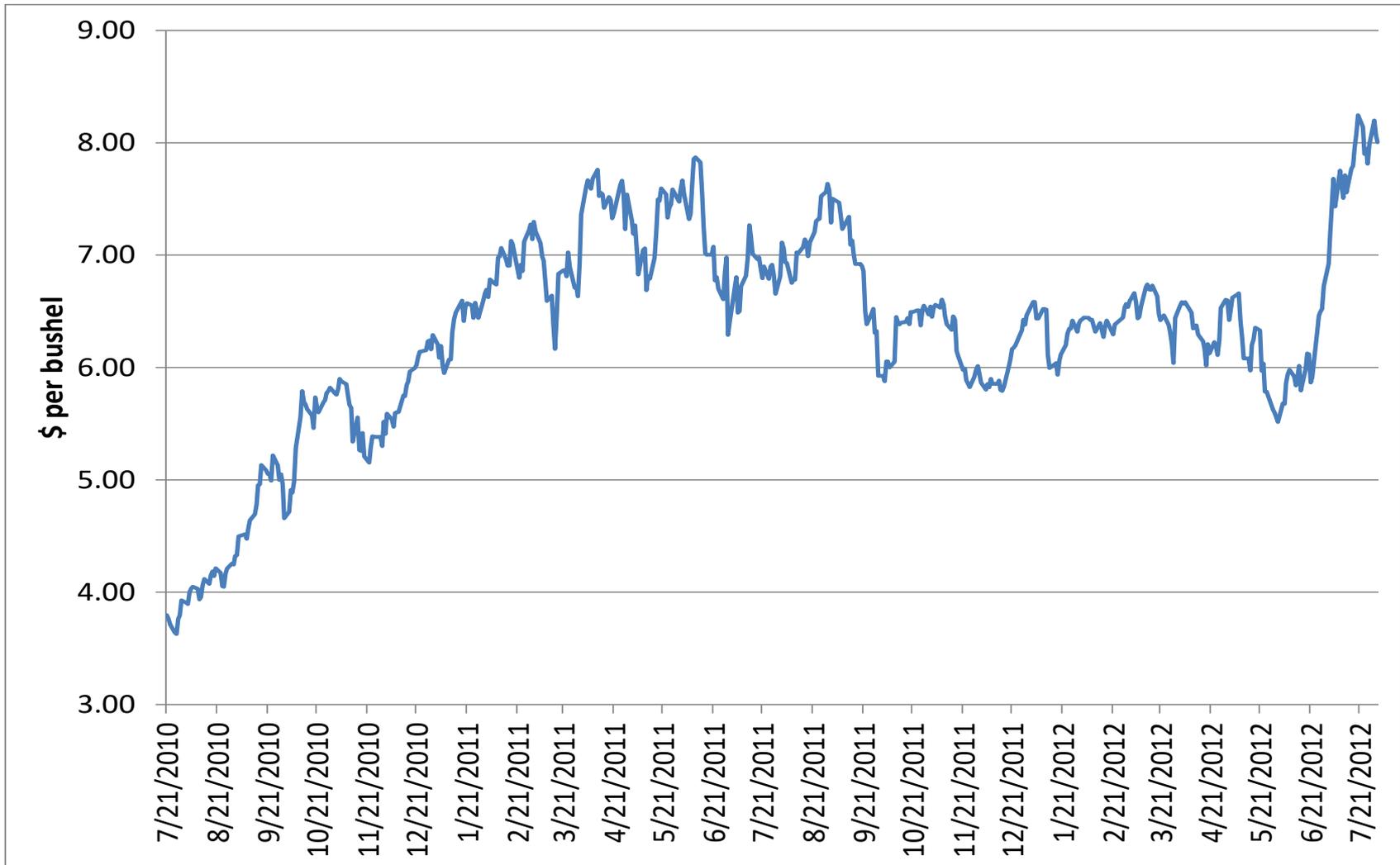
Impacts of Drought on Corn Supplies

- Expected 2012 Production
 - 360 million tons
- USDA August 10th Projections
 - 275 million tons of corn (down 24%)

The Problem

- US corn use was 317 million tons in 2011
 - 127 million for ethanol
 - 117 million for feed
 - 40 million for exports
 - 36 million for food and seed
- With total supplies of 285 million tons and 2011 use of 317, U.S. is “short” 32 million tons of corn

Price Movement

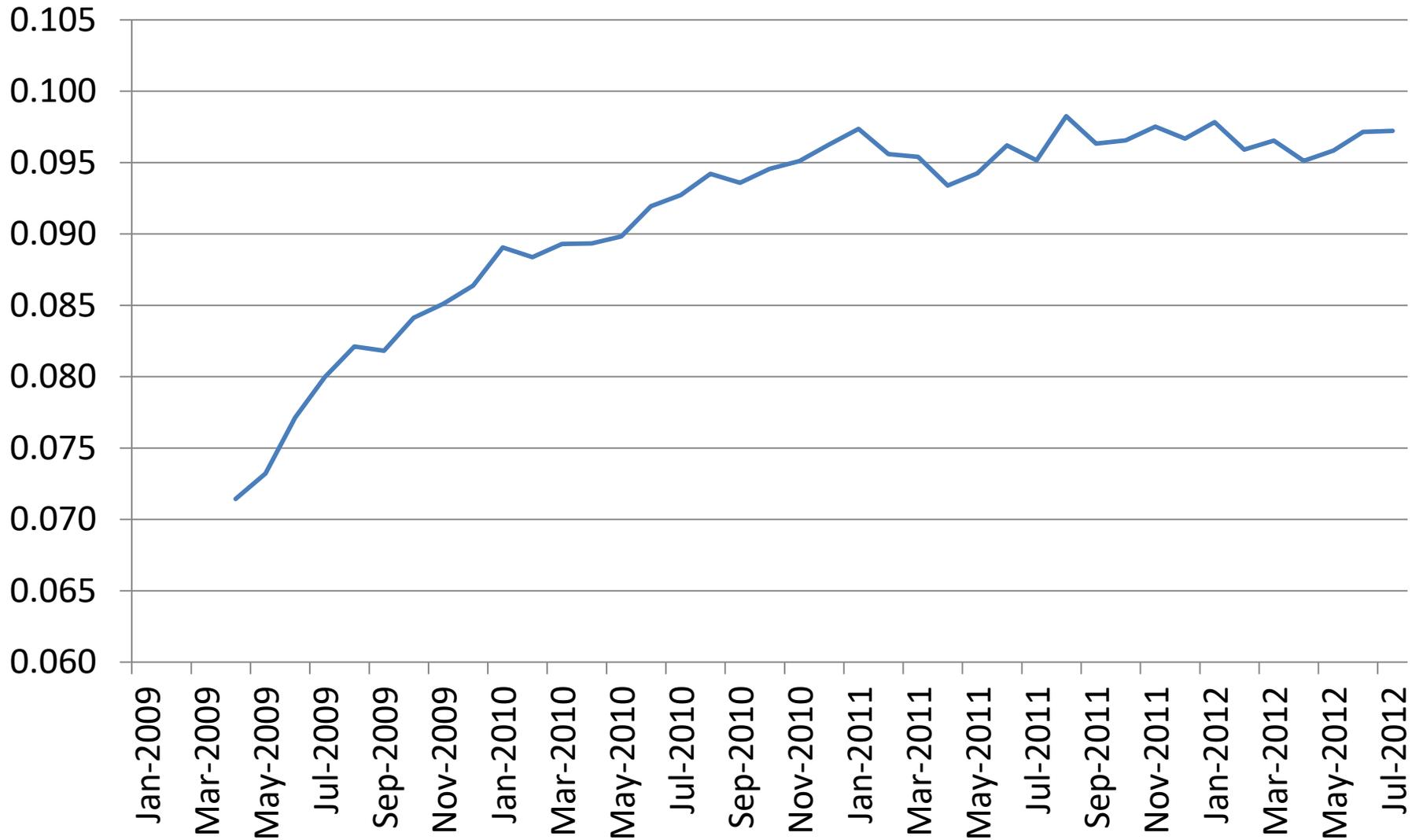


Some elasticity arithmetic

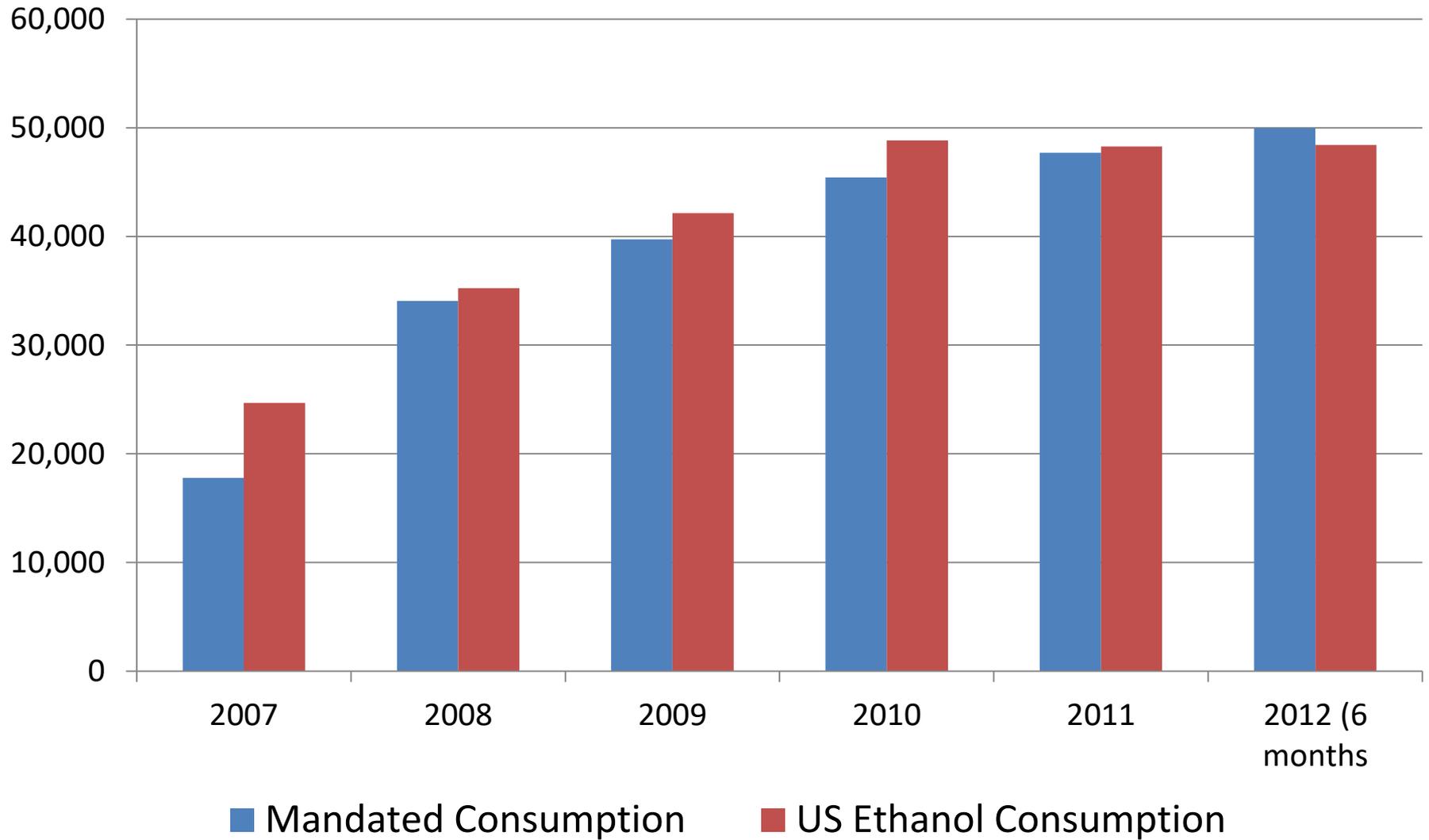
- Supply contracted by about 25%
- Price increased by about 50%
- Implied total demand elasticity = -0.5

- But price likely would have fallen in the summer without a drought
 - Price elasticity lower than -0.5 because demand for ethanol is likely quite price inelastic

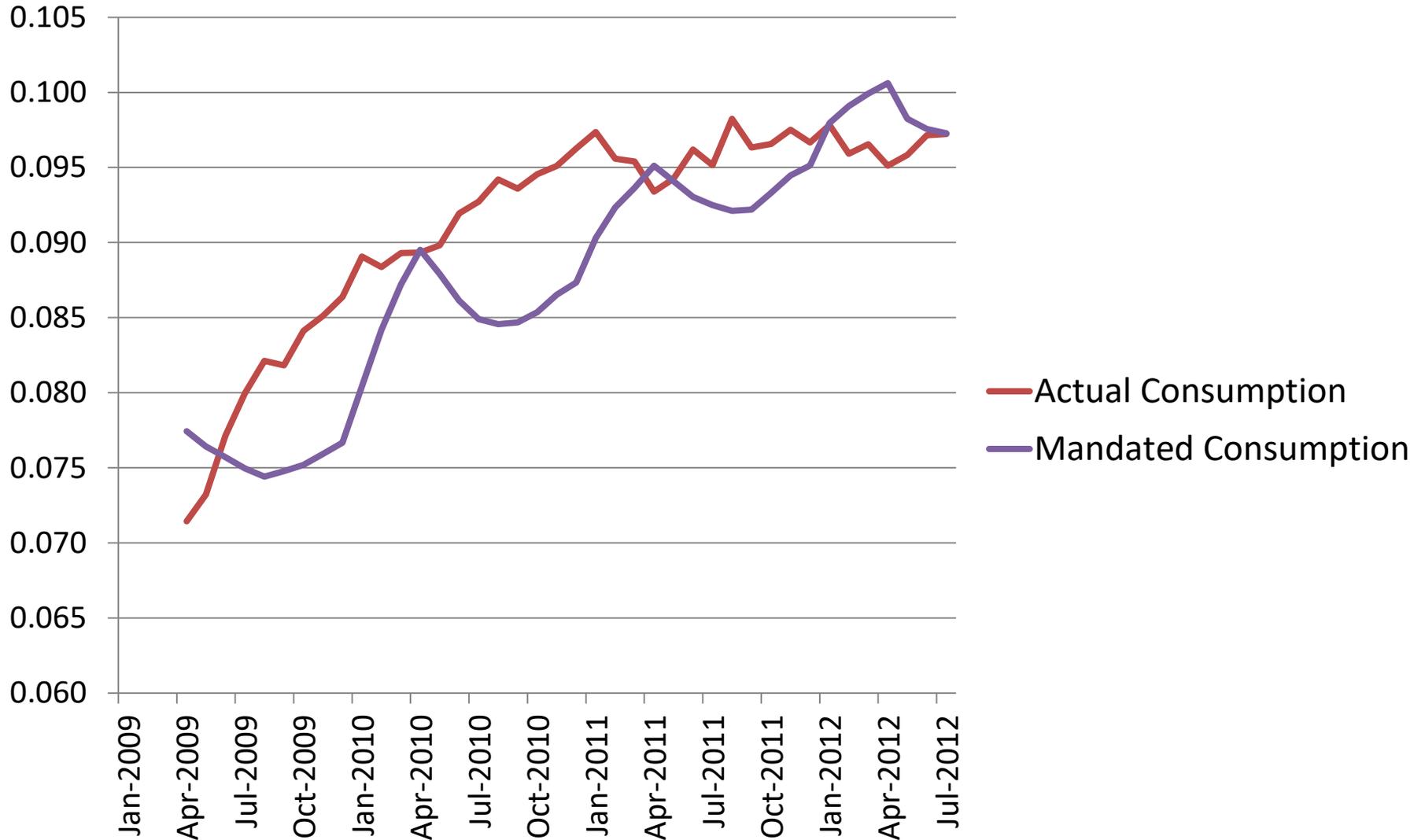
Ratio of US Ethanol Consumption to Gasoline Consumption since 2009



US Mandate Has Not Been Binding Until Perhaps This Year



Mandated versus Actual Consumption of Ethanol



Current Situation

- Two U.S. governors at the behest of livestock industries have asked for a mandate waiver
- U.S. will be short of feed.
- Will waiver reduce ethanol consumption?

What is Demand Elasticity for Ethanol?

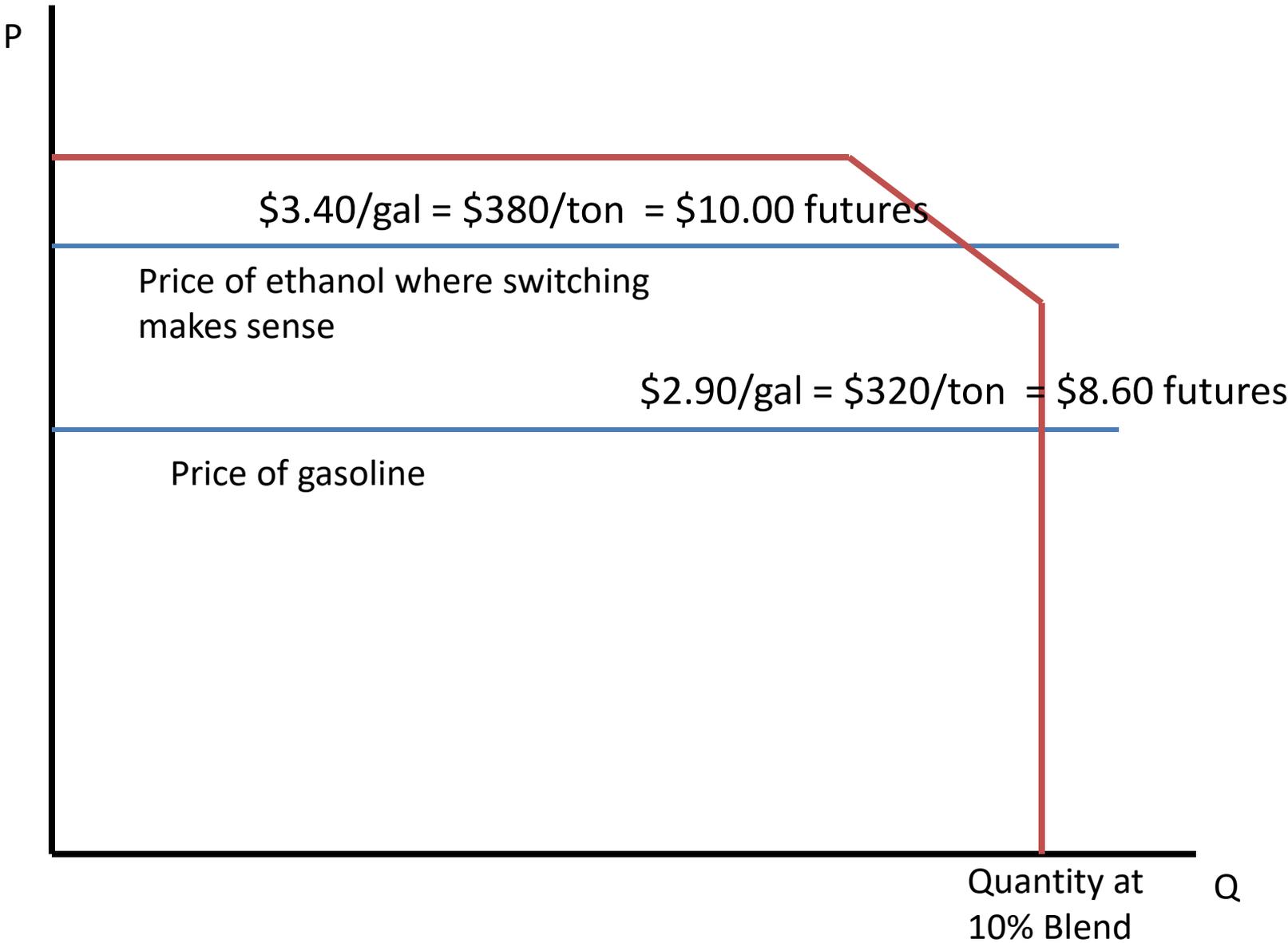
- Is ethanol a close substitute for gasoline?
 - In Brazil, yes if FFVs are using ethanol
 - In US, yes if ethanol is being used for its energy value as a fuel
- Or is ethanol a complement to gasoline?
 - Yes if Brazilian FFVS are running on gasoline and there is a 20% blend mandate
 - Yes if refineries are configured to need octane to produce 87 octane gasoline
 - Yes if oil companies are mandated to use ethanol

Will Refineries Switch from Ethanol?

- If switching costs are greater than the cost of using ethanol, refineries will not switch
- If waiver lasts 12 months, refineries will need to switch back in the fall of 2013.
- If price of ethanol $<$ price of gasoline, no benefit from switching
- Some price of ethanol above price of gasoline will result in a benefit to switching

Switching Costs

- Fuel attributes regulated by EPA
- Different methods of meeting fuel standards, but costs of switching from one method to another are significant.
- Difficult for a non-insider to estimate



Observations

- Importance of reality of short-run inelasticities often overlooked by market-oriented economists
- Degree of long-run flexibility underestimated by industry-following economists
- Prediction:
 - Some low-cost, reversible flexibilities will be found by refineries if a waiver is granted so prices will not increase to \$10.00
 - But price of corn is too low now to induce switching. Price will have to rise

Lessons Learned

- Thought that corn use for ethanol could be turned off if supplies are short was misguided.
 - High price of crude oil combined with short-run inflexibilities limit the ability to switch from corn to crude
- Idea of a flexible mandate makes no sense if crude is high and switching costs are important
- Better to be like Brazil and to be in the elastic portion of ethanol demand
- US is not ready to embrace biofuels to the extent that demand will be elastic