Biofuel Issues in a Stochastic World

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NAREA annual meeting
Quebec City
July 1, 2008

Food and Agricultural Policy Research Institute
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Major points

- Effects of biofuel policies are contingent on market situation
- Stochastic analysis helps

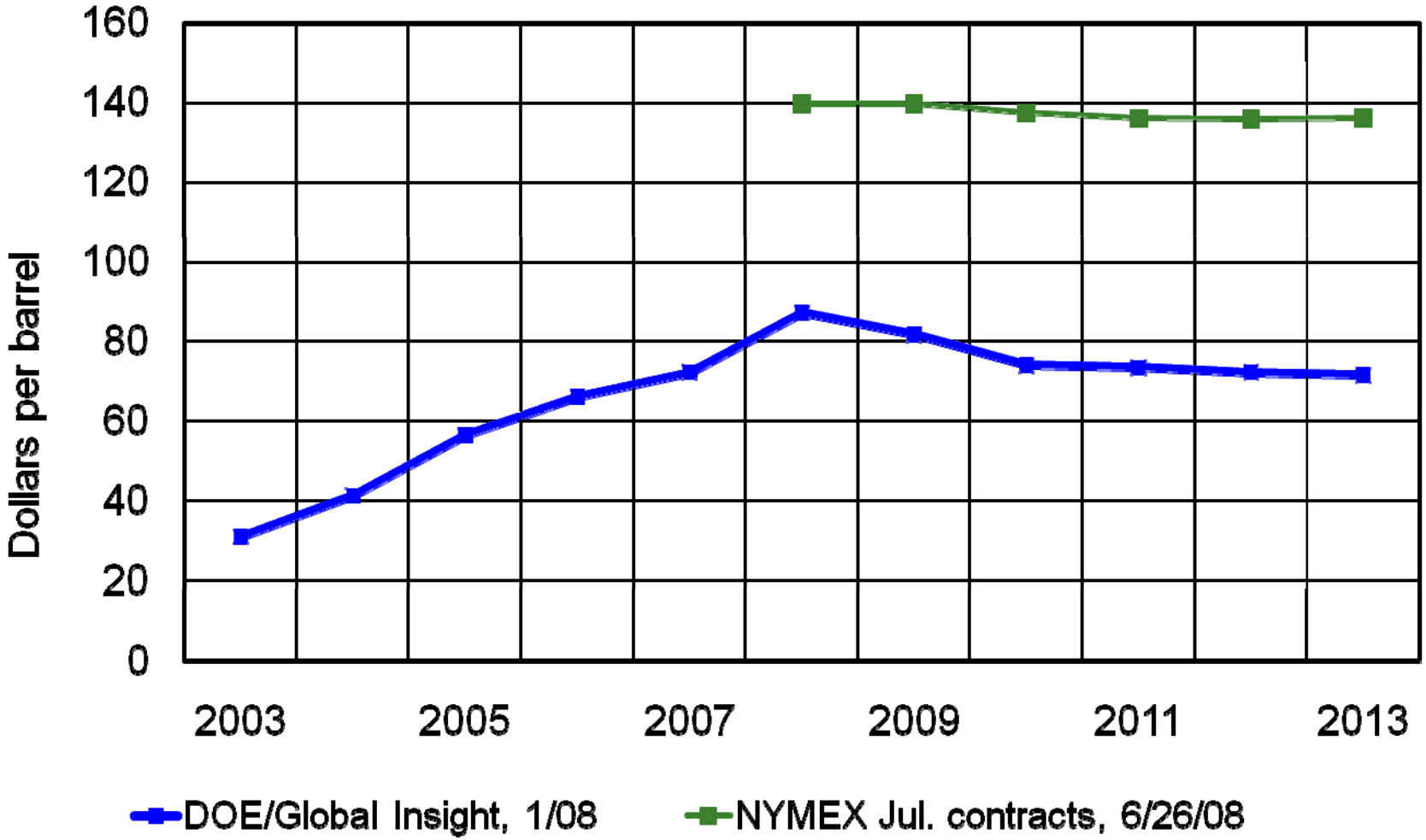
Starting point for analysis: FAPRI baseline

- Deterministic baseline (early 2008)
  - Biofuels, grains, oilseeds, sugar, cotton, livestock
  - Major exporters and importers

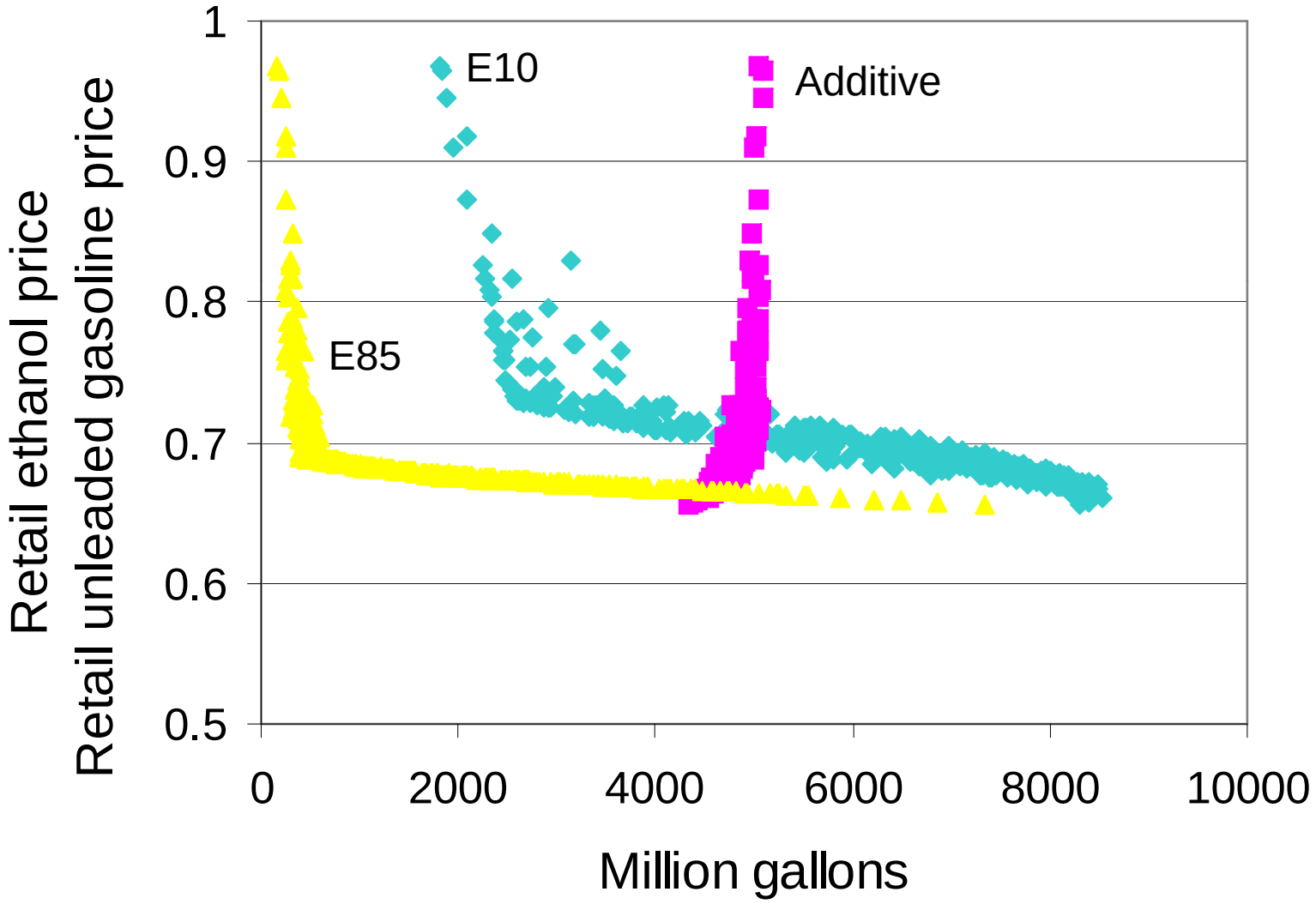
- Stochastic baseline
  - 500 outcomes for U.S. only
  - Draws from distributions of crop yields, petroleum prices, other supply and demand factors
  - Share same policy assumptions
  - Reduced form ROW equations

Petroleum price

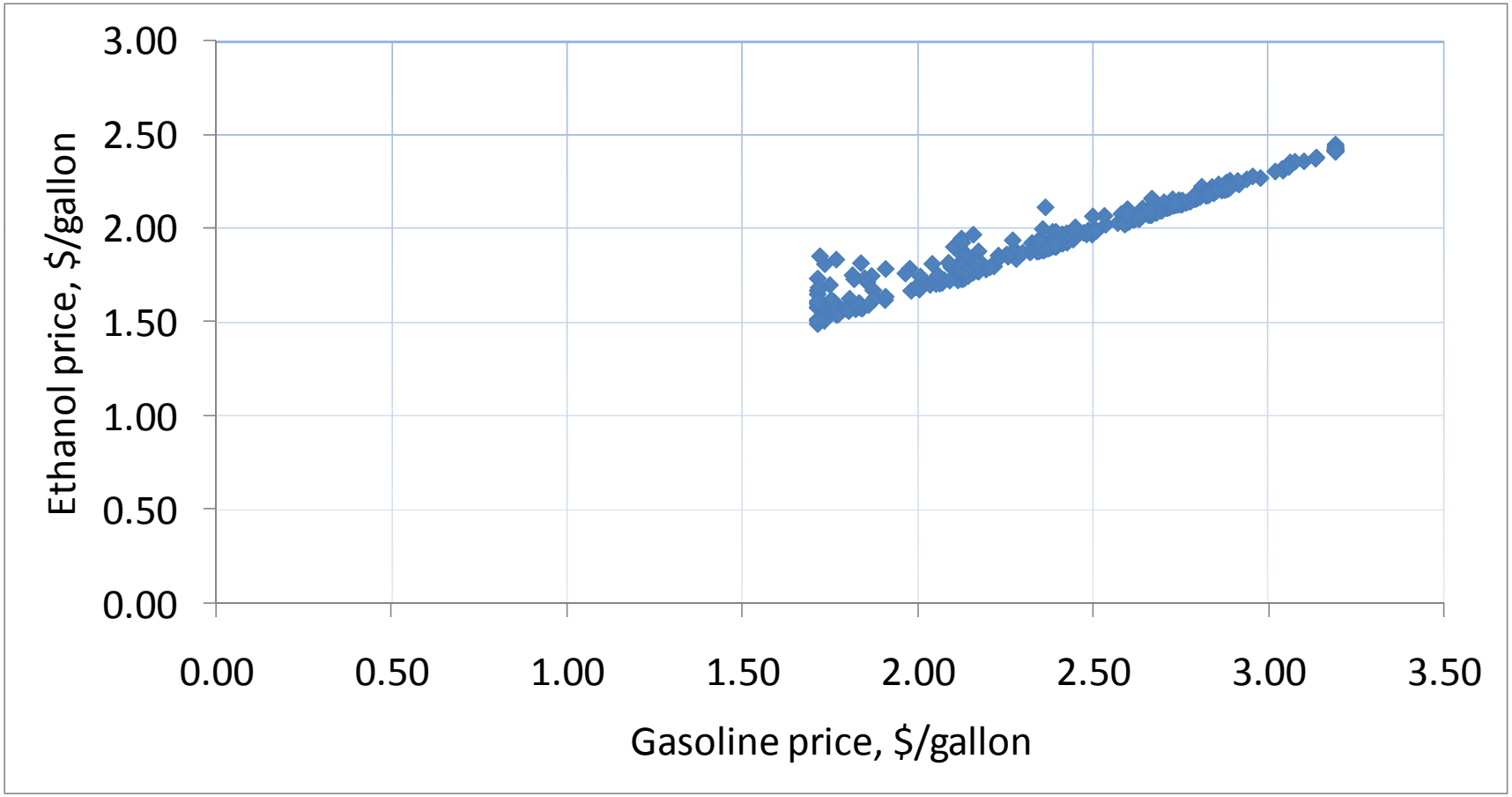
(West Texas Intermediate)



Ethanol demand by type 2012/13



2008/09 ethanol, gasoline rack prices



Source: FAPRI 2008 stochastic baseline

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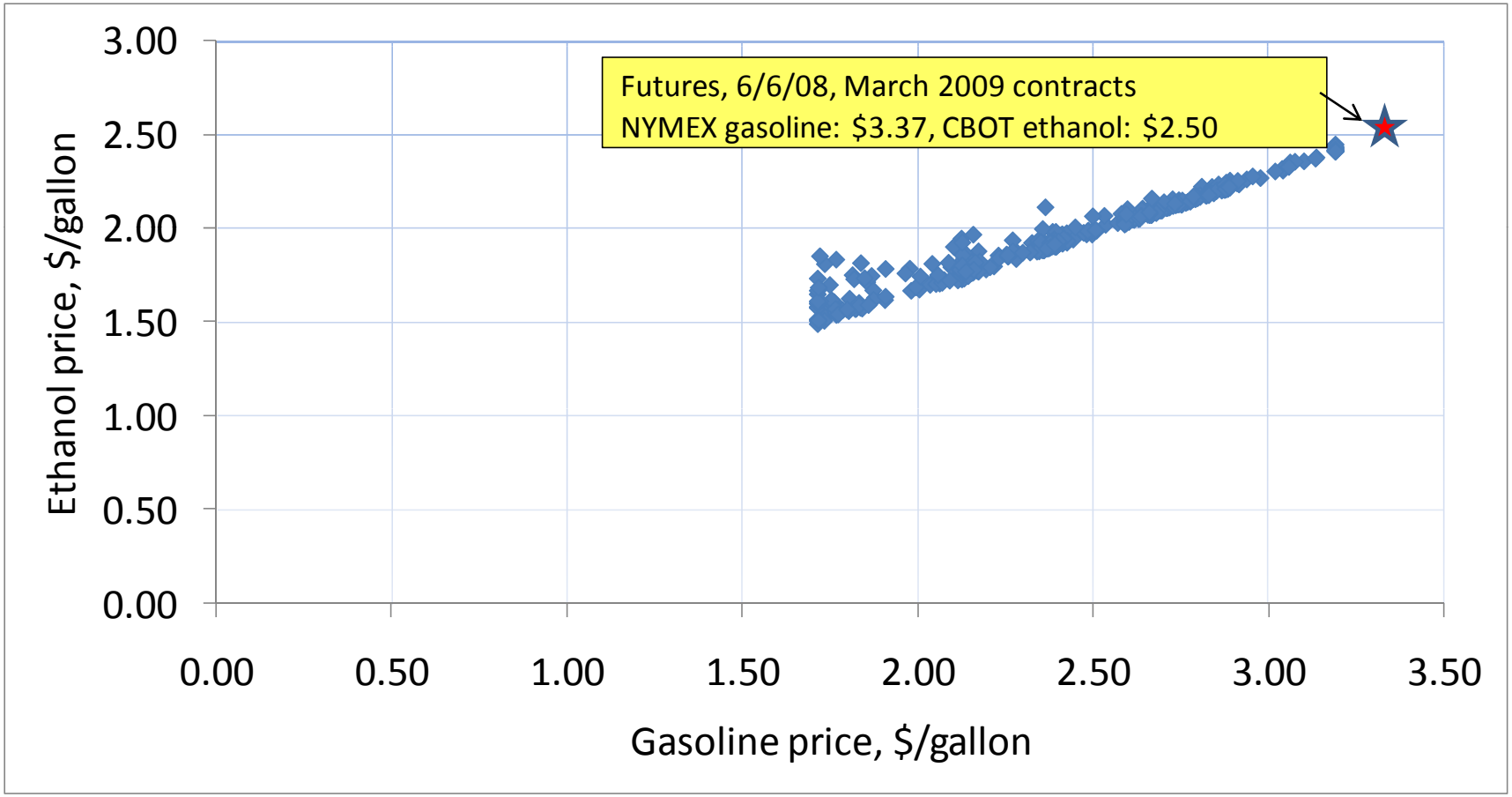

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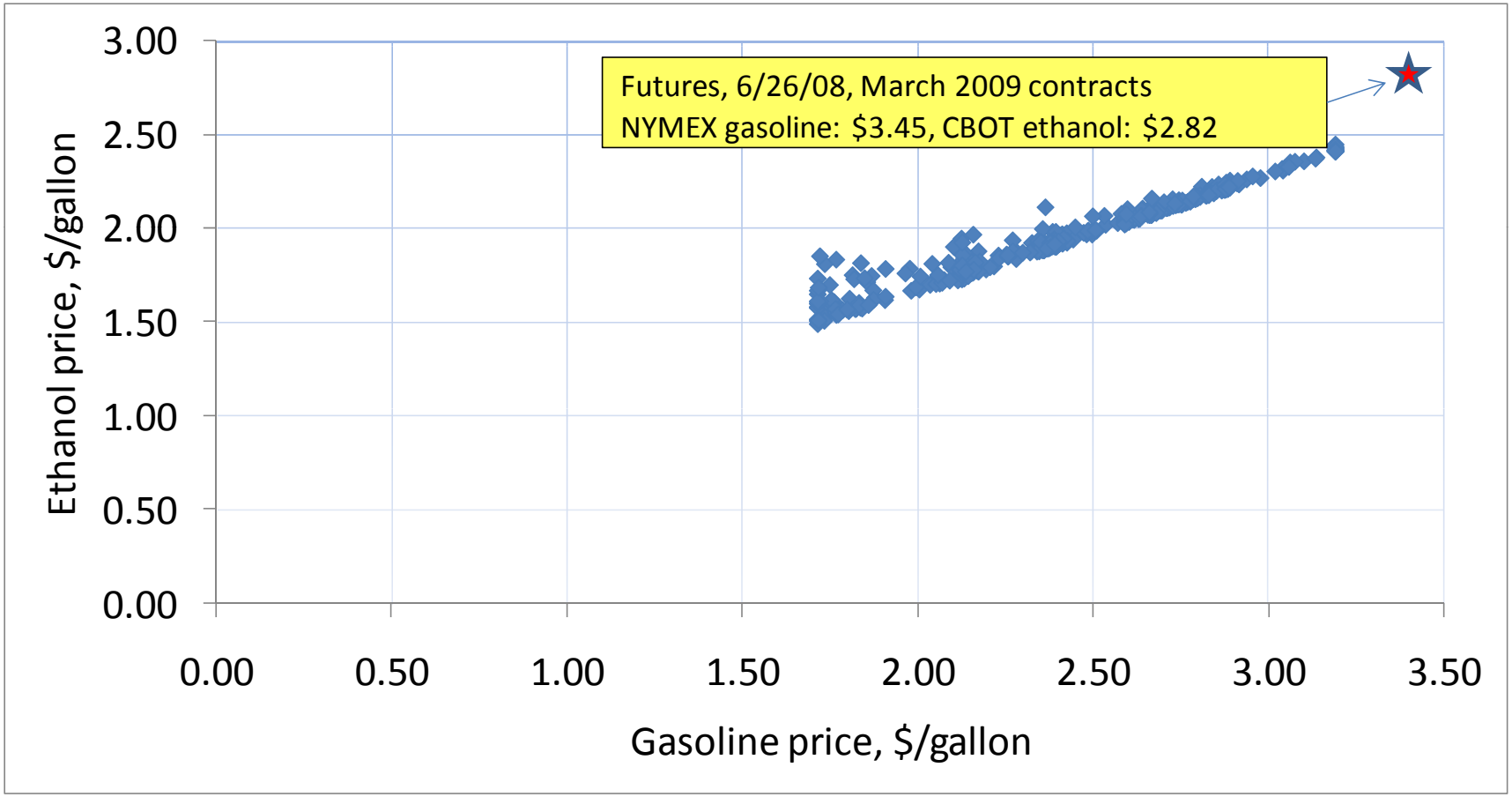
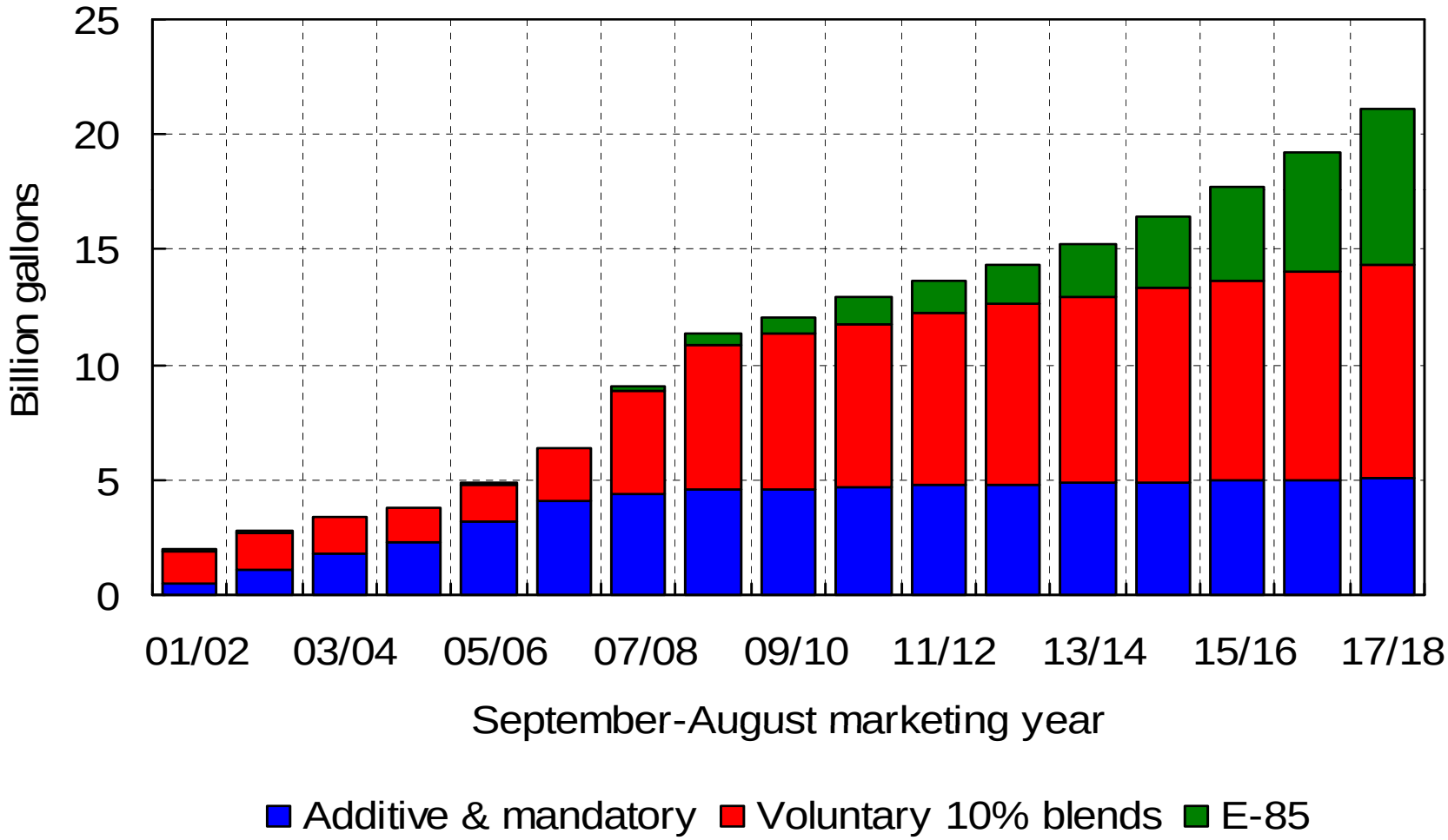


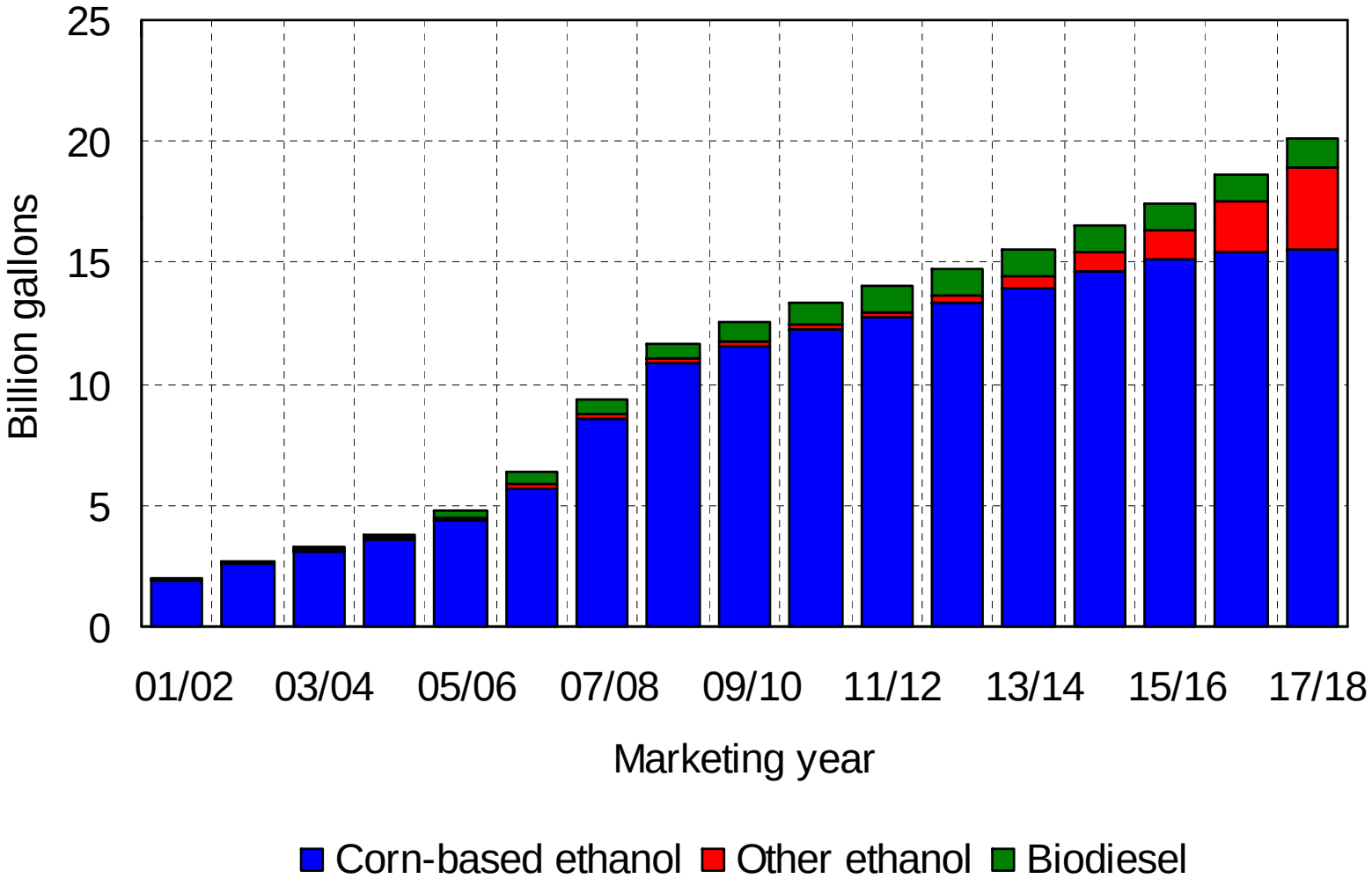
Source: FAPRI 2008 stochastic baseline

Ethanol consumption

Jan. 2008 FAPRI baseline



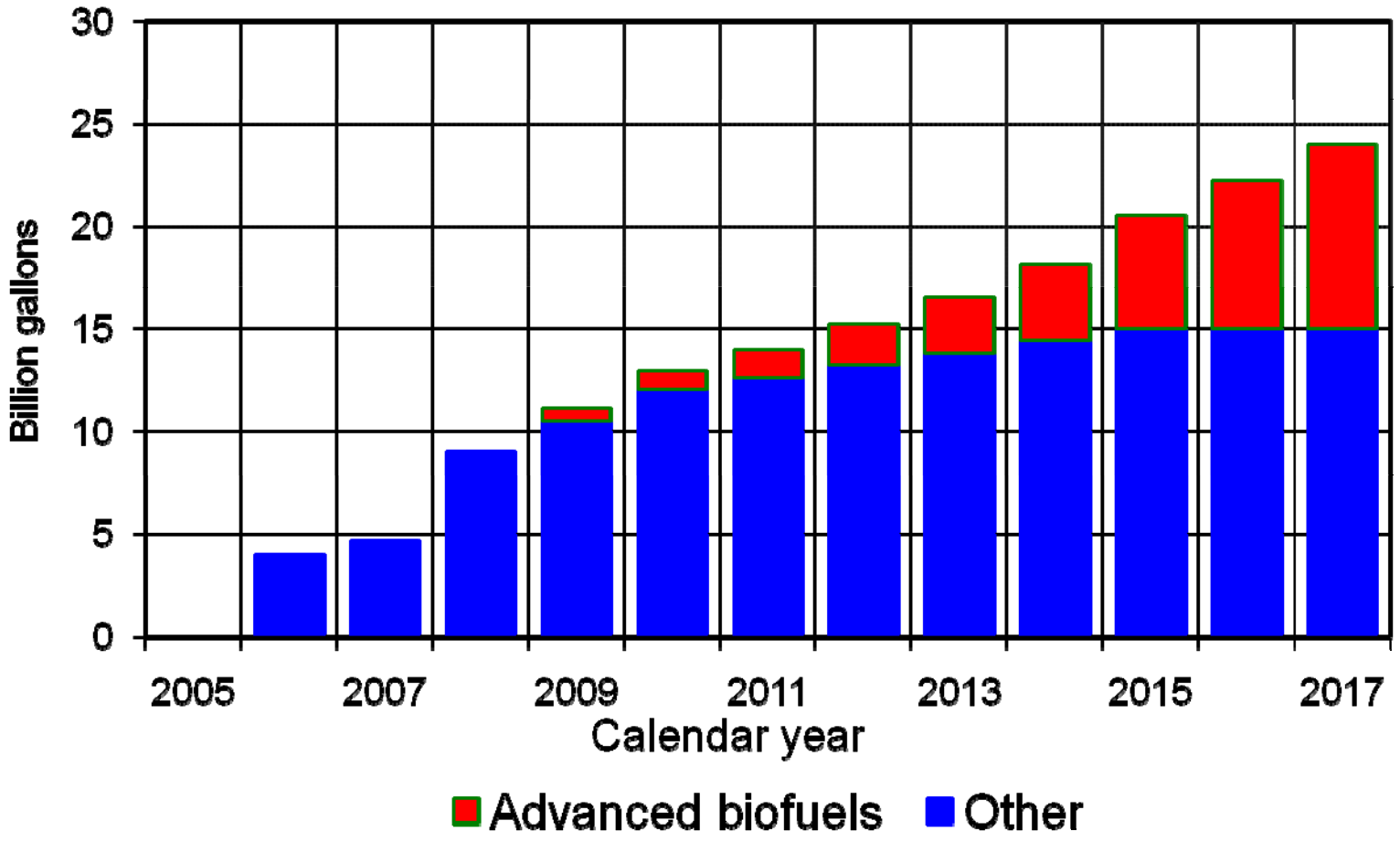
Biofuel production
(Jan. 2008 FAPRI baseline)



EISA provisions

- Minimum levels of use of various classes of biofuels
  - Overall total grows to 36 billion gallons by 2022
  - Corn-based ethanol can only contribute 15 bil. gallons toward meeting the mandate
- Authority for waivers of the mandates
- Does NOT change pre-existing biofuel tax credits and tariffs

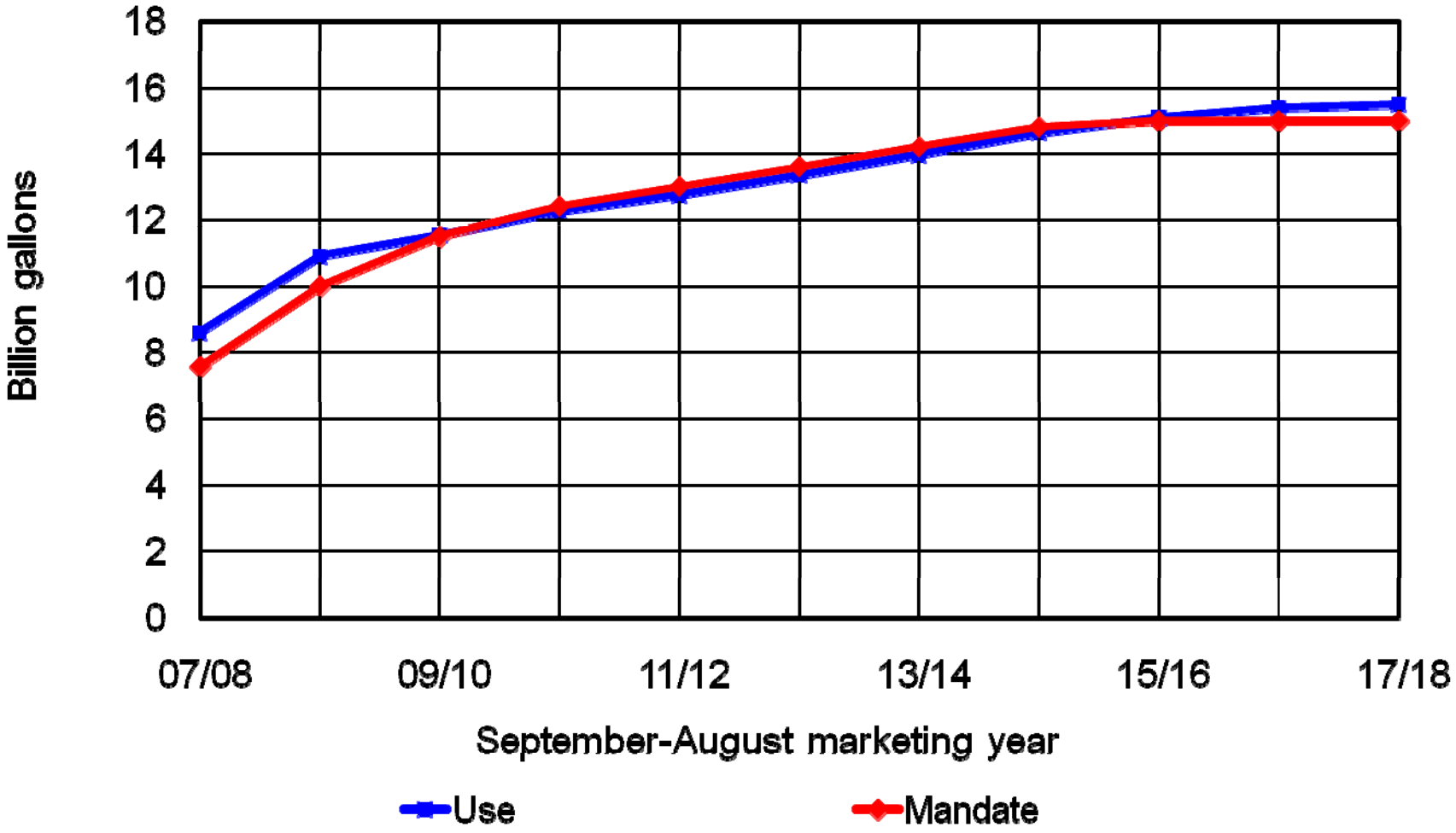
EISA mandates: the simple version



EISA: a few of the complications

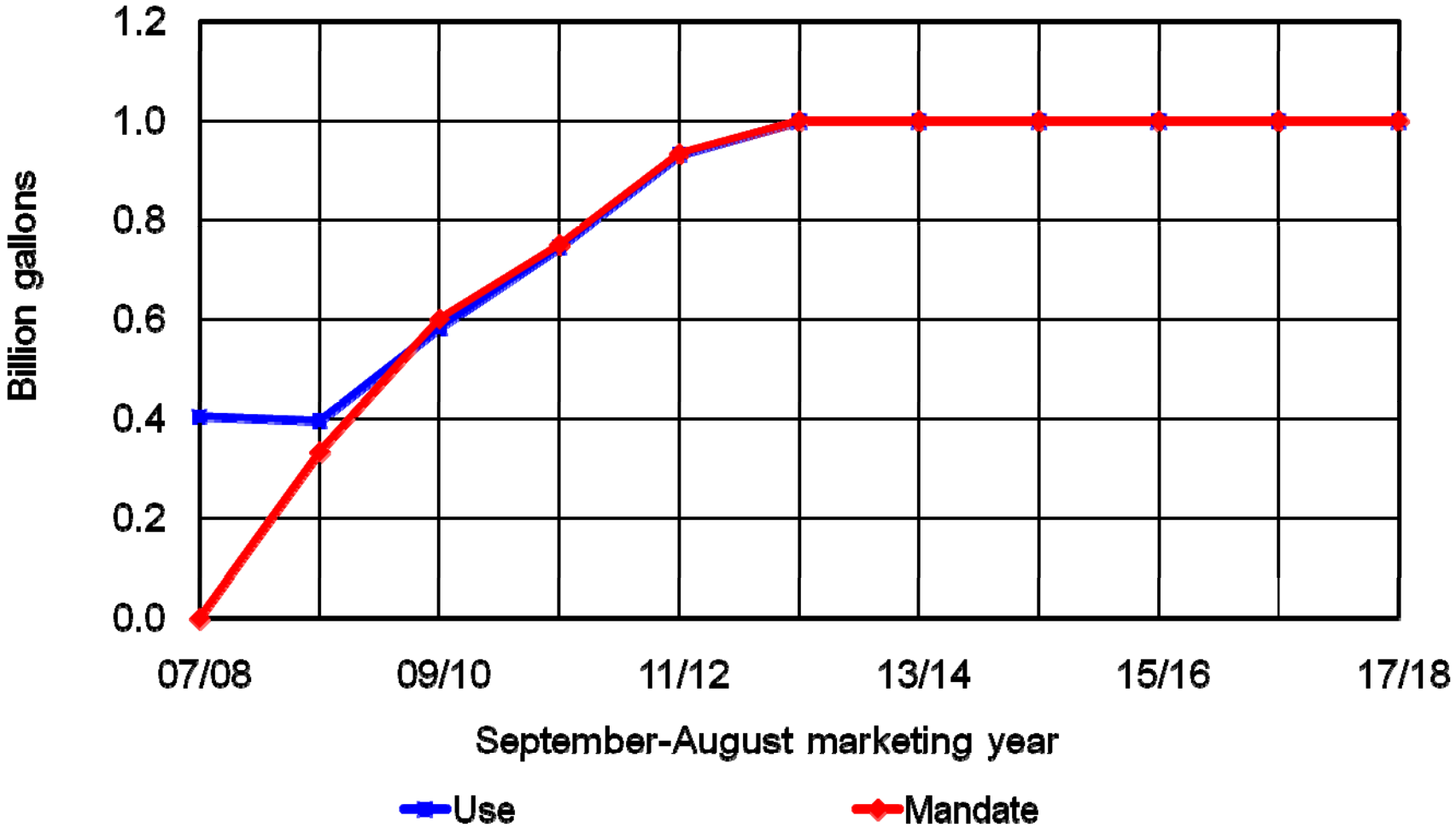
- "Advanced biofuels" include biodiesel, cellulosic ethanol, and other fuels that meet greenhouse gas reduction and other criteria
- Sub-mandates
  - Biodiesel: 1 billion gallons by 2012
  - Cellulosic ethanol: 1 billion gallons by 2013, 7 billion gallons by 2018
- If not waived, each mandate must be met
  - Trading scheme—to use less than mandated amount, must buy credit (RIN) from those with surplus
  - Could result in different producer prices for
    - Corn-based ethanol
    - Cellulosic ethanol
    - Other advanced ethanol (e.g., sugar-based ethanol imports)

Conventional ethanol consumption



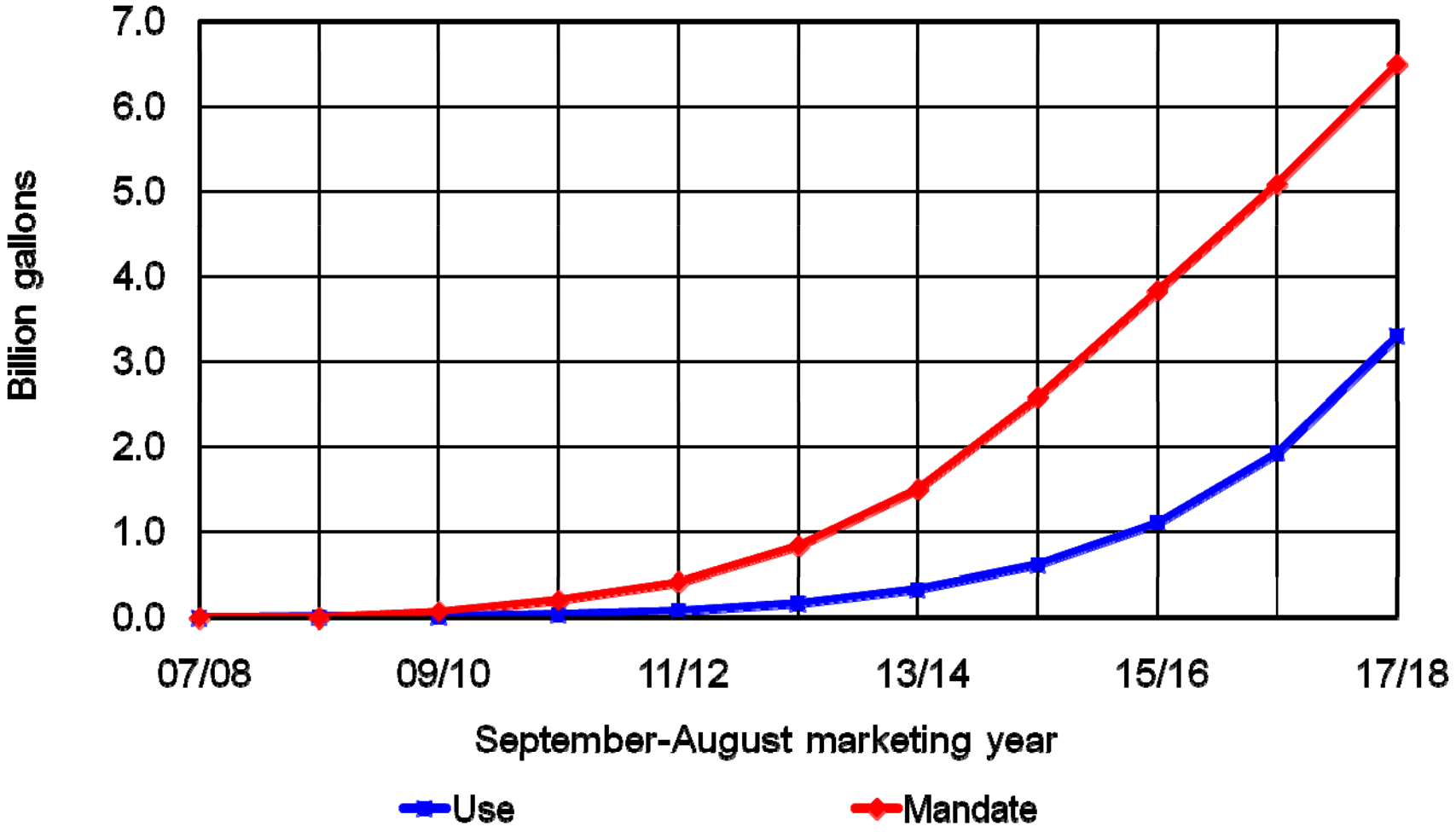
Source: Means of FAPRI 2008 stochastic baseline

Biodiesel consumption



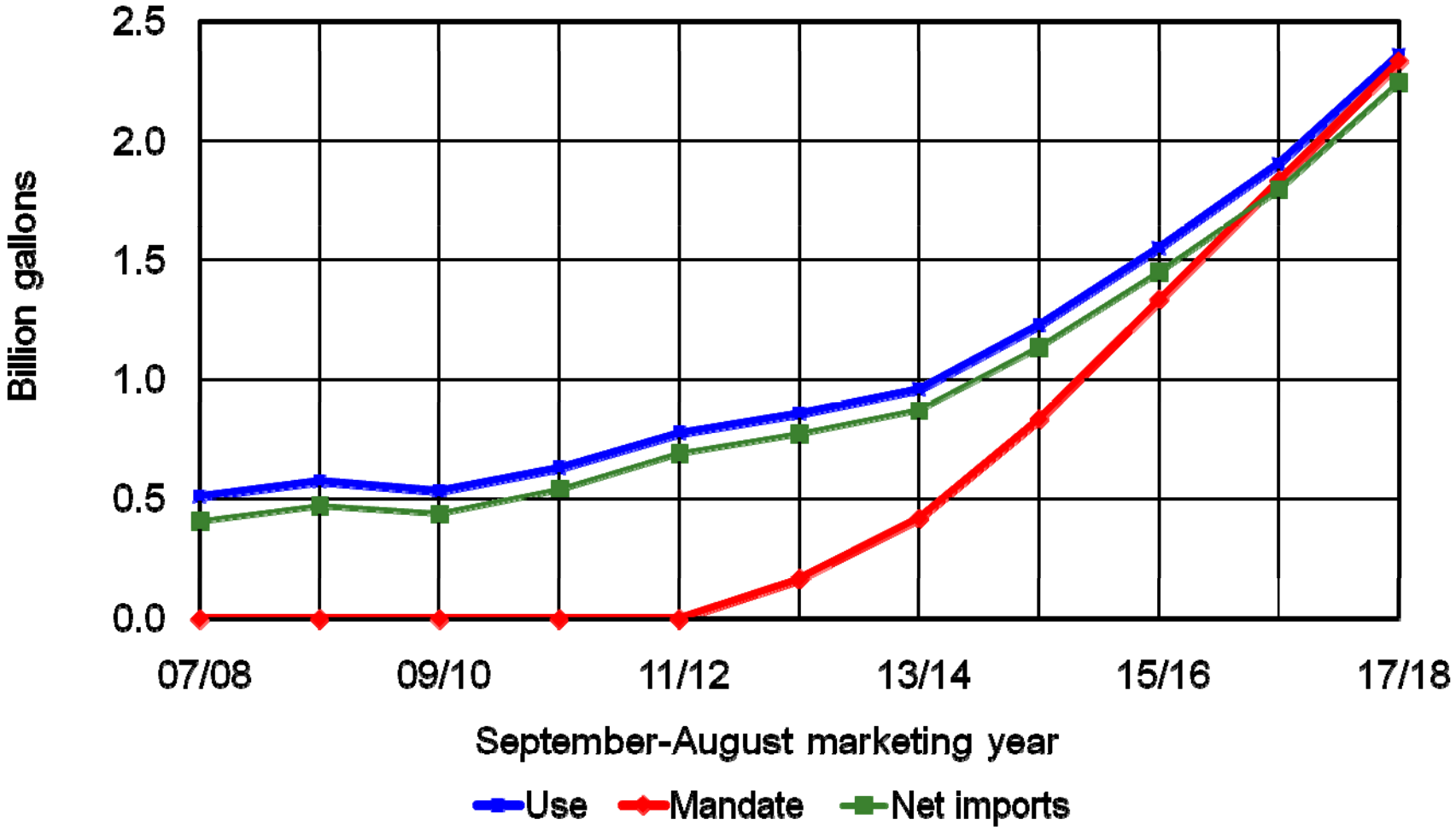
Source: Means of FAPRI 2008 stochastic baseline; assumes no mandate increase after 2012

Cellulosic ethanol consumption



Source: Means of FAPRI 2008 stochastic baseline

Other “advanced” biofuel consumption and ethanol imports



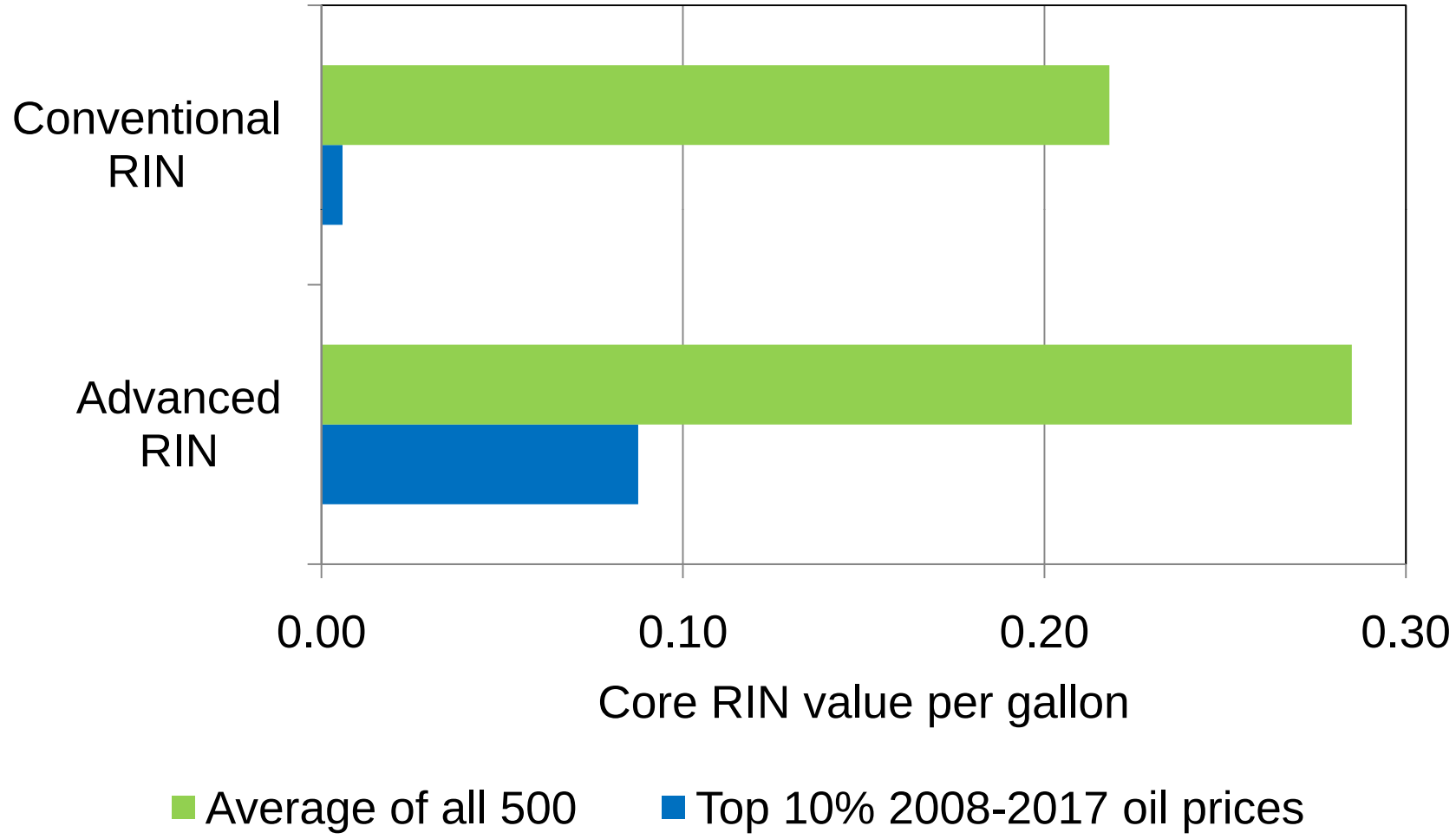
Source: Means of FAPRI 2008 stochastic baseline; assumes 1 gal. of biodiesel = 1.5 gal. of advanced biofuel

RIN

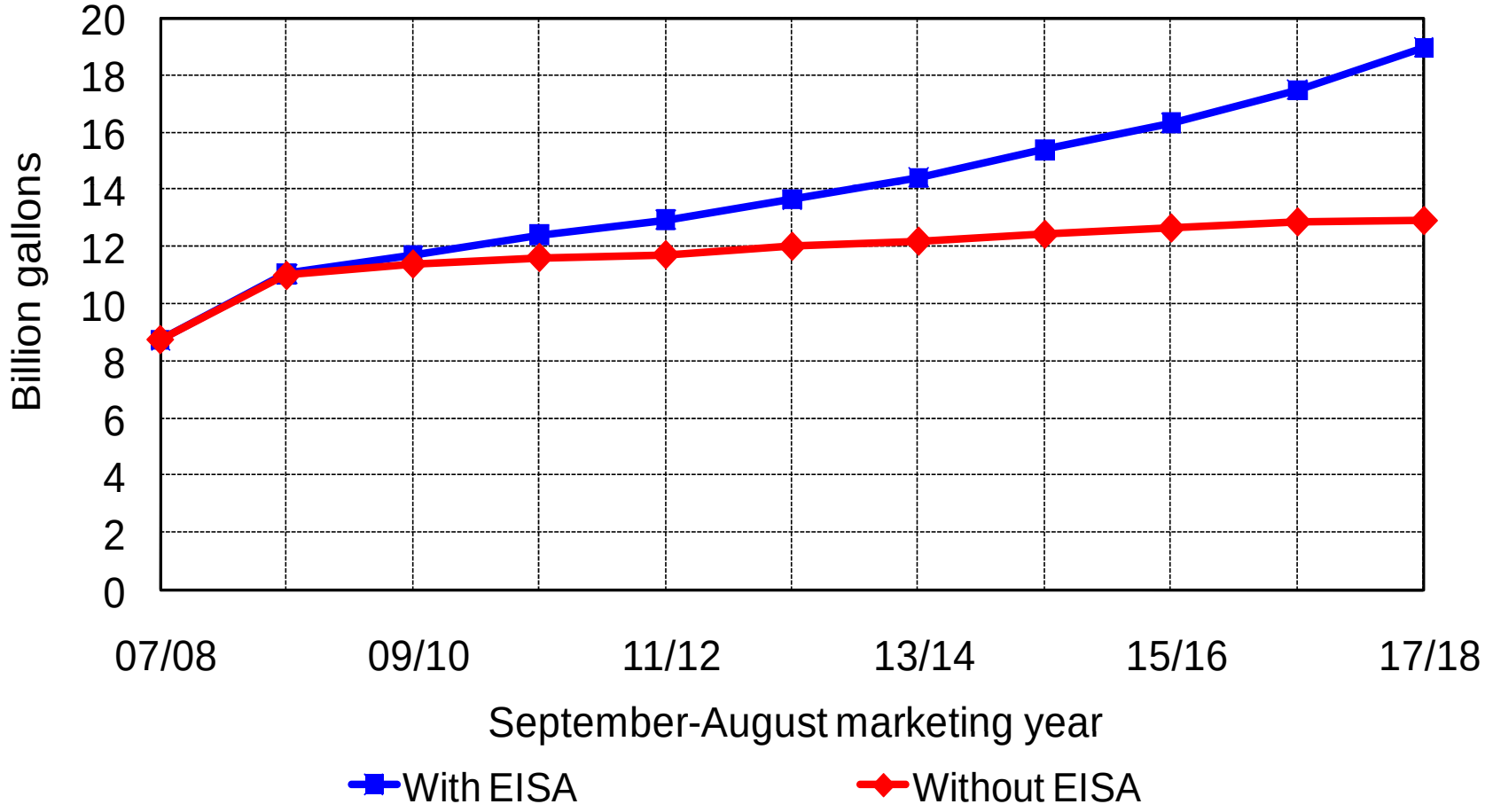
Renewable Identification Number

- Created by biofuel producer
- Tradable
- Elements of RIN value
  - Consumer cost calculation
  - Speculation about how binding mandates may be over the life of the RIN
- Transaction costs

Core RIN values average of 2008-2017

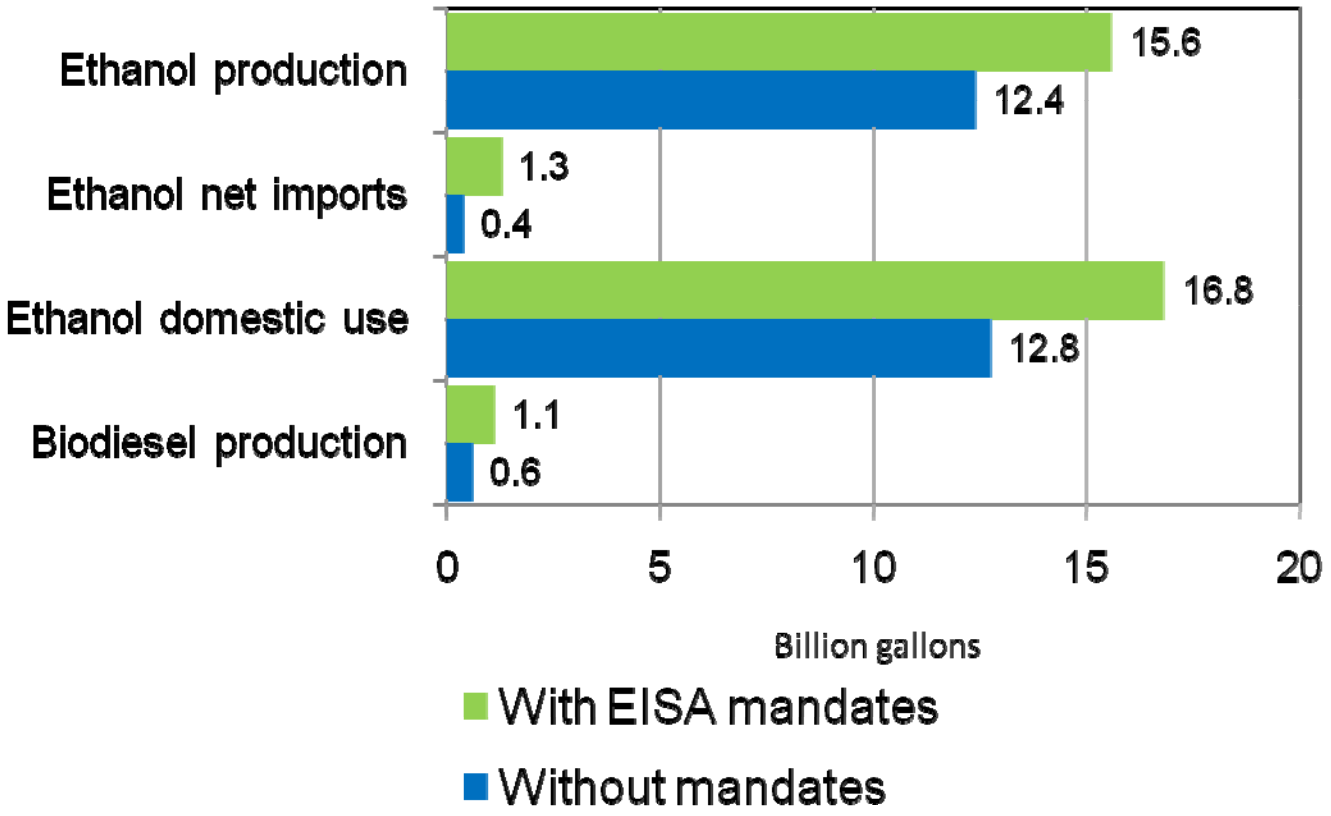


Ethanol production



Biofuel market results with and without EISA mandates

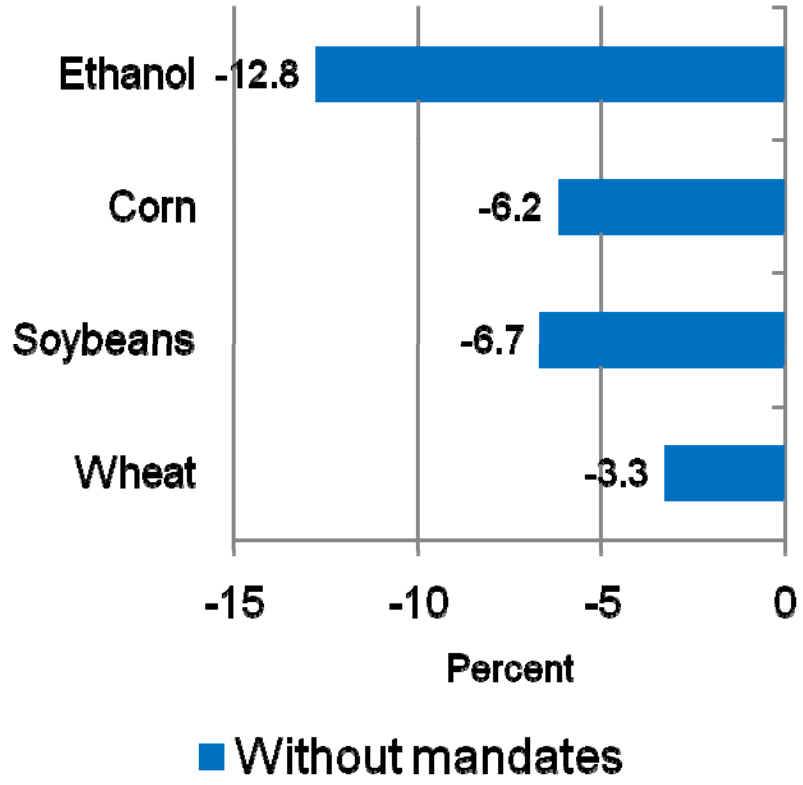
Biofuel supply and use, 2011-2017 average



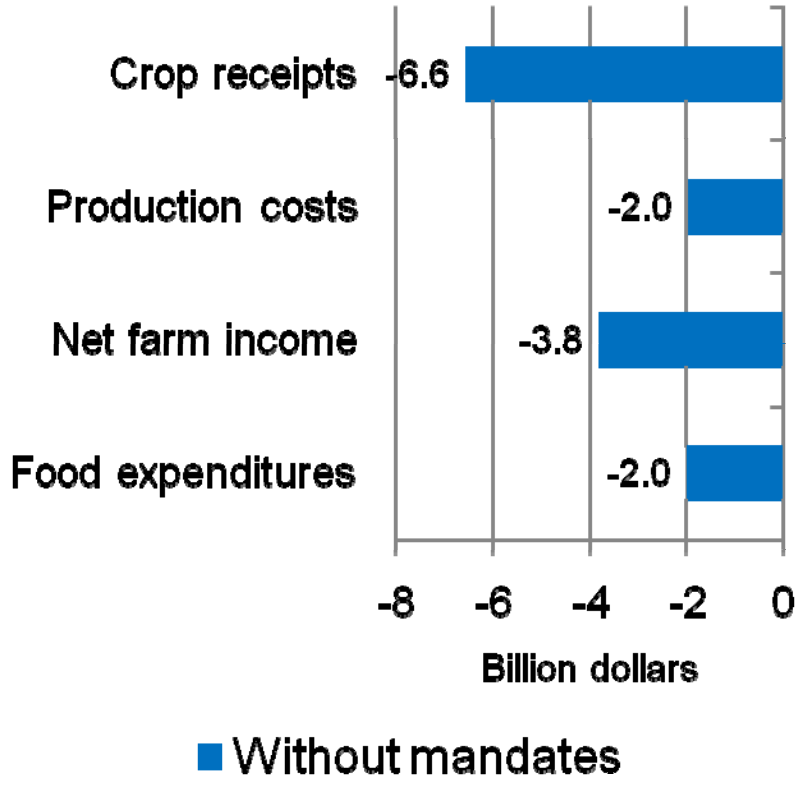
Impacts of removing EISA mandates

2011-2017 average effects

Change in prices



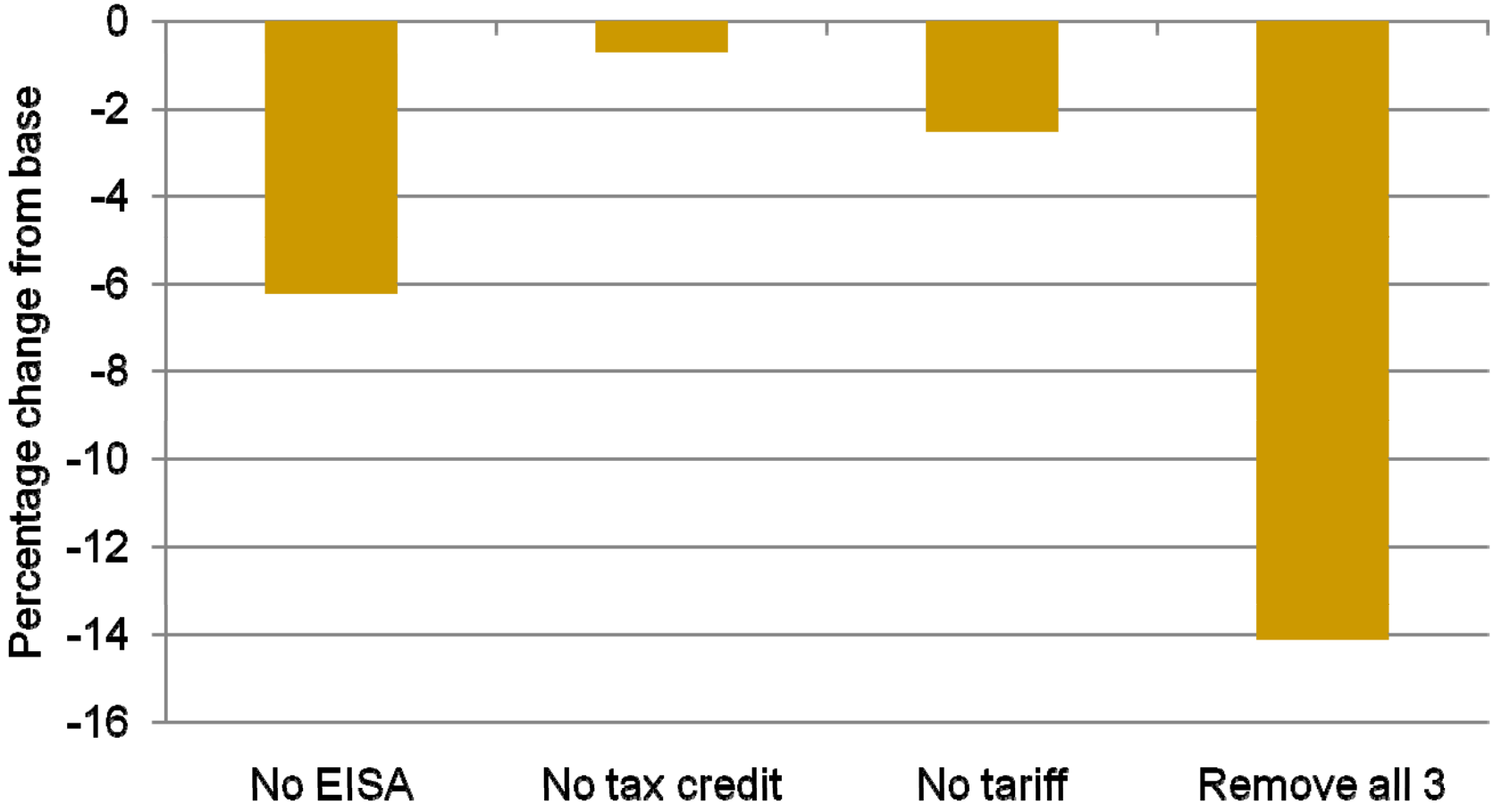
Farm income and consumer effects



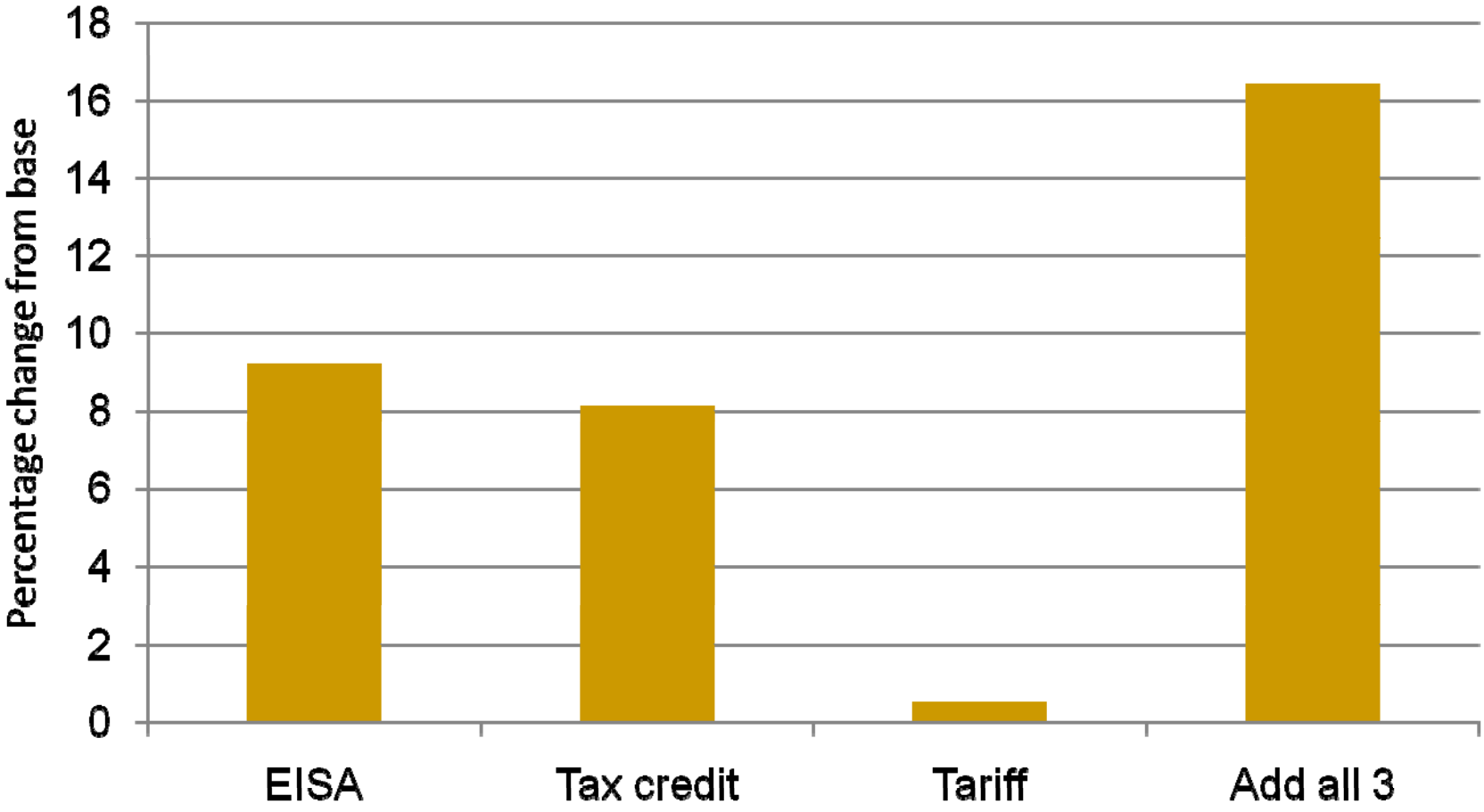
Other US biofuel policies

- Blender's tax credit (pre farm bill)
  - $0.51 per gallon for ethanol, expires end of 2010
  - $1.00 per gallon for biodiesel from pre-consumer oils, expires end of 2008
- Ethanol specific tariff (ad valorem of 2.5%)
  - $0.54 per gallon on imports not from Caribbean
  - Specific tariff was due to expire at end of 2008
- Farm bill
  - Reduces ethanol credit to $0.45 per gallon
  - Extends ethanol tariff through 2010
  - $1.01/gallon tax credit for cellulosic ethanol

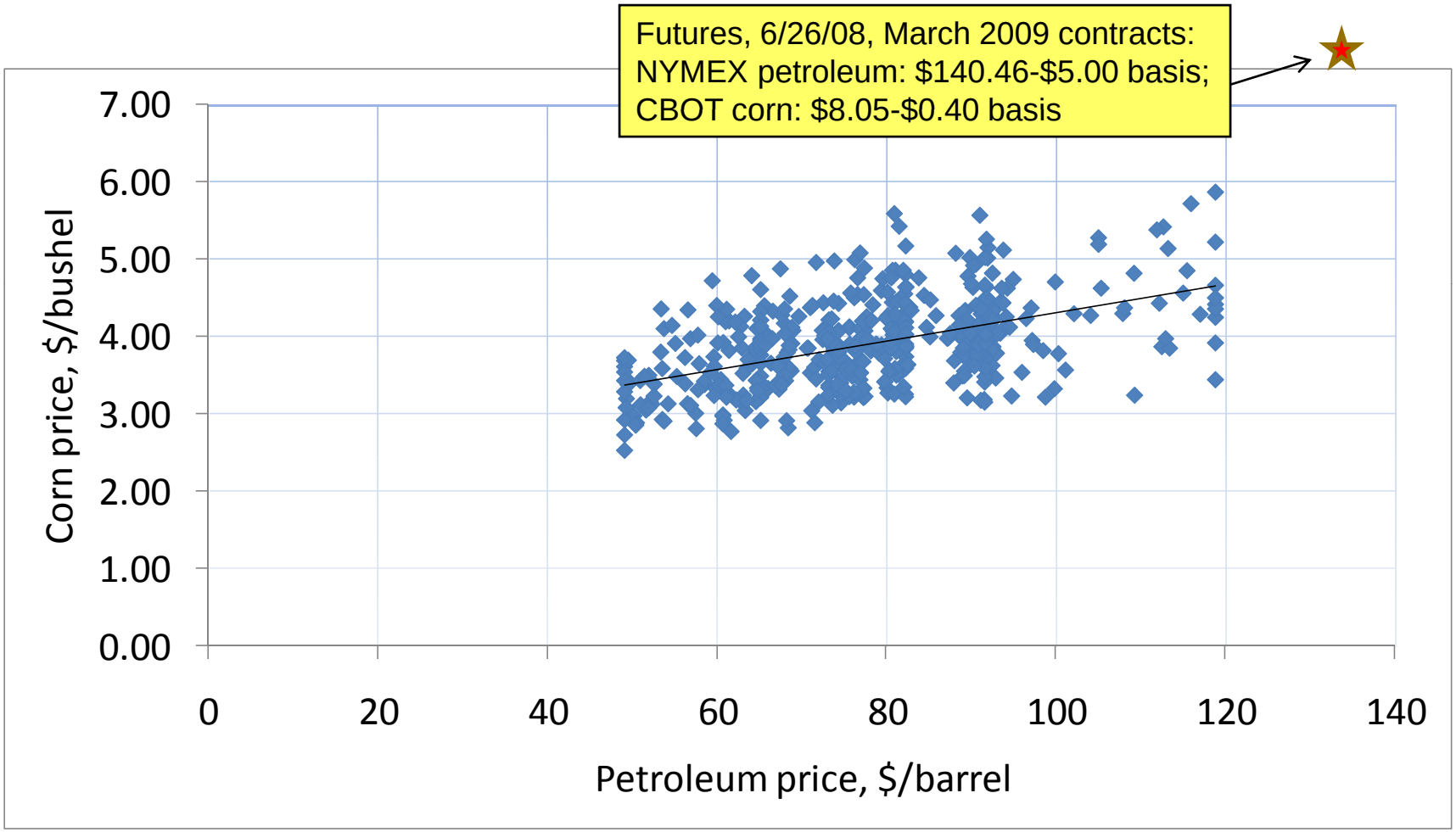
Removing current policies: effect on corn prices, 2011-17 avg.



Starting from no biofuel policy baseline: effect on corn prices, 2011-17 avg.



2008/09 corn, petroleum prices



Source: FAPRI 2008 stochastic baseline

Dry mill ethanol plant returns

(Dollars per gallon of ethanol)

	2005/ 2006	2006/ 2007	July 08 futures	Mar 09 futures
Value of ethanol	2.61	2.32	2.90	2.82
Value of DDGS	0.27	0.34	0.60	0.64
Cost of corn	-0.74	-1.12	-2.60	-2.78
Cost of fuel, electricity	-0.27	-0.27	-0.29	-0.29
Other operating costs	-0.31	-0.32	-0.32	-0.32
Net return over operating costs	**1.56**	**0.95**	**0.29**	**0.07**

*Based on CBOT futures prices for ethanol and corn, 6/26/08

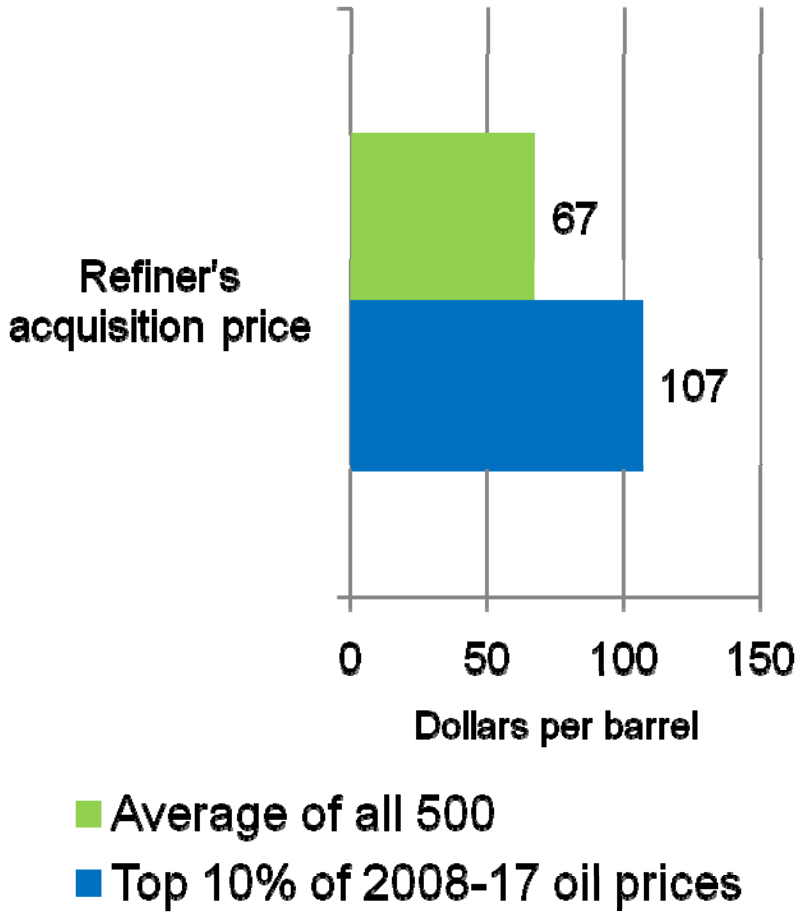
What's happened since January?

- Petroleum and ethanol prices much higher
- Corn supply and use much tighter
  - "News" is not ethanol—we had that built in
  - Fewer planted acres in 2008, yield concerns
  - Very strong non-ethanol demand, low stocks
- Narrow ethanol plant margins
  - Normally expect higher margins at higher petroleum/ethanol prices
  - But tight corn situation means margins narrow

Petroleum price revisited

2011-2017 average

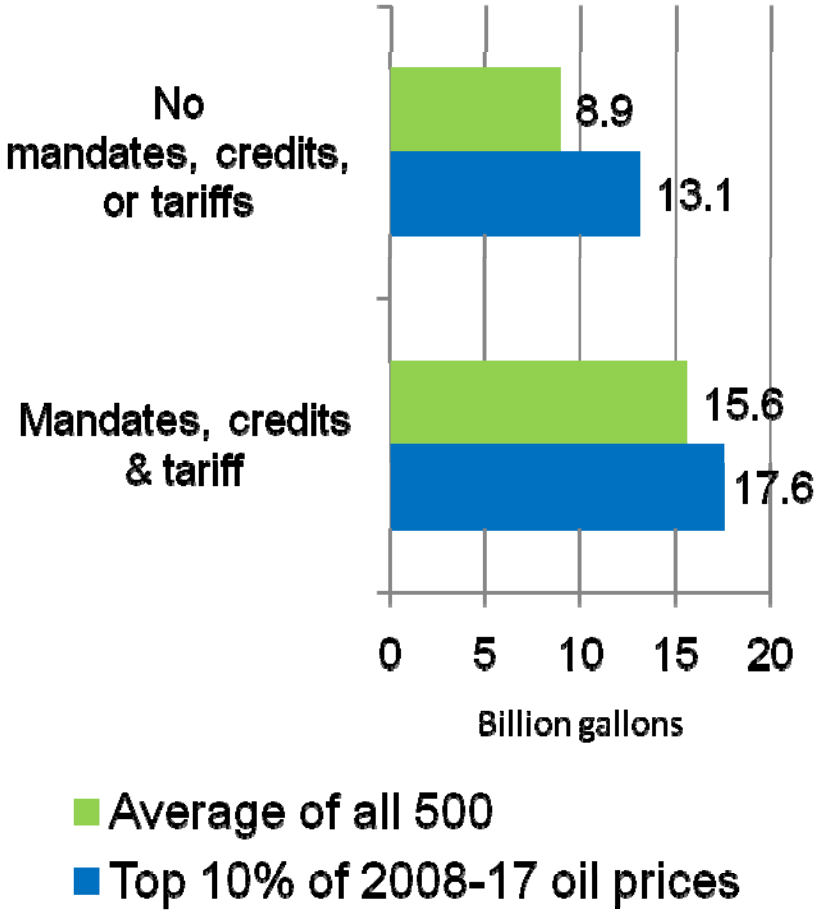
- Current market and futures for petroleum are far above stochastic baseline mean
- Sort stochastic results by 2008/09-2017/18 average petroleum price
- Compare top 50 oil price outcomes to average of all 500 outcomes



Ethanol production

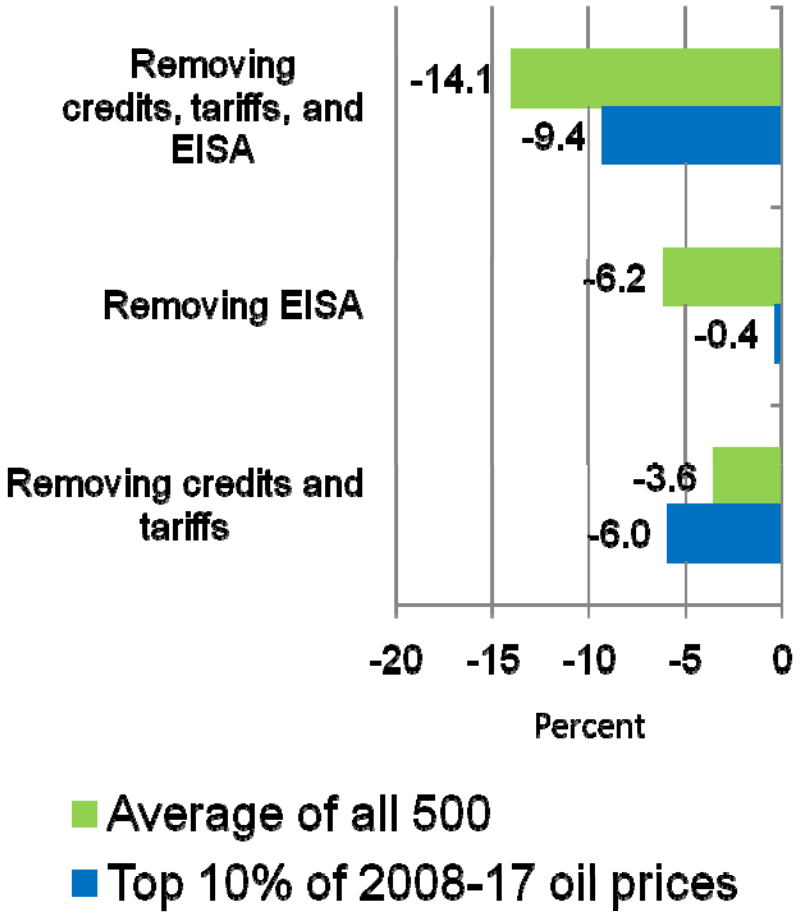
2011-2017 average

- With no mandates, credits or tariffs, ethanol production very sensitive to oil price
- By mandating use, EISA results in much ethanol production even at low oil prices
- Interaction effects are important
  - Oil prices matter more without EISA mandates
  - Mandates matter more at low oil prices



Corn price effects
2011-2017 average

- Ranking of policy effects on corn prices depends on oil price
  - Removing mandates has little or no impact at high oil prices
  - Removing credits and tariffs matters more at high oil prices (when mandates do not bind)
- In any year, corn yields, etc. matter, too



Summary

- Biofuel markets depend on
  - Policies
  - Agricultural markets
  - Energy markets
- Interactions are complex
  - Sometimes mandates matter a lot
  - Sometimes tax credits matter a lot
  - Sometimes petroleum prices matter a lot
  - And sometimes they don’t
- Stochastic analysis helpful

For more information on FAPRI biofuel research

- Visit the FAPRI-MU website
  - http://www.fapri.missouri.edu/
  - US 2008 stochastic baseline: click on the March 5 report, “FAPRI US Baseline Briefing Book”
  - Biofuel policy options discussed today: click on the June 12 report, “Biofuels: Impact of Selected Farm Bill Provisions and Other Biofuel Policy Options”
  - Watch for FAPRI baseline update, expected release in late August
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