

# ***The Great Plunge in Oil Prices: Causes, Consequences, and Policy Responses***

**JOHN BAFFES**

**WORLD BANK**

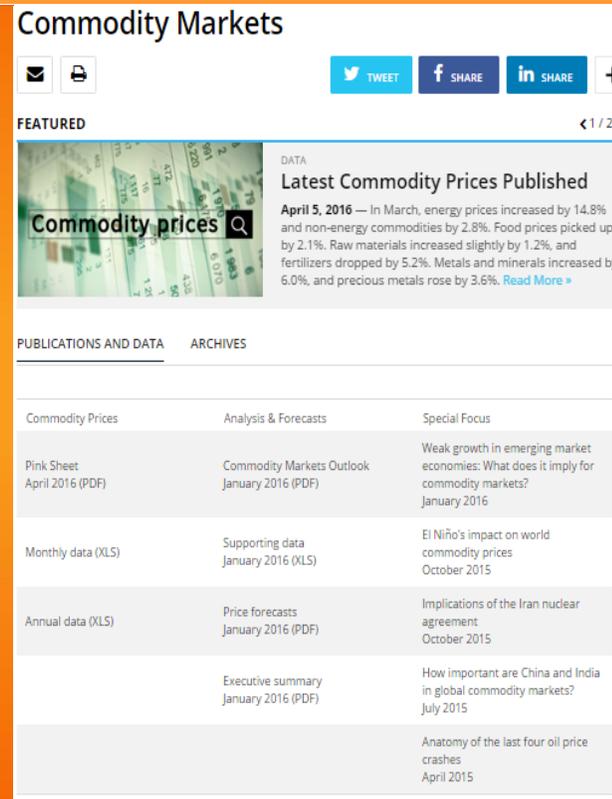
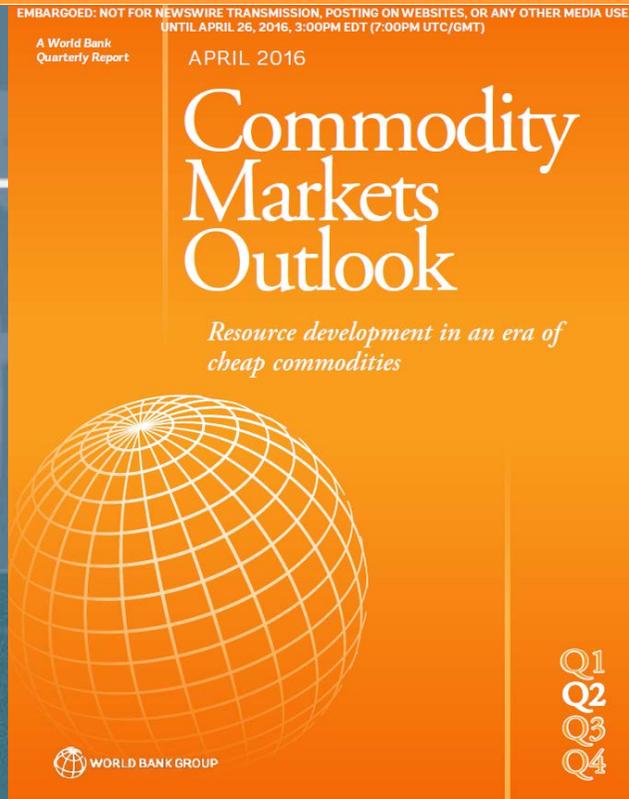
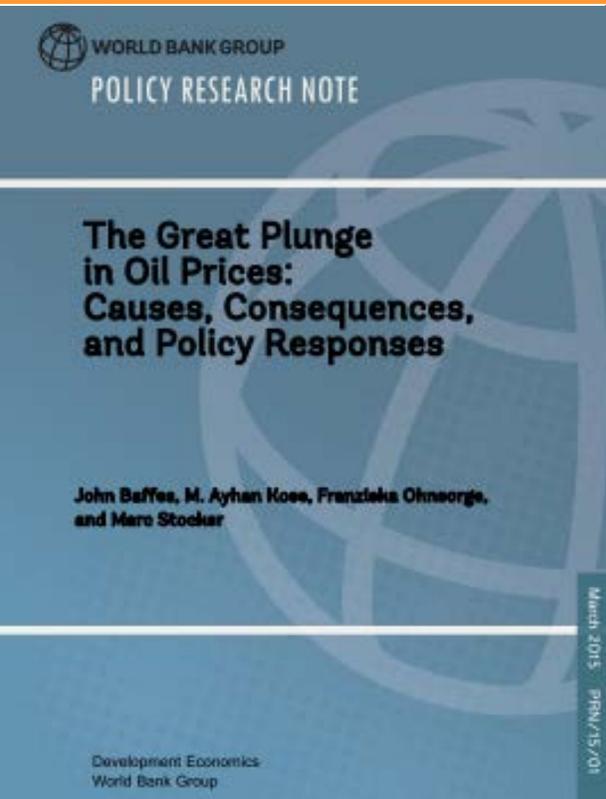
**“Commodity Cycles and their Implications”**

**Bank of Canada and International Energy Forum**

**Ottawa, Canada**

**April 25, 2016**

# This presentation is based on



- The latest edition of the World Bank's *Commodity Markets Outlook* was published on January 26, 2016. The next edition will be published tomorrow at 3:00 pm EST!
- Commodity prices (“pink sheet”) are updated on the third business day of each month (the next update will be posted on May 4, 2016).

[www.worldbank.org/commodities](http://www.worldbank.org/commodities)

World Bank, *Commodity Markets Outlook*, Various *Special Focus* sections (including, China's and India's role on commodity consumption, the nature of the four oil price plunges, Effects of El Nino on commodity prices, the effect of EMDEs growth slowdown on commodity markets, Iran's role in energy markets).

Baffes, J. (2007). “Oil spills on other commodities.” *Resources Policy*, 32 (3), 126-134.

Baffes, J. (2013). “A framework for analyzing the interplay among food, fuels, and biofuels.” *Global Food Security*, 2 (2), 110-116.

Baffes, J. and X.L. Etienne (2016). “Analyzing food price trends in the context of Engel's Law and the Prebisch-Singer Hypothesis.” *Oxford Economic Papers*, doi:10.1093/oep/gpw011

Baffes, J. and T. Haniotis (2016). “What explains agricultural price movements?” *Journal of Agricultural Economics*, forthcoming.

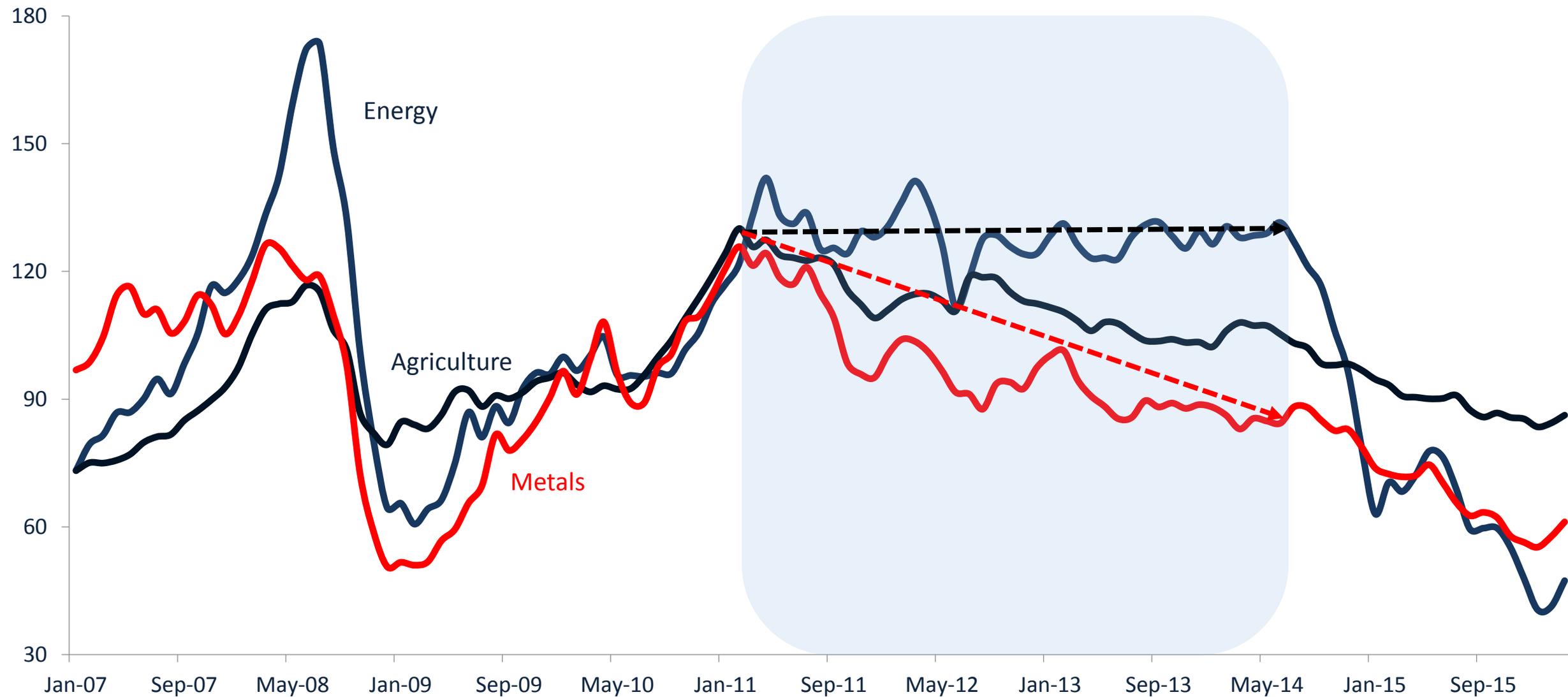
# Questions

- **What kept oil prices high during 2011-14? Did OPEC play a key role?**
- **What are the implications of the oil price plunge for other commodity markets?**
- **Where are commodity prices heading?**

What kept oil prices high  
during 2011-14? **MENA**  
**disruptions and OPEC. Did**  
**OPEC play a key role? Yes**

# Virtually all commodity prices declined after 2011Q1, but oil

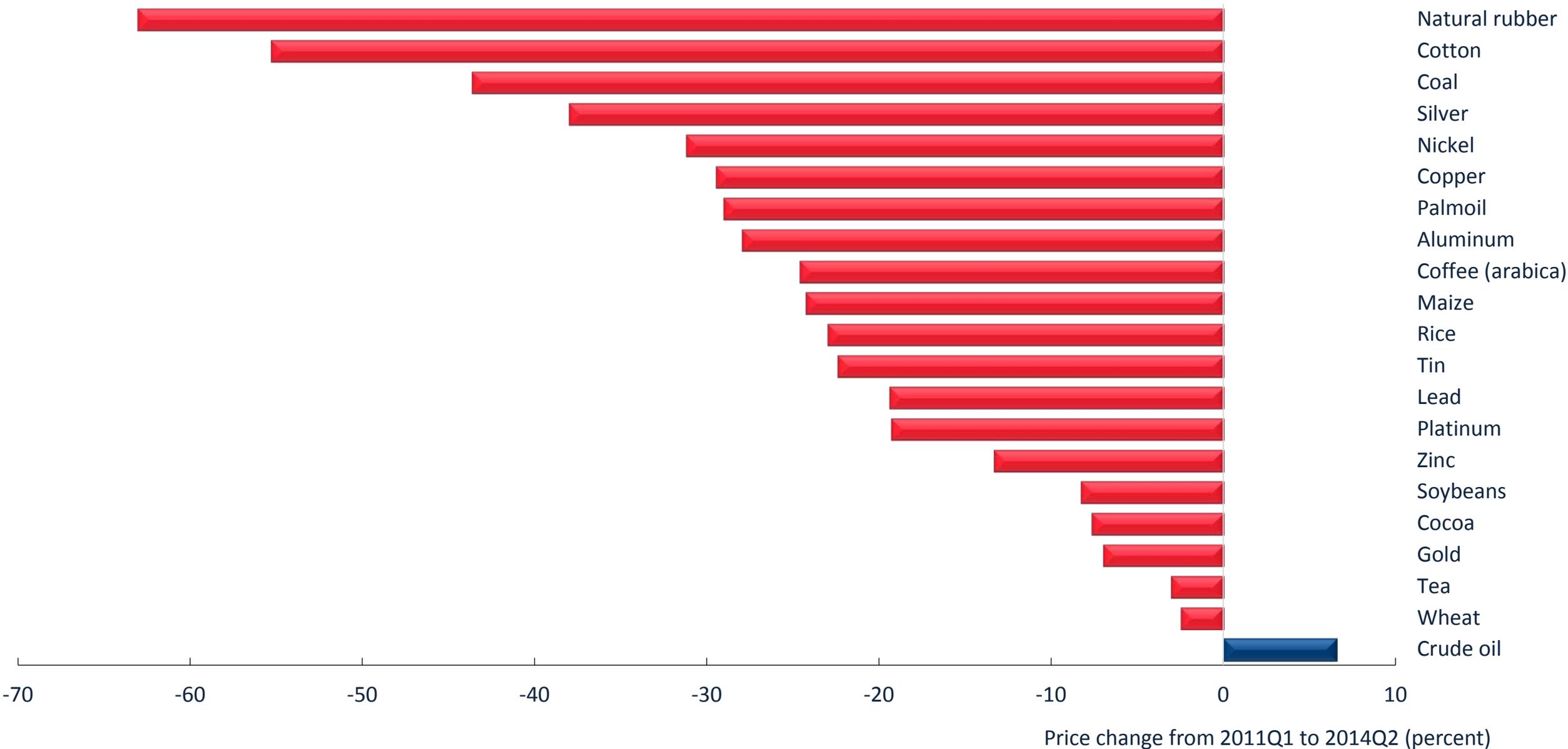
Index, nominal terms, 2010 = 100



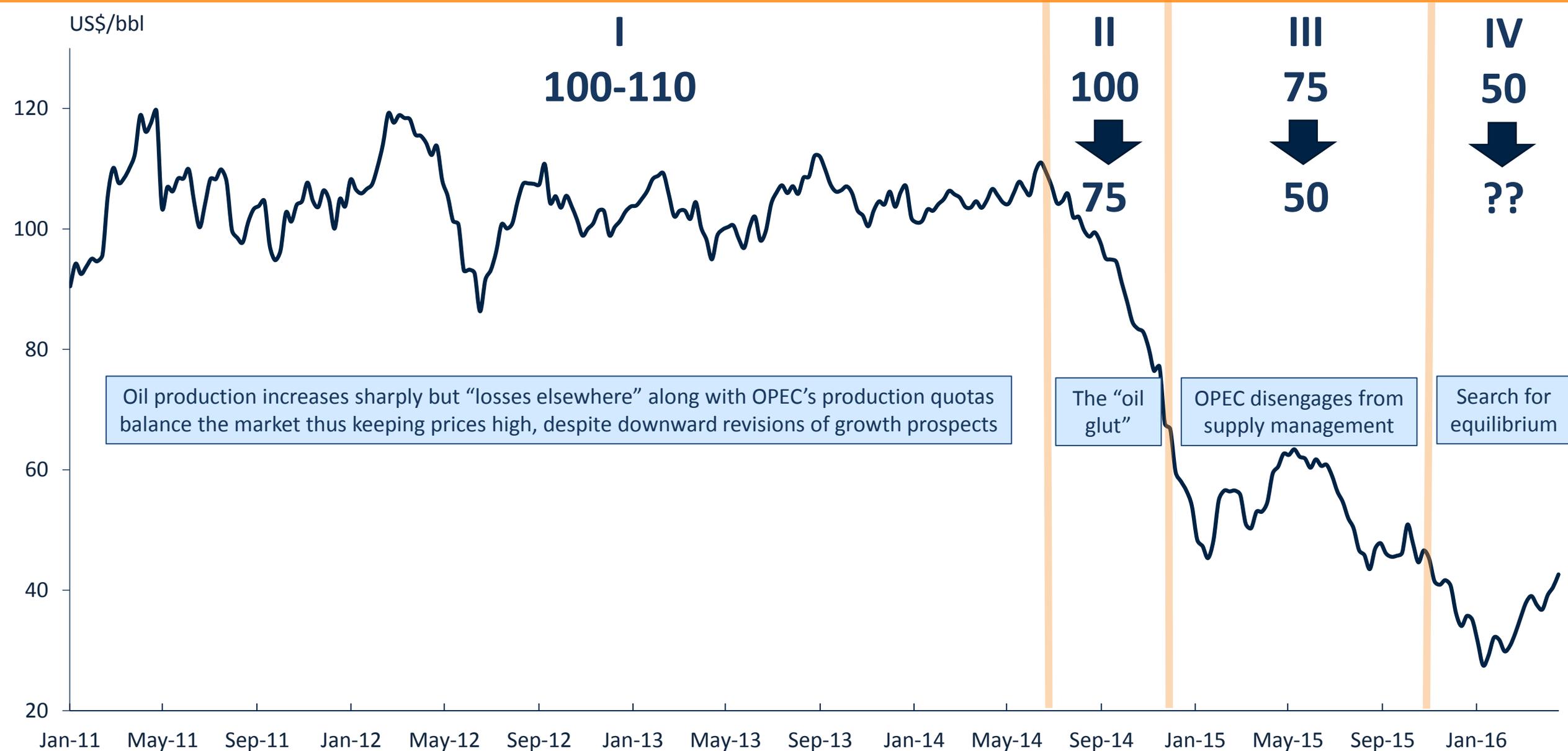
Source: World Bank

Note: Last observation is March 2016

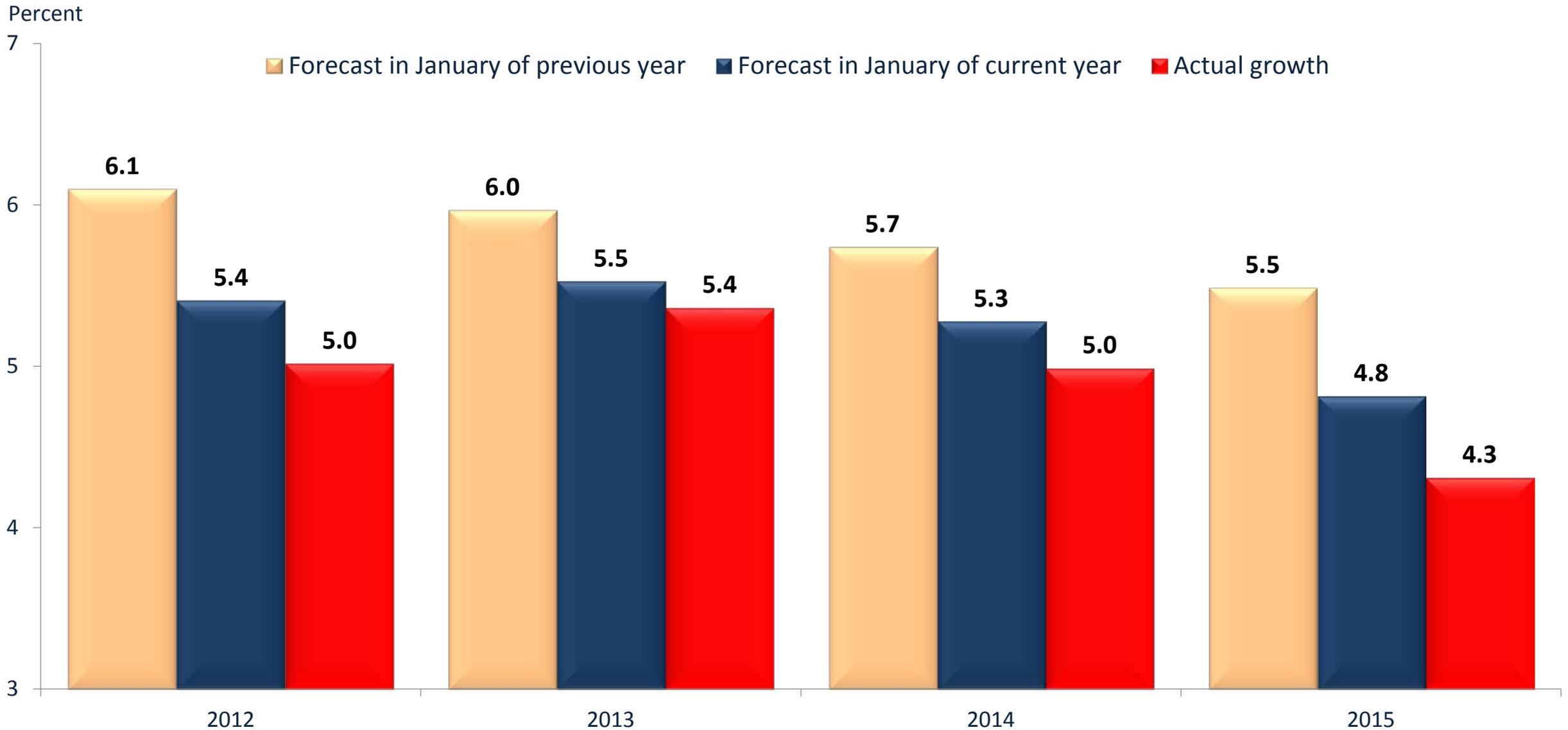
# Indeed, oil was the outlier, out of all major commodities! Why?



# The four acts of oil



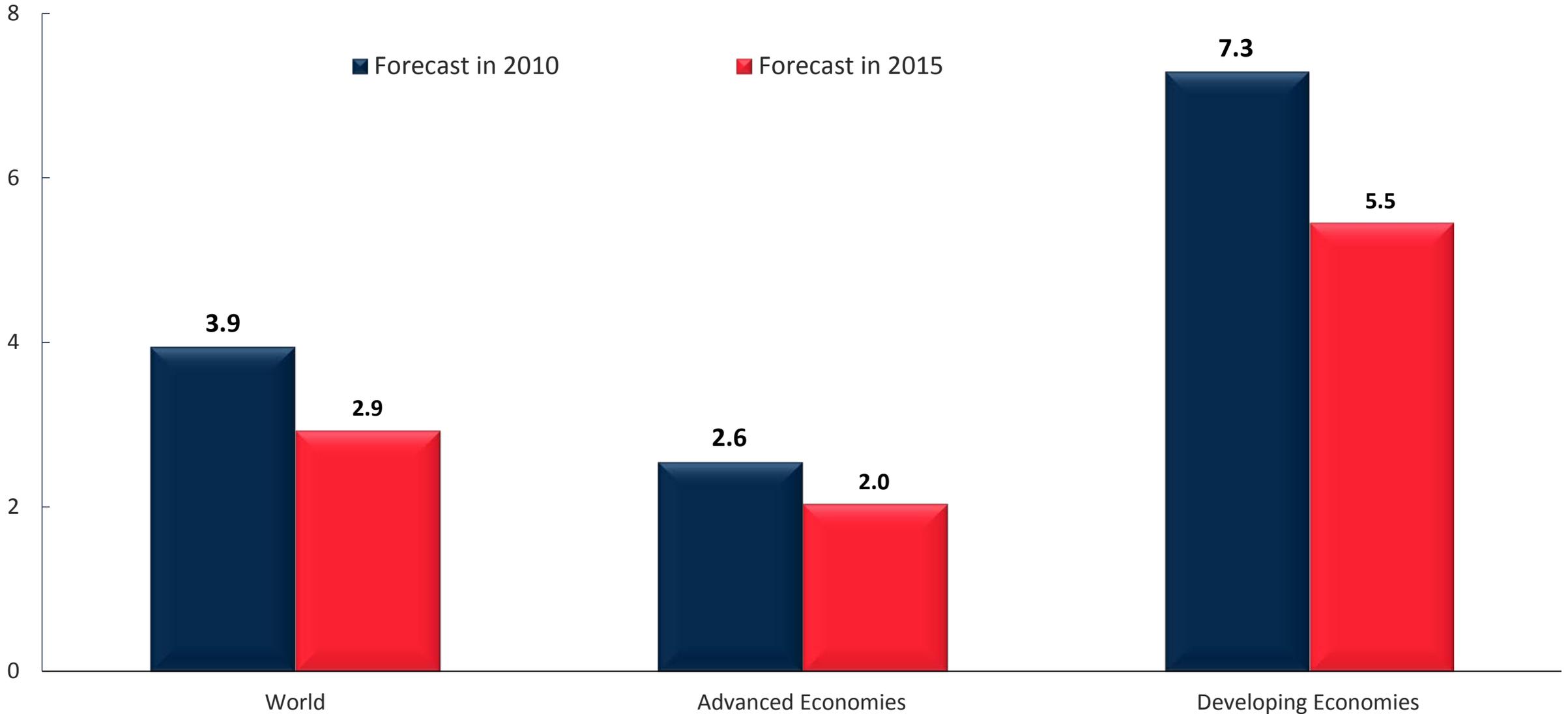
# Global growth: Pessimist in the short term



Source: World Bank, *Global Economic Prospects*

Notes: Growth refers to developing countries.

# But also pessimism in the long term

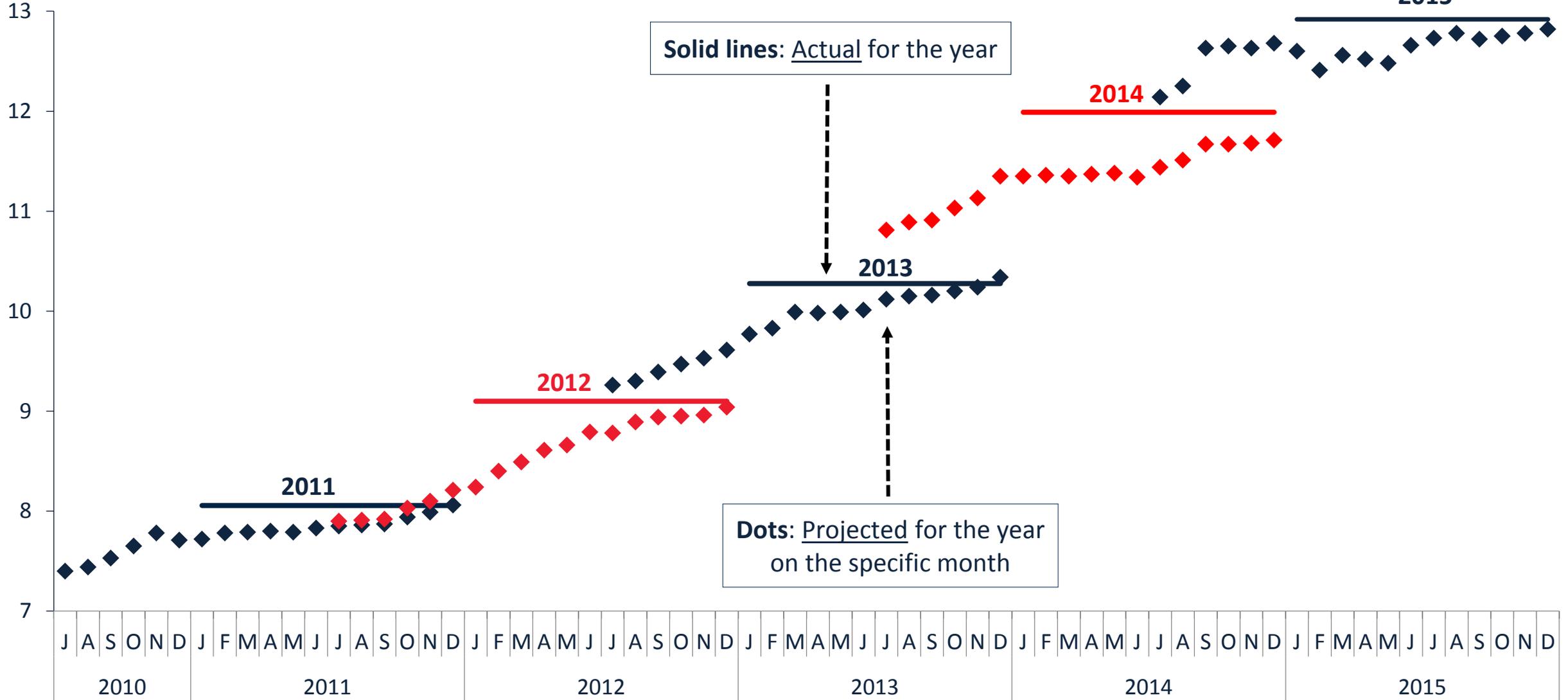


**Source:** World Bank calculations based on Consensus data.

**Note:** Weighted average growth October forecasts for 46 countries for which long-term consensus forecasts are available.

# Consistent upward revisions to U.S. oil production by IEA

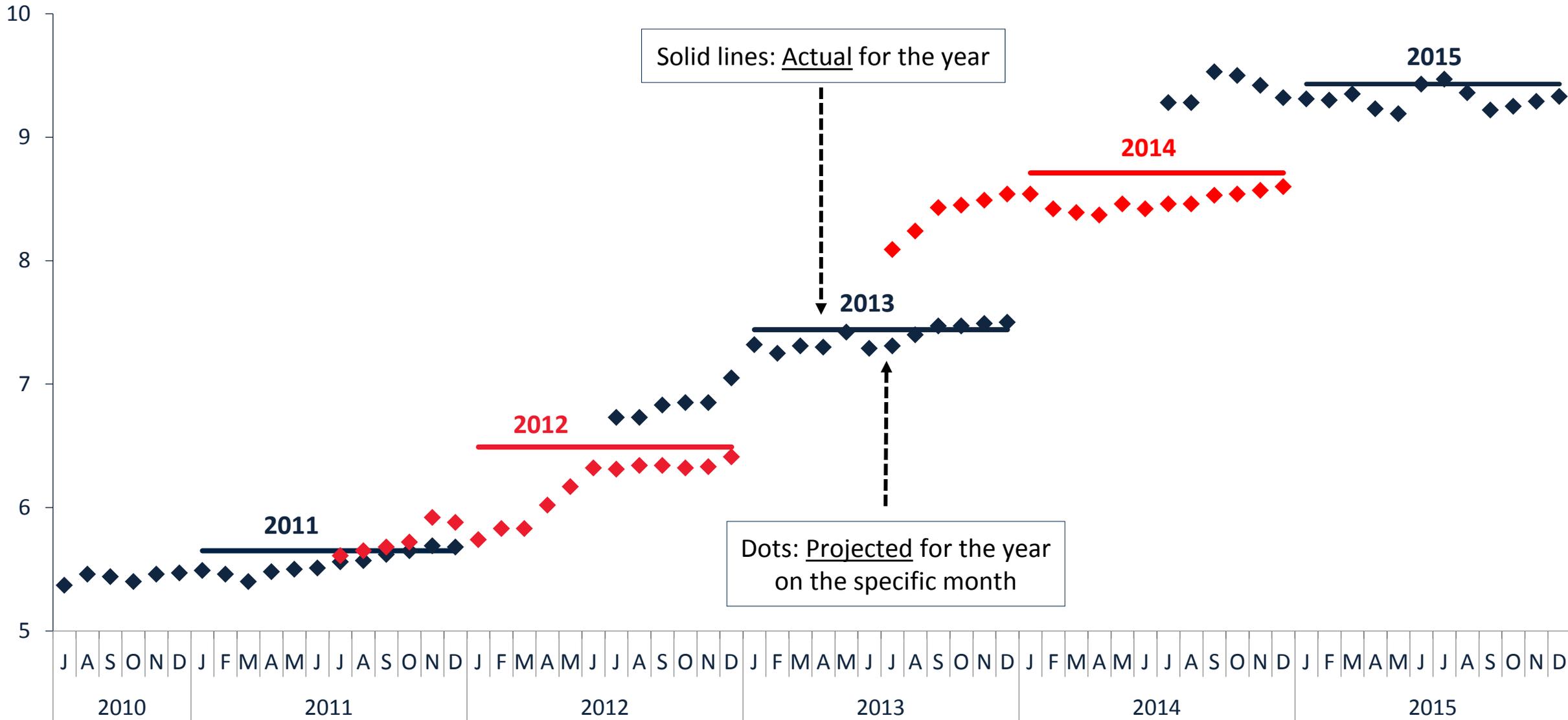
Million barrels per day



**Source:** International Energy Agency and World Bank  
**Note:** U.S. oil output includes biofuels. Last observation is December 2015.

# And by EIA as well

Million barrels per day

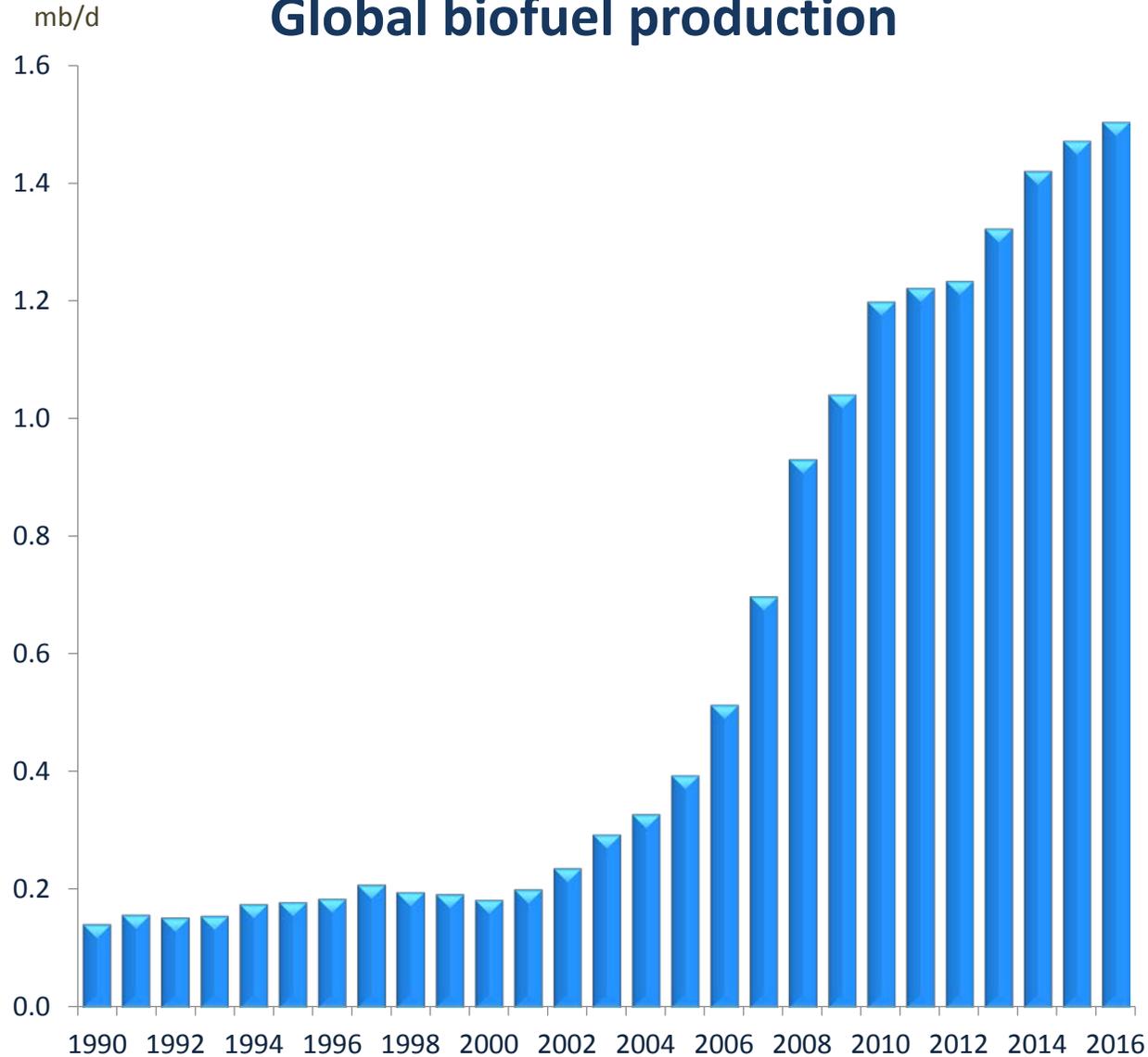


Source: Energy Information Agency and World Bank

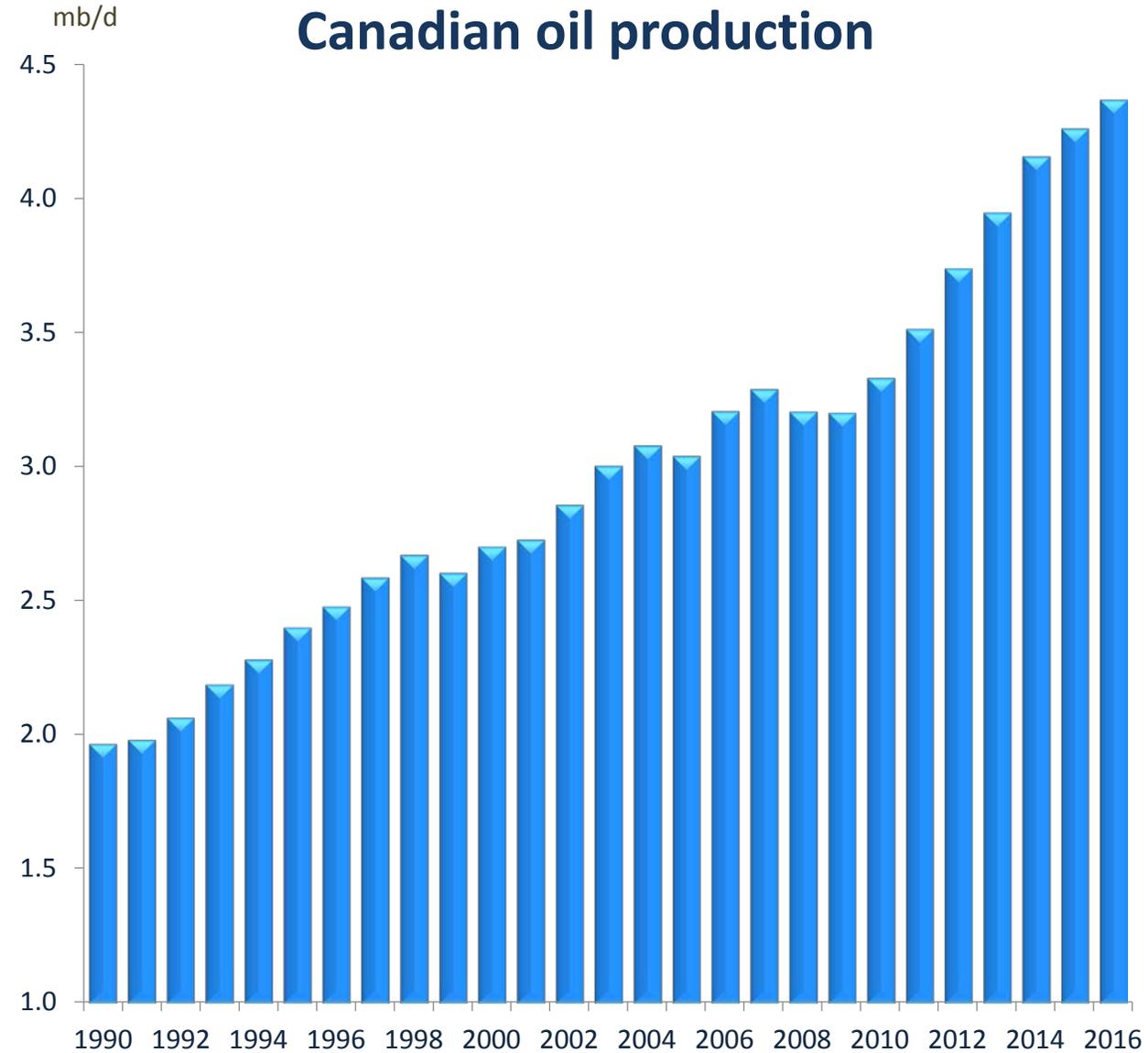
Note: Last observation is December 2015.

# Biofuels and Canadian oil production

## Global biofuel production

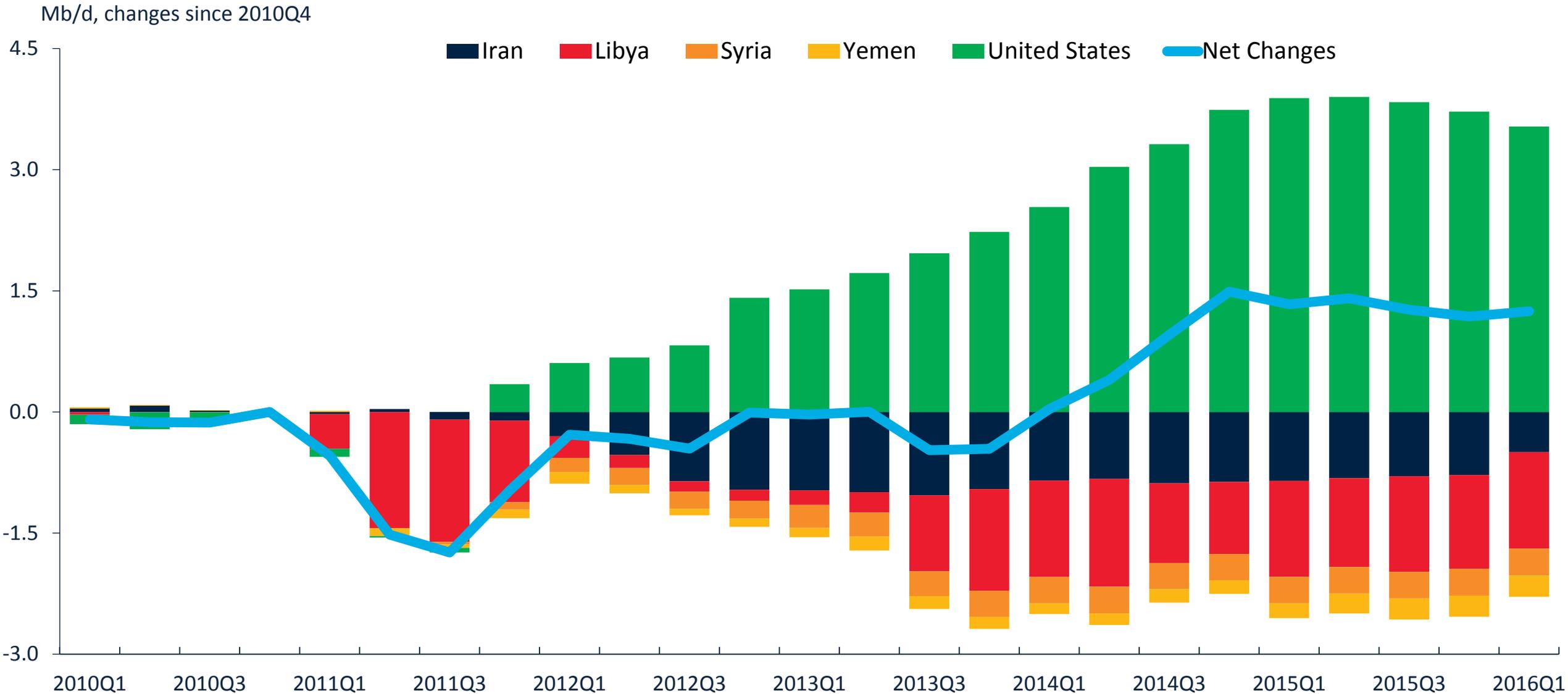


## Canadian oil production



Source: IEA, BP Statistical Review, and World Bank estimates.

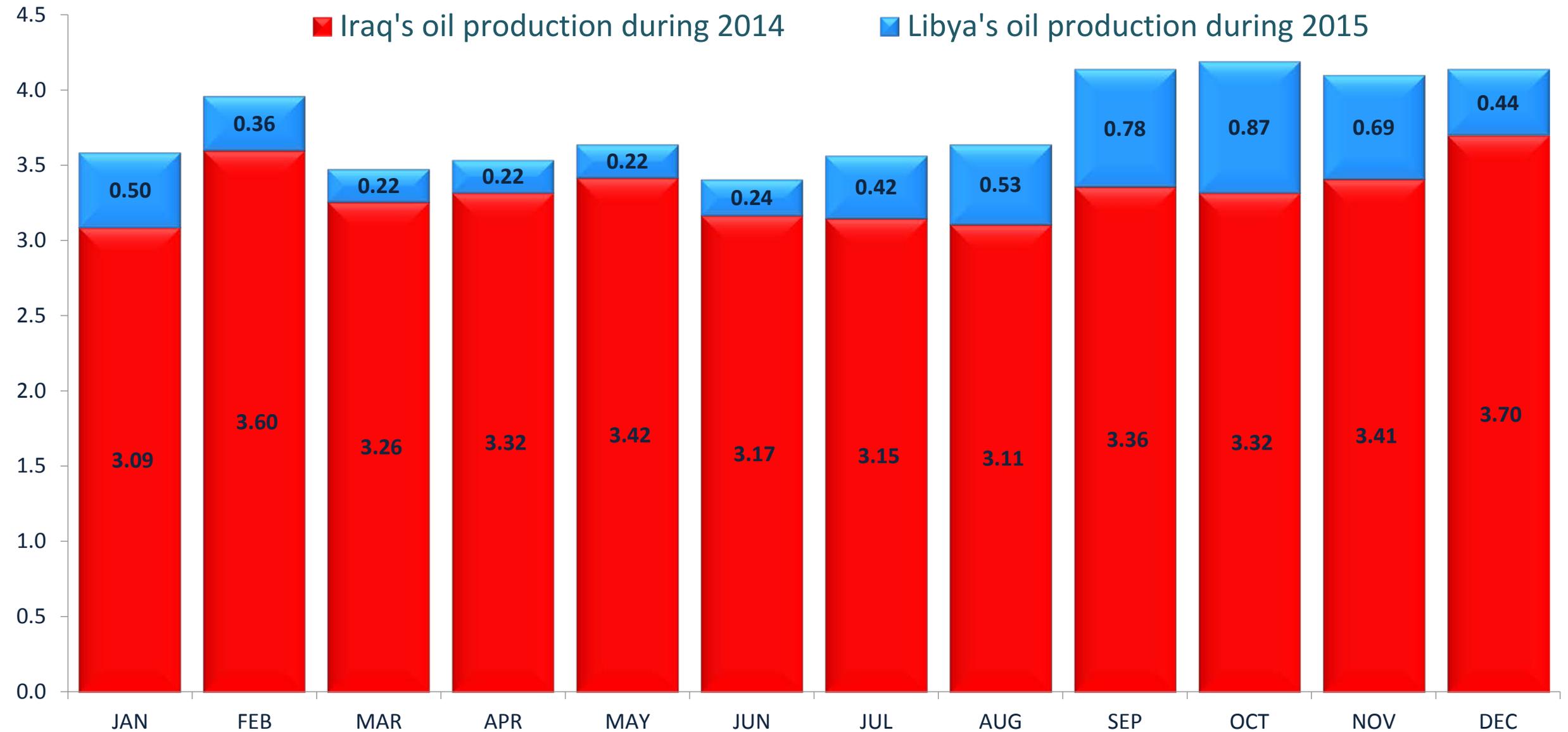
# Surplus conditions became apparent in 2014Q2



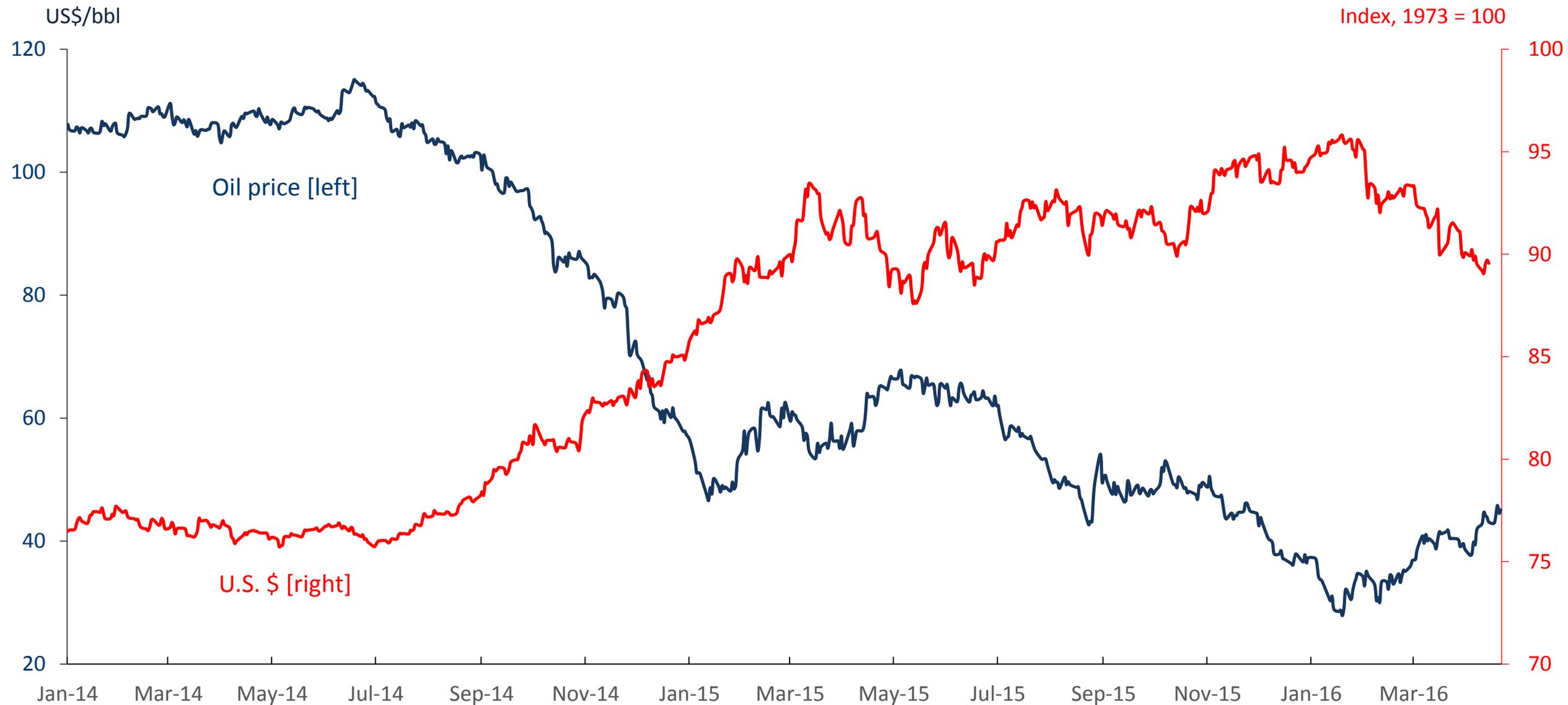
Source: International Energy Agency and World Bank

Note: Last observation 2015Q4

# Trigger I: Geopolitical concerns dissipate



# Triger II: The U.S. dollar begins appreciating



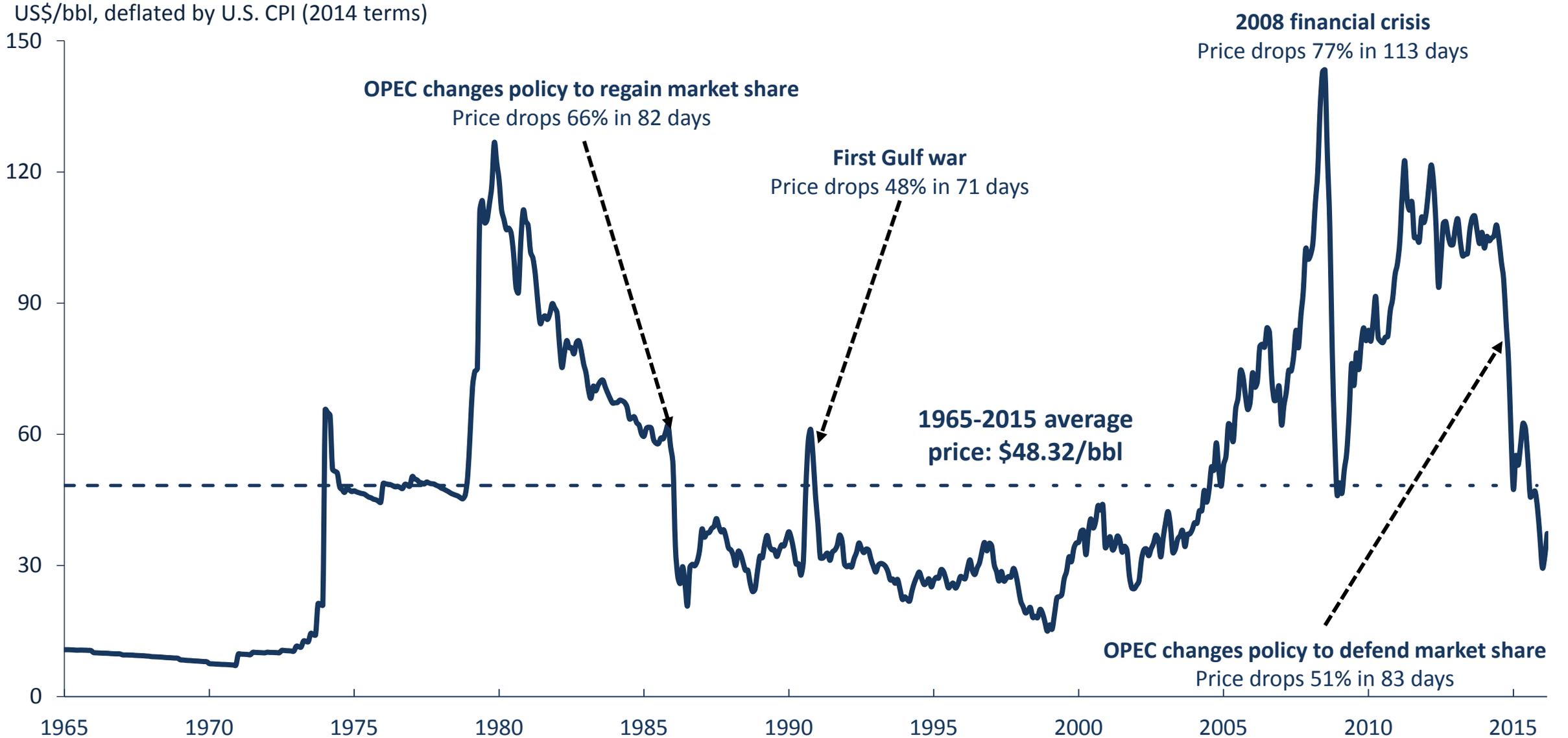
Source: World Bank and FRED.

Note: Oil refers to WTI and US\$ is the trade weighted U.S. dollar index against major currencies, not seasonally adjusted (DTWEXM), both daily frequency

# OPEC's changing objective

- Following the East Asian financial crisis when oil dropped below \$10/bbl, OPEC began setting a price target range, initially at \$20-25/bbl and gradually reaching \$100-110/bbl.
- In the face of weakening demand and increasingly strong supplies from unconventional sources, OPEC decided not to cut production in order to defend market share (November 27, 2014). An earlier, similar (albeit delayed) move was taken in 1985/86.
- The decision most likely reflects the realization that global commodity markets cannot be “managed” for long, regardless the nature of the commodity. Artificially maintaining high and stable prices not only attracts suppliers not bound by the agreements but also encourages development of substitute products. Examples abound:
  - ***International Tin Agreement, 1954-85:*** It had two implications: (i) Artificially high tin prices made non-member producers more competitive; (ii) it encouraged the use of aluminum, a substitute product.
  - ***International Coffee Agreement, 1962-89:*** It attracted new (non-member) producers, including Vietnam, which is now world's second largest coffee supplier.

# The four great oil plunges

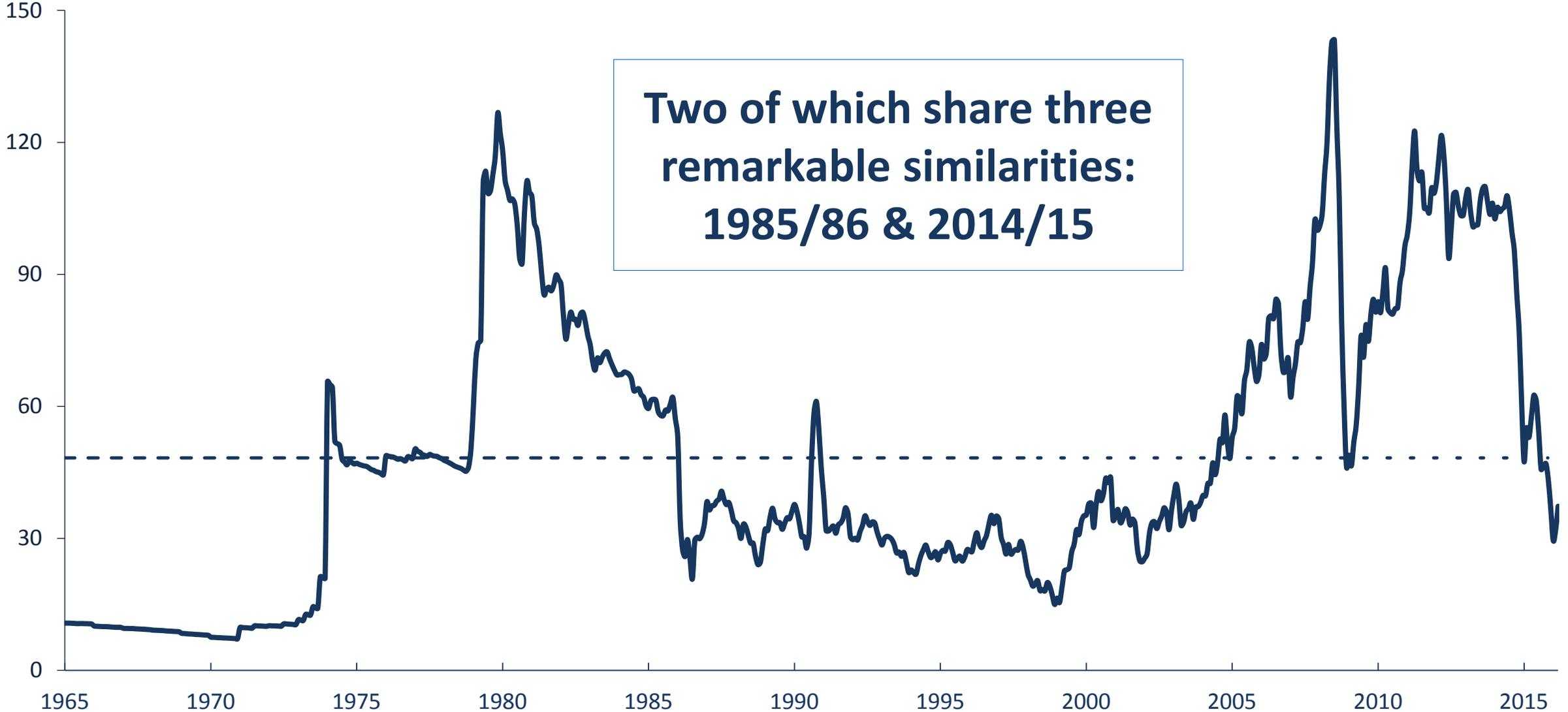


Source: World Bank

Note: Last observation is April 2016

# Two of which are similar

US\$/bbl, deflated by U.S. CPI (2014 terms)

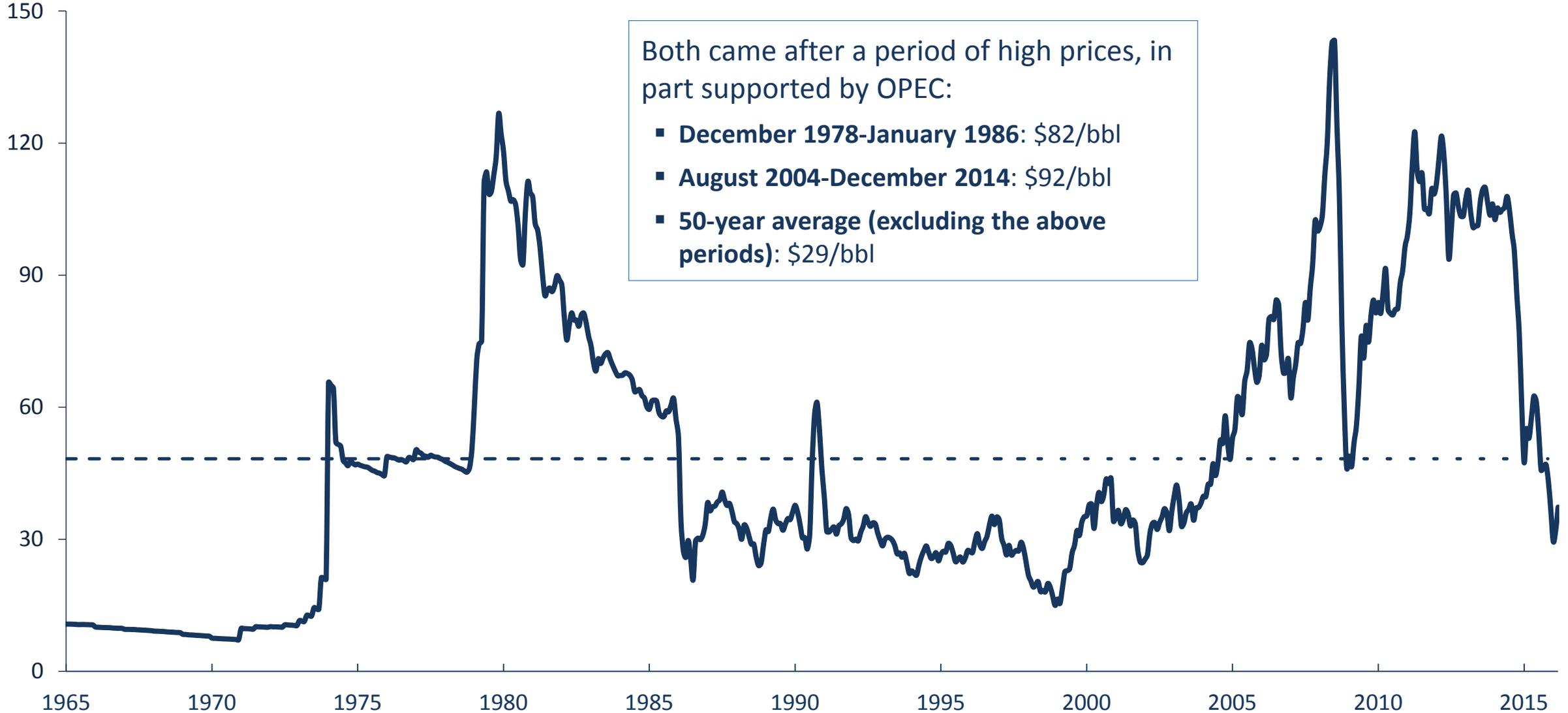


Source: World Bank

Note: Last observation is April 2016

# Both materialized after a period of high prices

US\$/bbl, deflated by U.S. CPI (2014 terms)

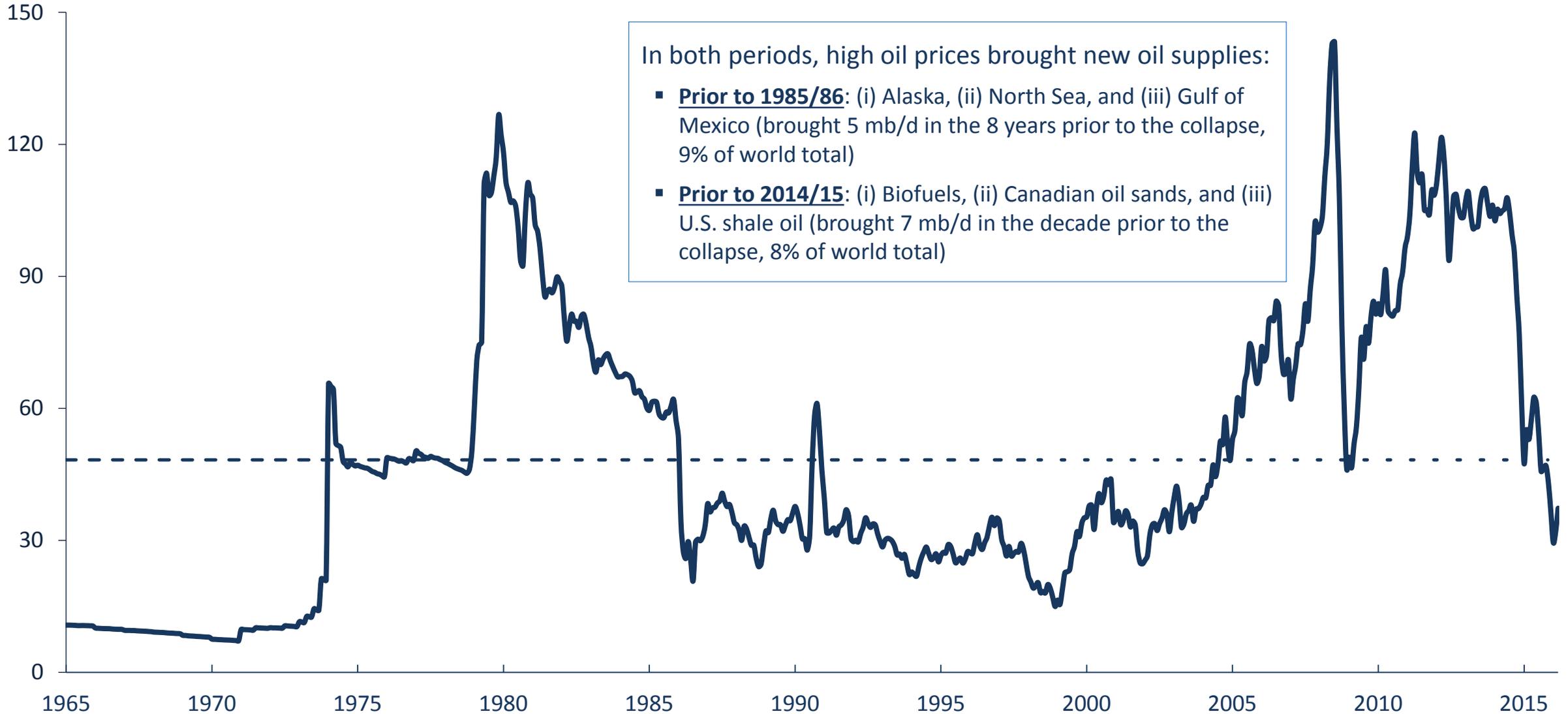


Source: World Bank

Note: Last observation is April 2016

# In both case high prices brought new supplies

US\$/bbl, deflated by U.S. CPI (2014 terms)

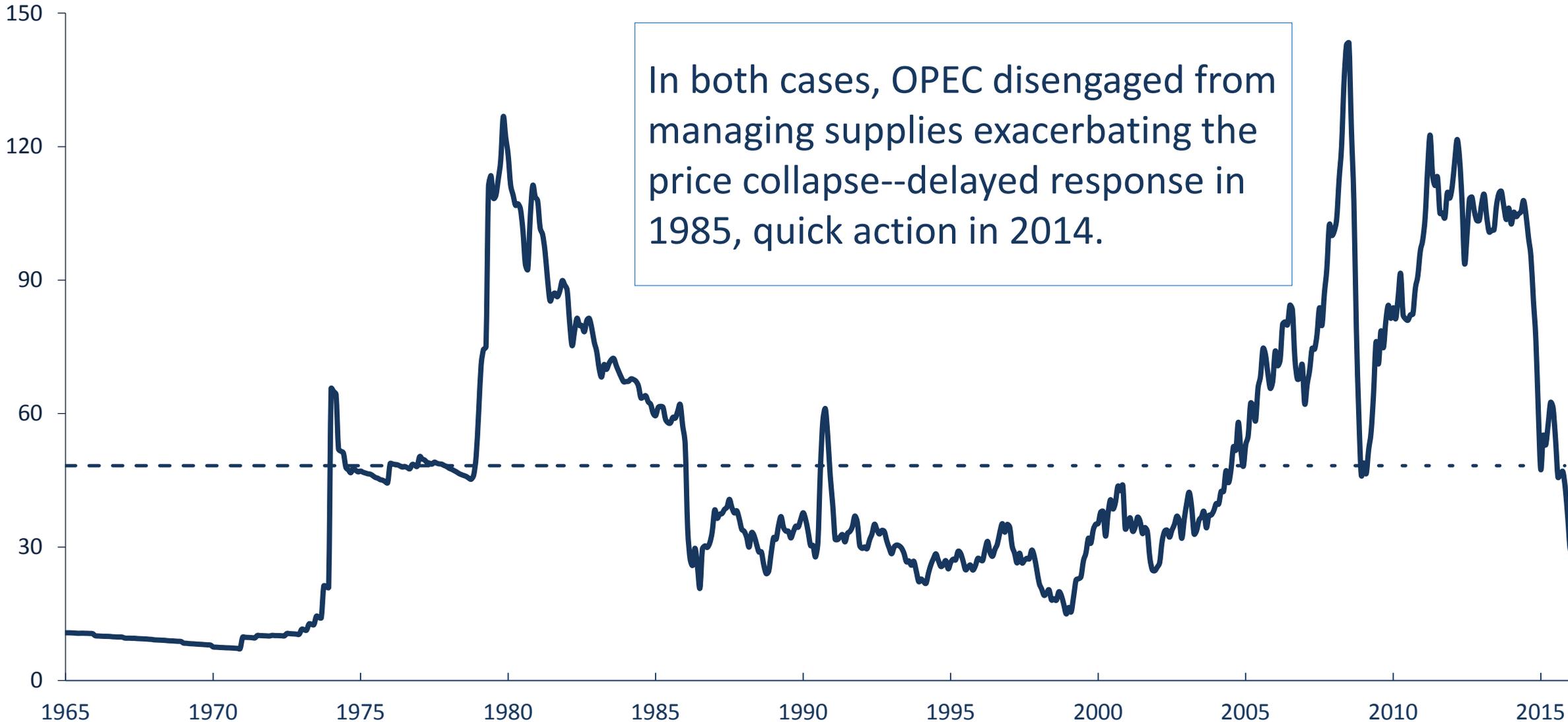


Source: World Bank

Note: Last observation is April 2016

# And in both cases OPEC responded

US\$/bbl, deflated by U.S. CPI (2014 terms)



In both cases, OPEC disengaged from managing supplies exacerbating the price collapse--delayed response in 1985, quick action in 2014.

Source: World Bank

Note: Last observation is April 2016

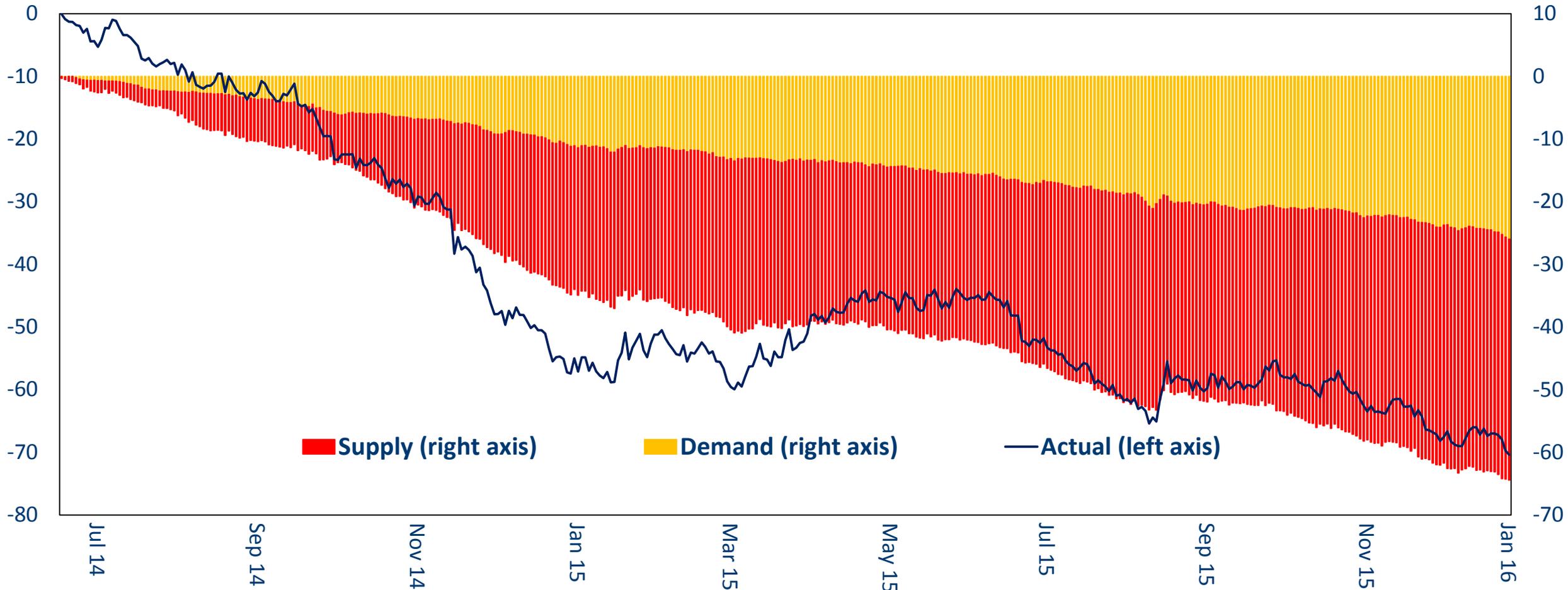
## A VAR model with sign restrictions

- The reduced-form VAR model is:

$$y_t = a_0 + A_1 y_{t-1} + A_2 y_{t-2} + \dots + A_l y_{t-l} + u_t$$

- The variables included in the model are: oil prices, equity prices, and U.S. exchange rates.
- Supply and demand shocks are identified using sign restrictions.
- Two orthogonal shocks with impulse responses that satisfy certain signs are estimated using the model.
- **Adverse demand shock:** Oil and equity prices decline reflecting a weak economy.
- **Favorable supply shock:** Oil prices decline but equity prices increase.
- The differing movement of equity prices allows one to discriminate between supply and demand shocks.

# Is it demand or supply?

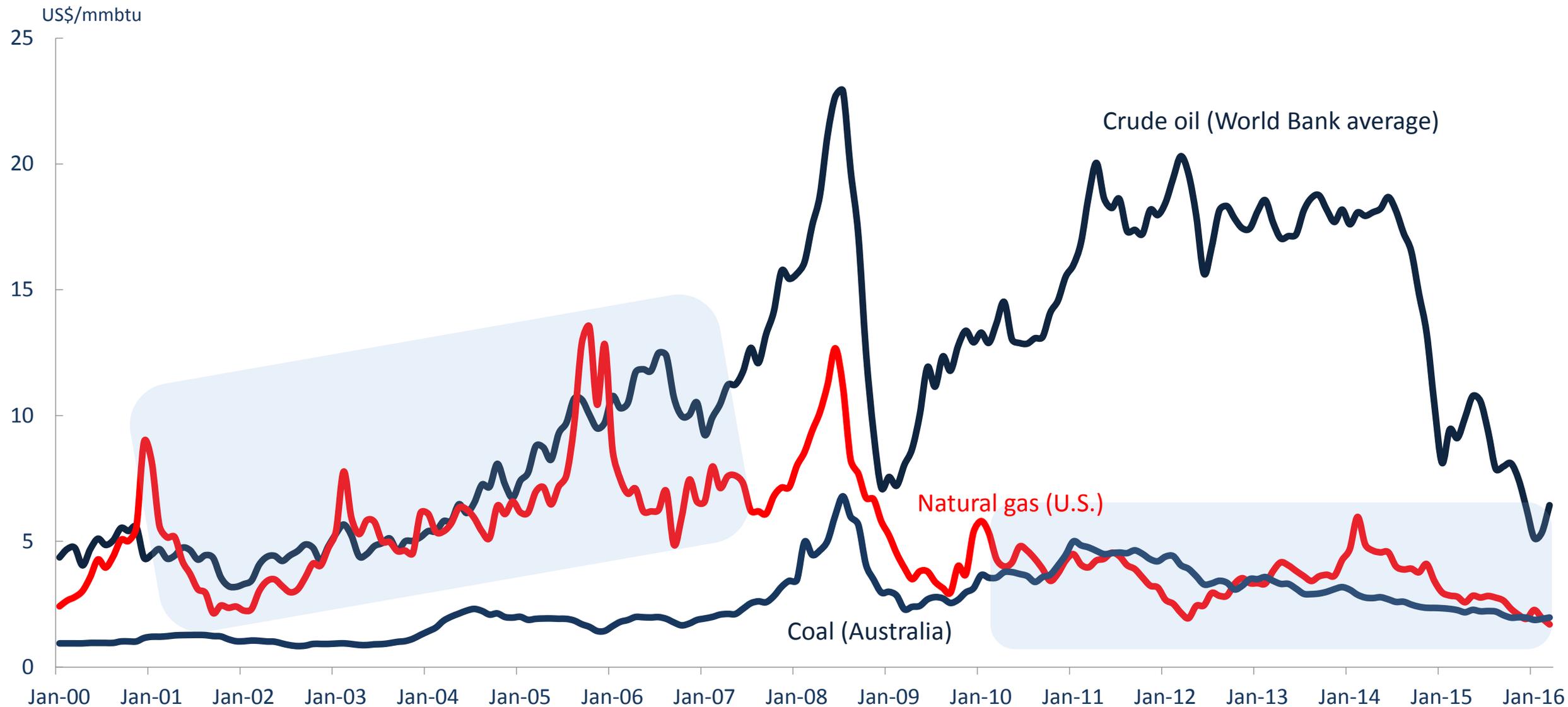


**Source:** Baffes, Kose, Ohnsorge, Stocker (2015).

**Note:** Based on estimates from a VAR model, identifying the demand and supply shocks using sign restrictions. All shocks except the shock of interest are shut off by setting them to zeros and the model is used to trace out the counterfactual oil price. This exercise is performed separately for supply and demand shocks. The red (yellow) counterfactual shows how much oil prices would have declined since the second half of 2014 only with the estimated supply (demand) shocks. The solid line is the actual cumulative growth rate in oil price since July 2014. The last observation is January 8, 2016.

What are the implications of the oil price plunge for other commodity markets? **Lower agricultural prices.**

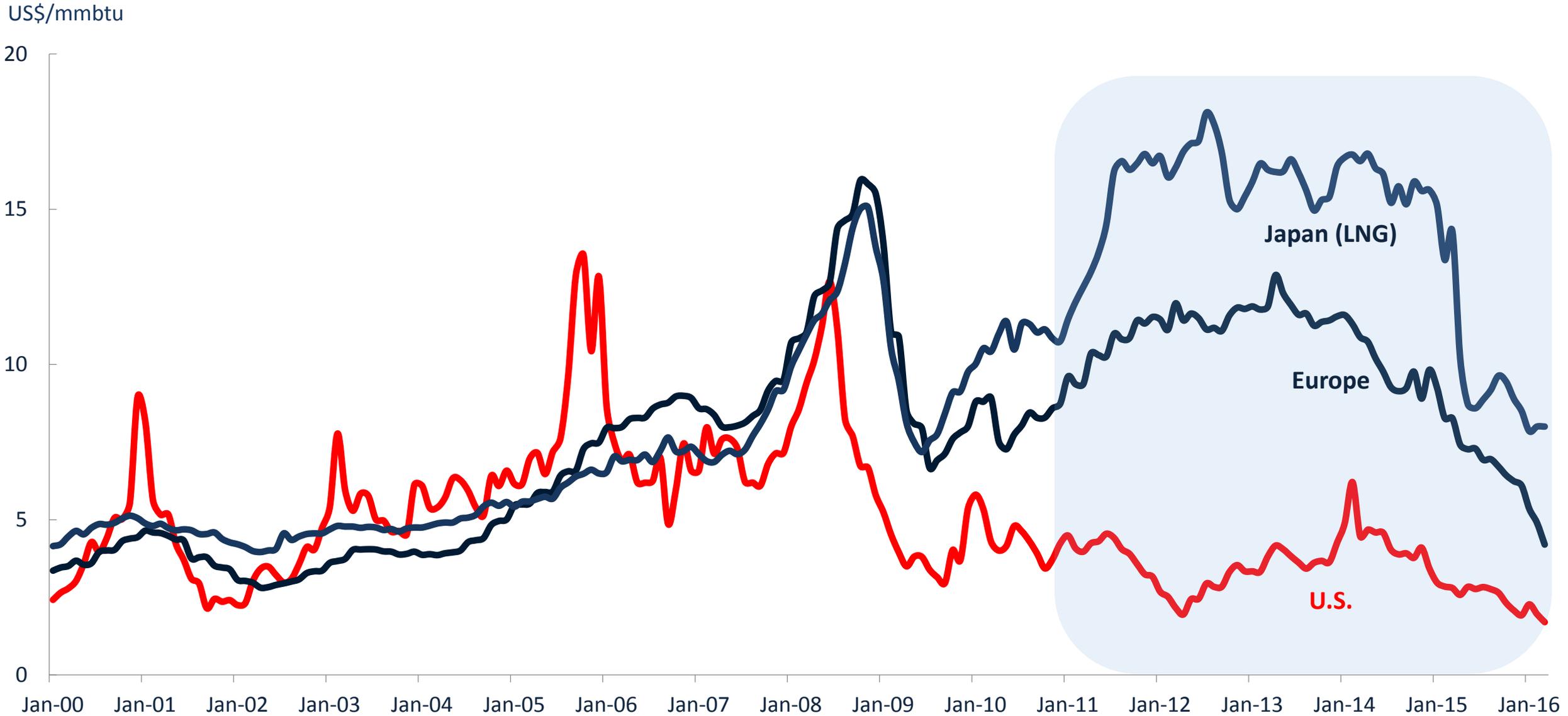
# The oil price plunge brought energy prices closer together



Source: World Bank

Note: Last observation is March 2016

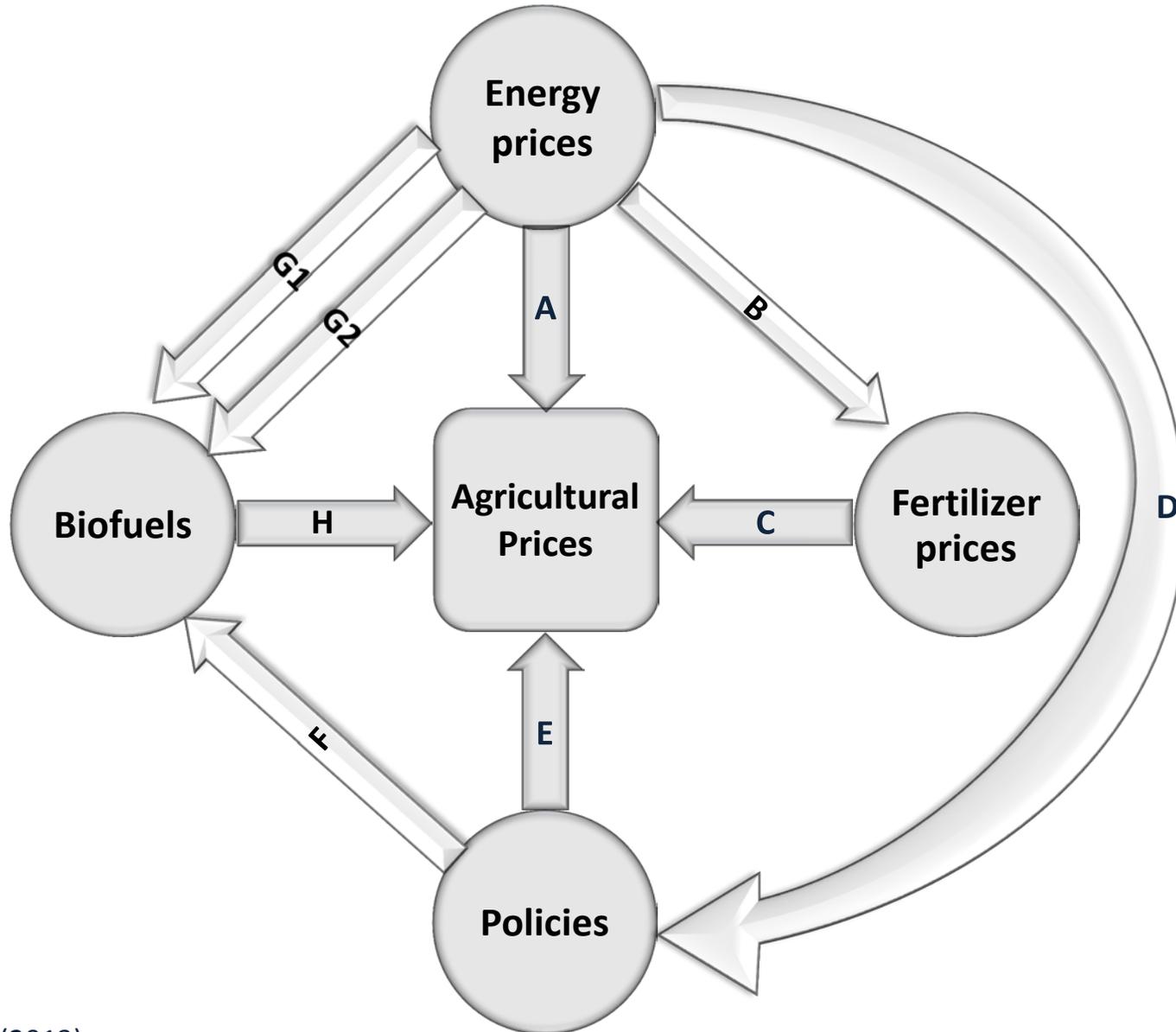
# Natural gas prices follow suit



Source: World Bank

Note: Last observation is March 2016

# The complex interaction between energy & agricultural prices



**A:** Crude oil

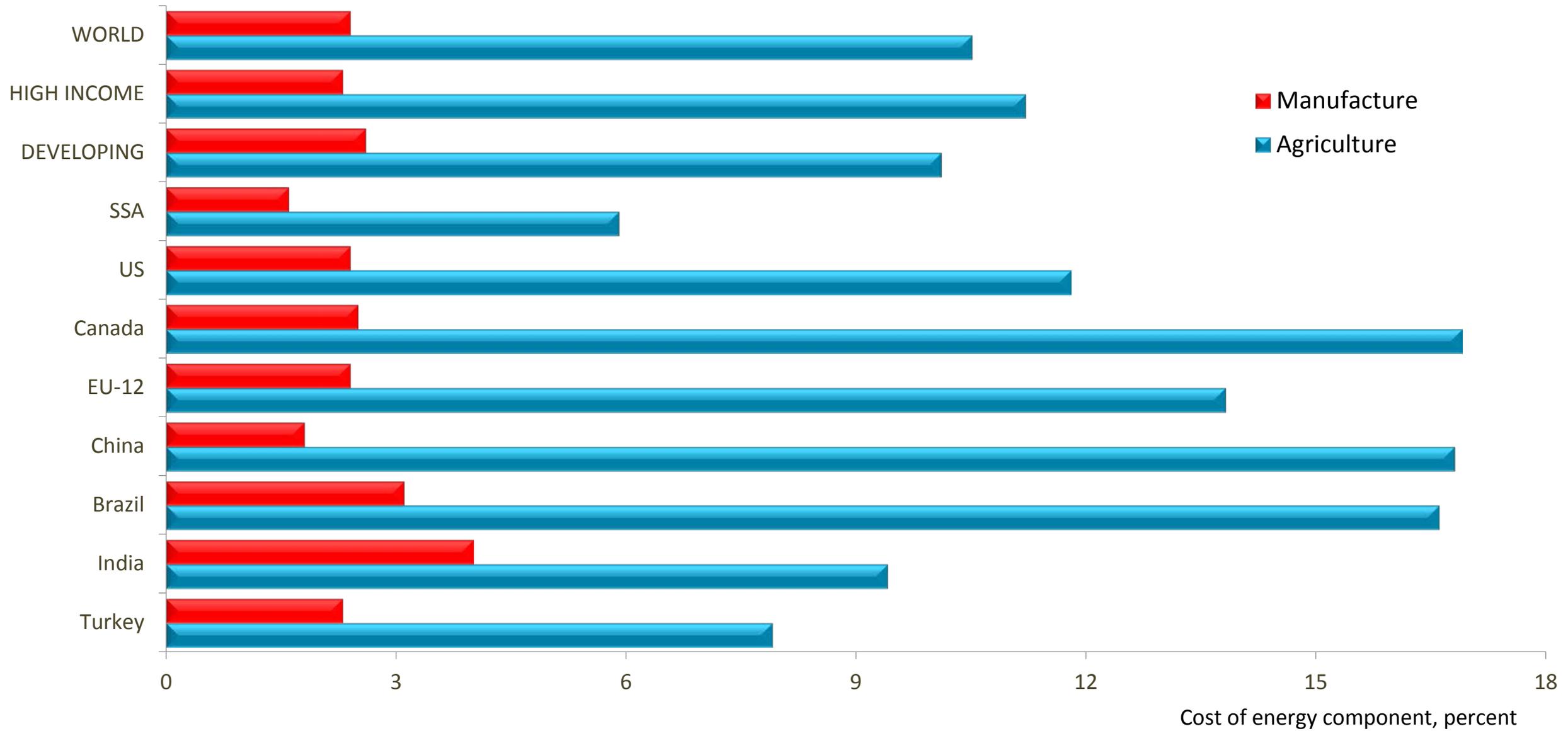
**B/C:** Natural gas

**D/F:** Policy-driven  
Biofuels

**G1:** Profitable biofuels  
(they may render A, B, and  
D/F irrelevant; oil price sets  
a floor to agricultural prices)

**G2:** Innovation in biofuels  
(agricultural prices fully  
linked to oil at lower level)

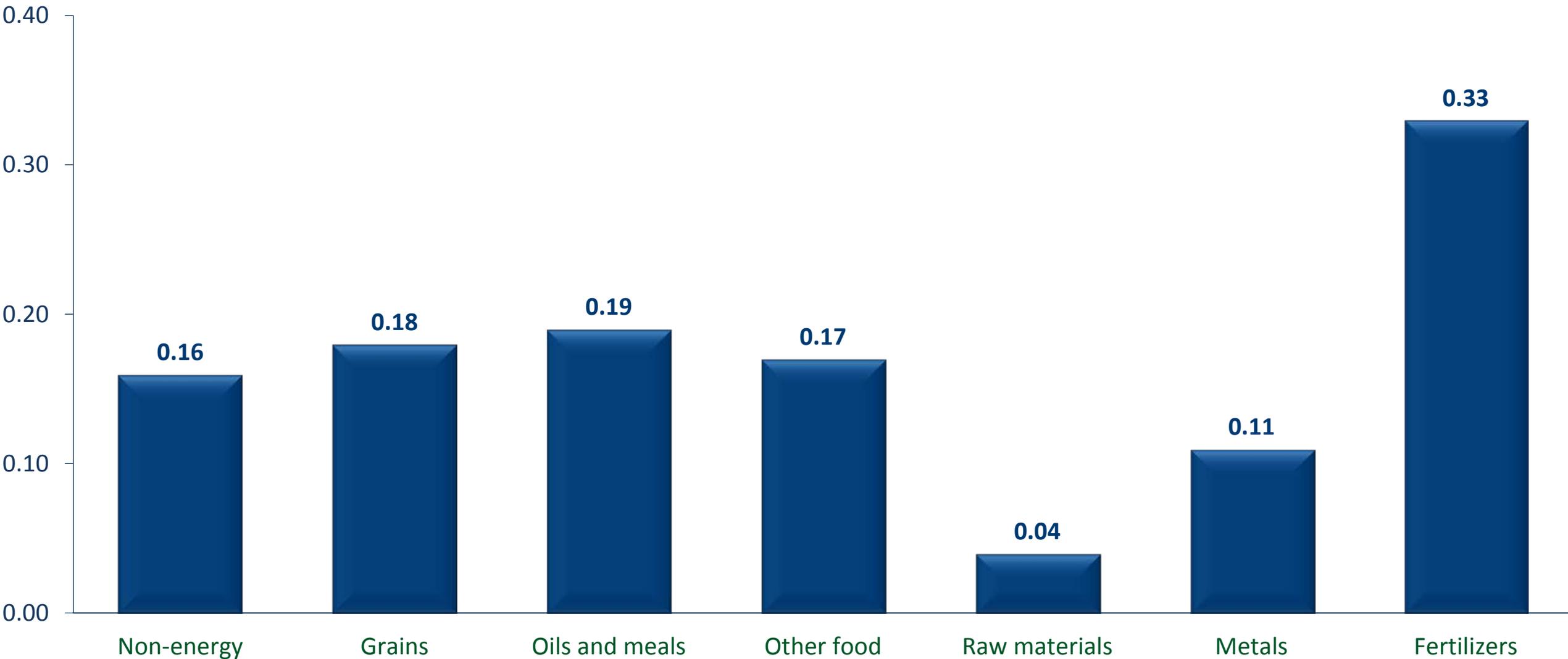
# Energy intensities



Source: Author's calculations based on the GTAP database

# Food commodity prices respond strongly to energy prices

Transmission elasticity estimates



Source: Baffes (2007)

Notes: based on OLS regression of nominal prices on oil price, deflator, time trend, annual data, 1960-2005.

# Oil's impact on other commodities

## Reduced-form econometric model

$$\log\left(\frac{P_t^i}{P_t^M}\right) = \beta_0^i + \beta_1^i \log(Y_t) + \beta_2^i R_t + \beta_3^i \log(X_t) + \beta_4^i \log(S_{t-1}^i) + \beta_5^i \log(P_t^E) + \varepsilon_t^i$$

$P_t^i$ : Nominal price of commodity  $i$  ( $i$  = maize, soybeans, wheat, rice, palm oil, cotton)

$P_t^M$ : Price index of manufacturing goods,

$Y_t$ : Income (proxied by various measures of GDP),

$R_t$ : Interest rate (3-month T-bill),

$X_t$ : US\$ exchange rate (broad index of currencies),

$S_t^i$ : Stock-to-use ratio of commodity  $i$ ,

$P_t^E$ : Price of crude oil,

**Data:** Annual frequency, 1960-2015

**Estimation:** OLS and Panel (next slide) as well as ARDL (not shown here)

# The role of energy in agricultural prices

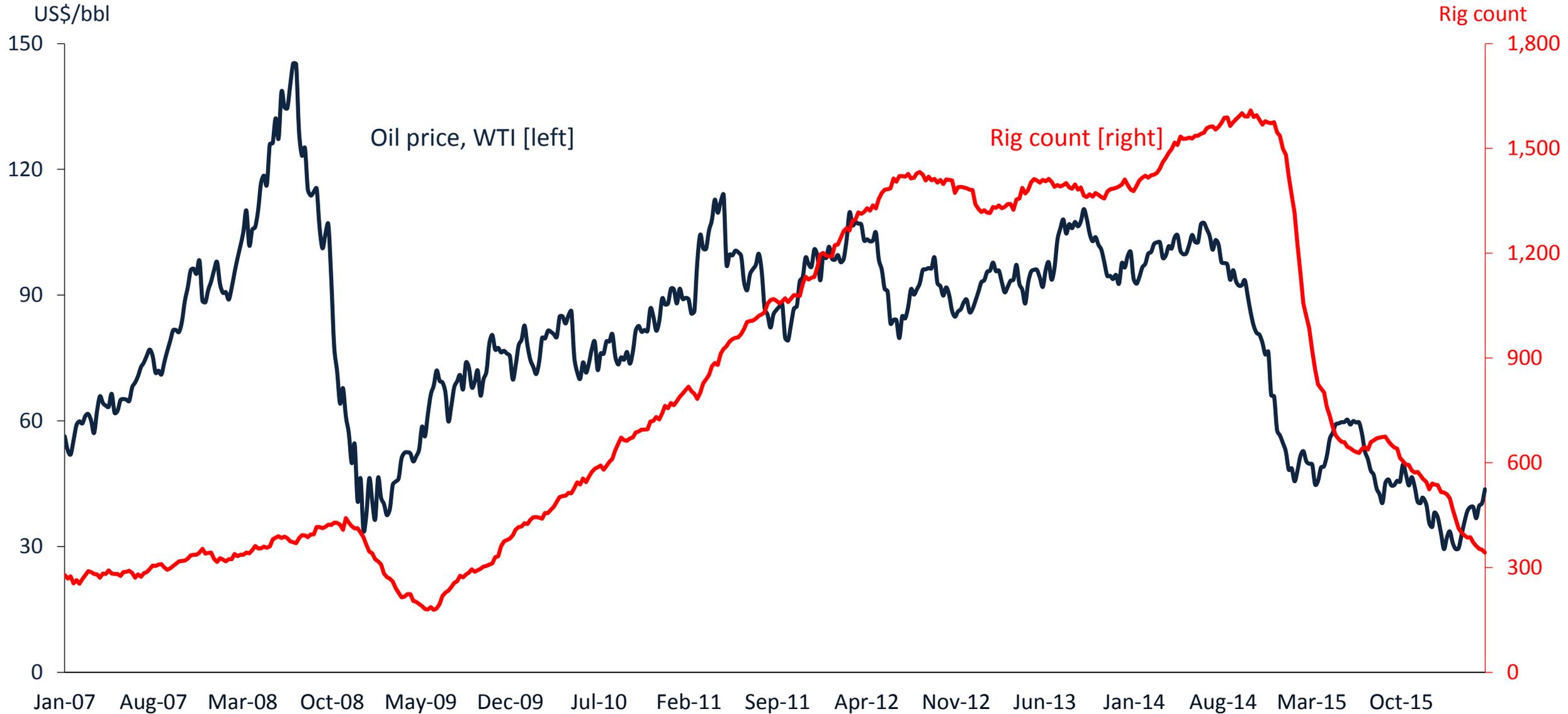
	Maize	Soybeans	Wheat	Rice	Palm oil	Cotton	Panel
<b>S/U ratio (-1)</b>	-0.48***	-0.21***	-0.46***	-0.49***	-0.42***	0.40***	-0.37***
<b>Oil price</b>	0.15***	0.13**	0.11*	0.15***	0.30***	0.10	0.15***
<b>Exchange rate</b>	-0.41	-0.21	-0.05	-1.44***	-0.13	-0.16	-0.46**
<b>Interest rate</b>	0.02	-0.06**	-0.06**	-0.04**	-0.06***	-0.05***	-0.01
<b>Income</b>	-0.60***	-0.44***	-0.49***	-0.71***	-0.71***	-0.71***	-0.48***
<b>Adjusted-R<sup>2</sup></b>	0.67	0.50	0.50	0.70	0.53	0.60	0.59
<b>No of obs</b>	55	50	55	55	50	55	310

Source: Baffes and Haniotis (2016)

Notes: Asterisks denote levels of significance.

**Where are commodity prices heading? The cycle is over.**  
**Down this year (from 2015), slightly up next year. Oil at \$41 in 2016 and \$50 in 2017.**

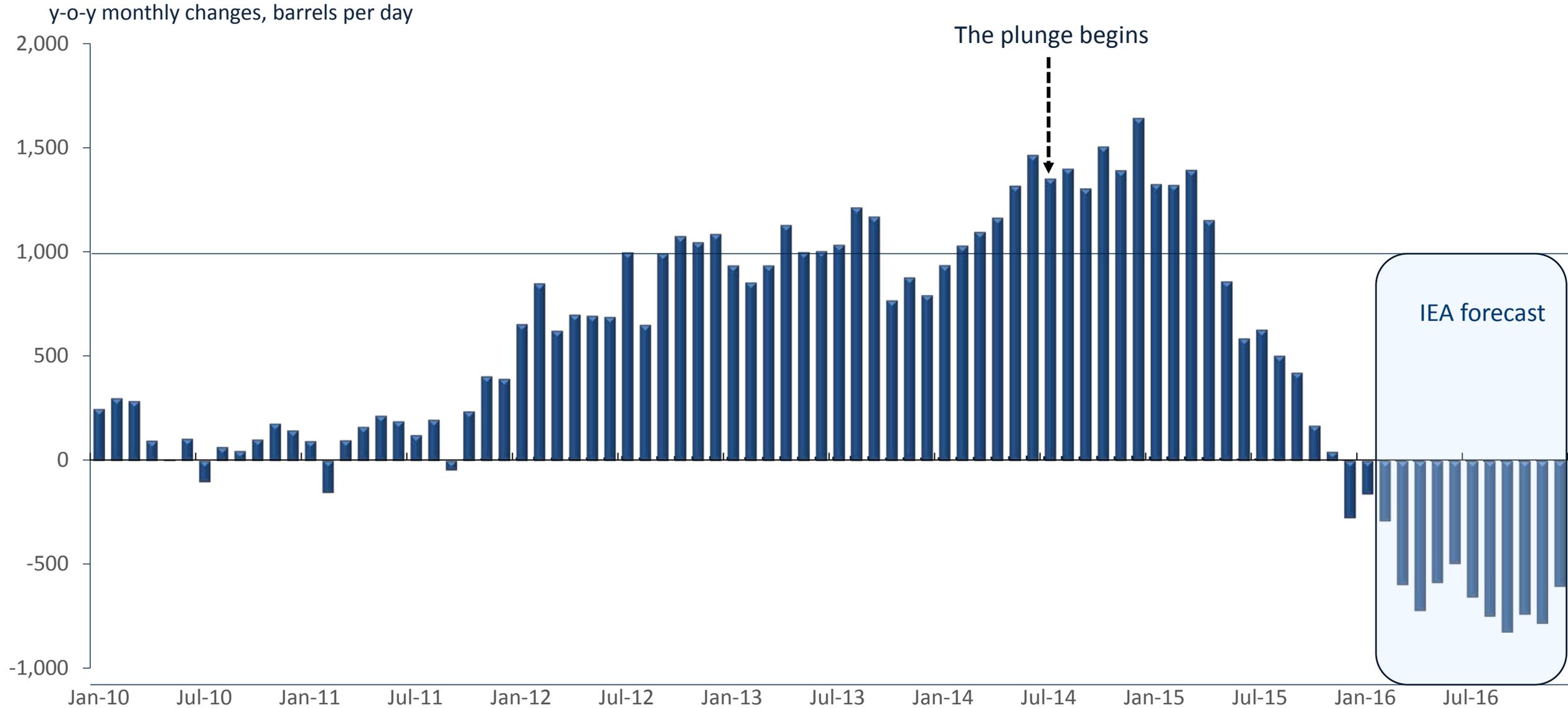
# The U.S. rig count responds to the price collapse



Source: Baker Hughes, Bloomberg, and World Bank

Note: Weekly data, last observation April 22, 2016

# U.S. oil production turned out to be resilient, ... until recently

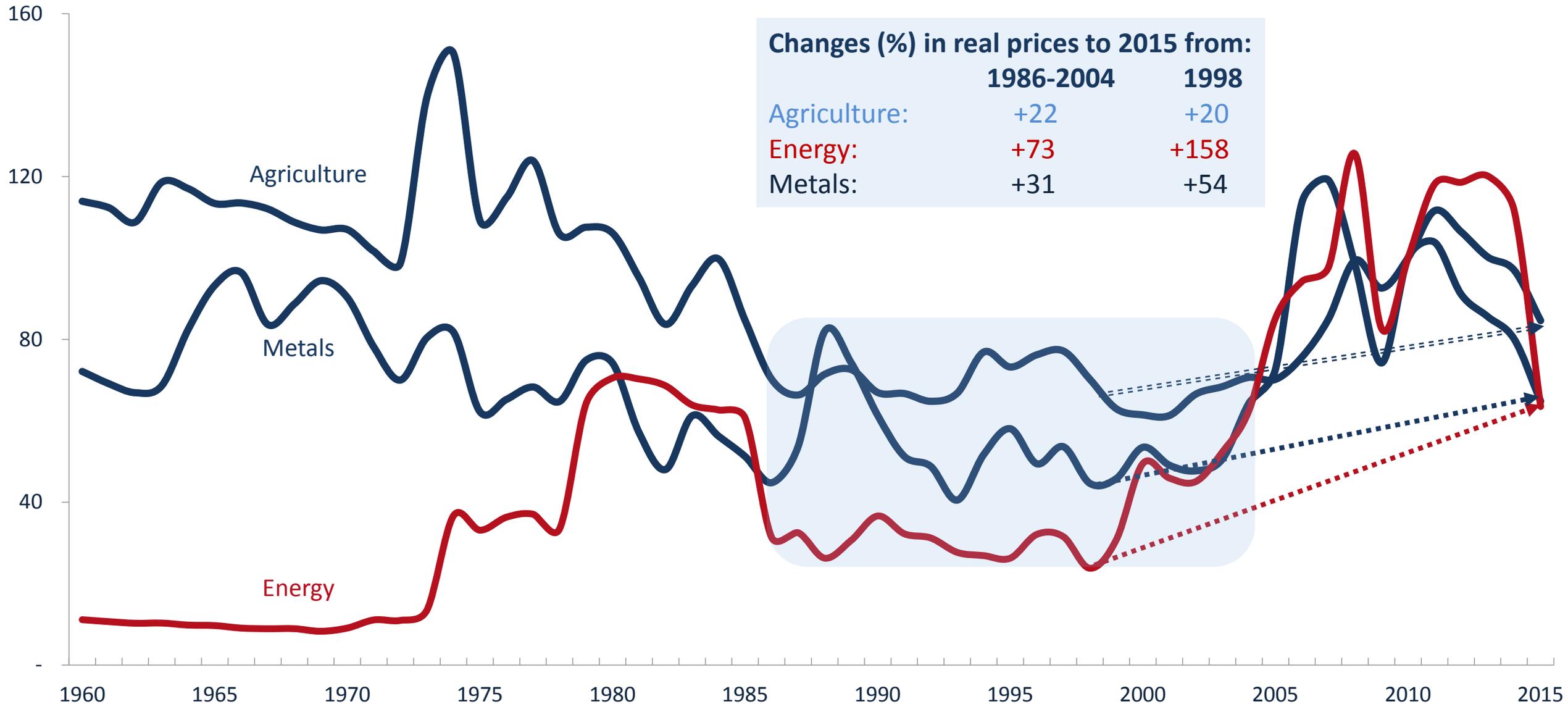


Source: International Energy Agency

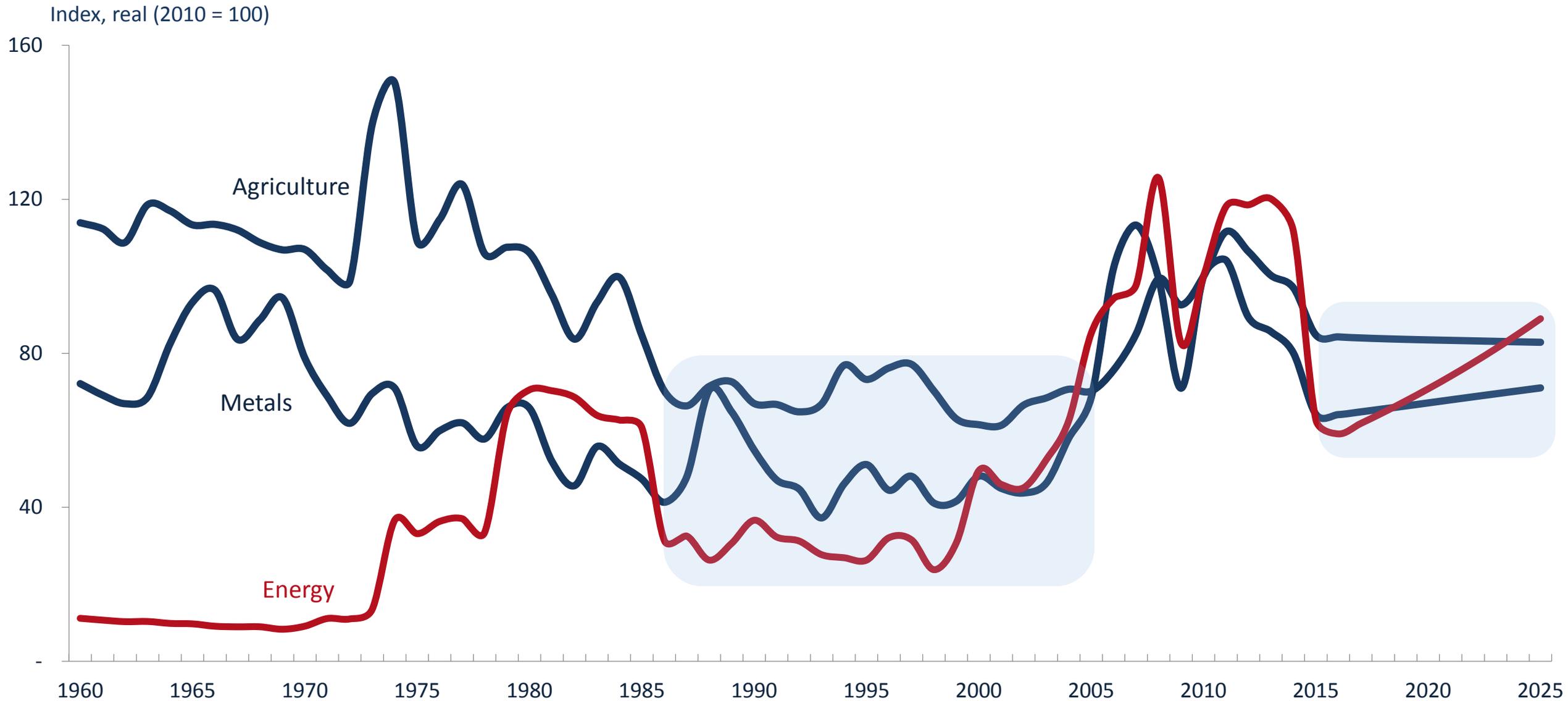
Notes: Last actual is January 2016. February 2016 to December 2017 is forecast

# Prices are still higher than the 1985-2004 average

Index, real (2010 = 100)



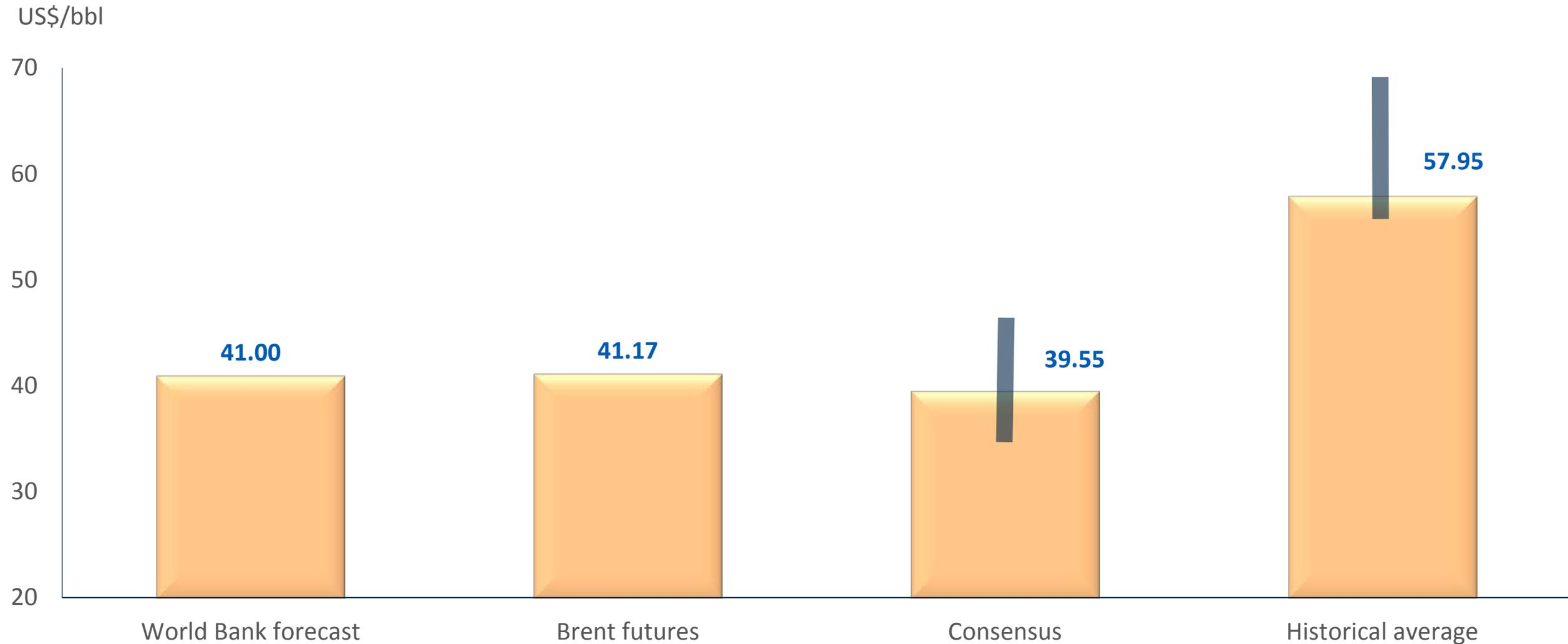
# The ultimate question: 1985-2004 Déjà vu?



Source: World Bank

Note: The period 2016-25 refers to forecasts, as of April 2016

# Crude oil price for 2016



**Source:** World Bank, Consensus Forecast, Bloomberg.

**Notes:** World Bank forecast (made available on April 26), average of Brent, WTI, Dubai. Average Brent futures closing for the week of April 18, including actuals to date. Consensus, median [39.55] and range [33.59-46.09] for Brent as of April 22. Historical average 12-month recovery, median [57.95] and range [55.85-69.11] since the lows of 07/86, 12/98, and 12/08 applied to 01/16 average of \$29.78/bbl.

# Supporting material

# Oil continues its search for equilibrium after November 2015

## ➤ DEMAND

- Forecast growth of emerging economies, notably China's, are revised downwards.
- The Northern Hemisphere experienced milder-than-usual winter linked to El Niño by some).

## ➤ SUPPLY

- OECD stocks reached record high levels.
- OPEC production surged, led by Iraq and Saudi Arabia.
- The US shale oil industry turned out to be more resilient-than-expected, but the first monthly year-on-year decline took place in December 2015.

## ➤ MACRO

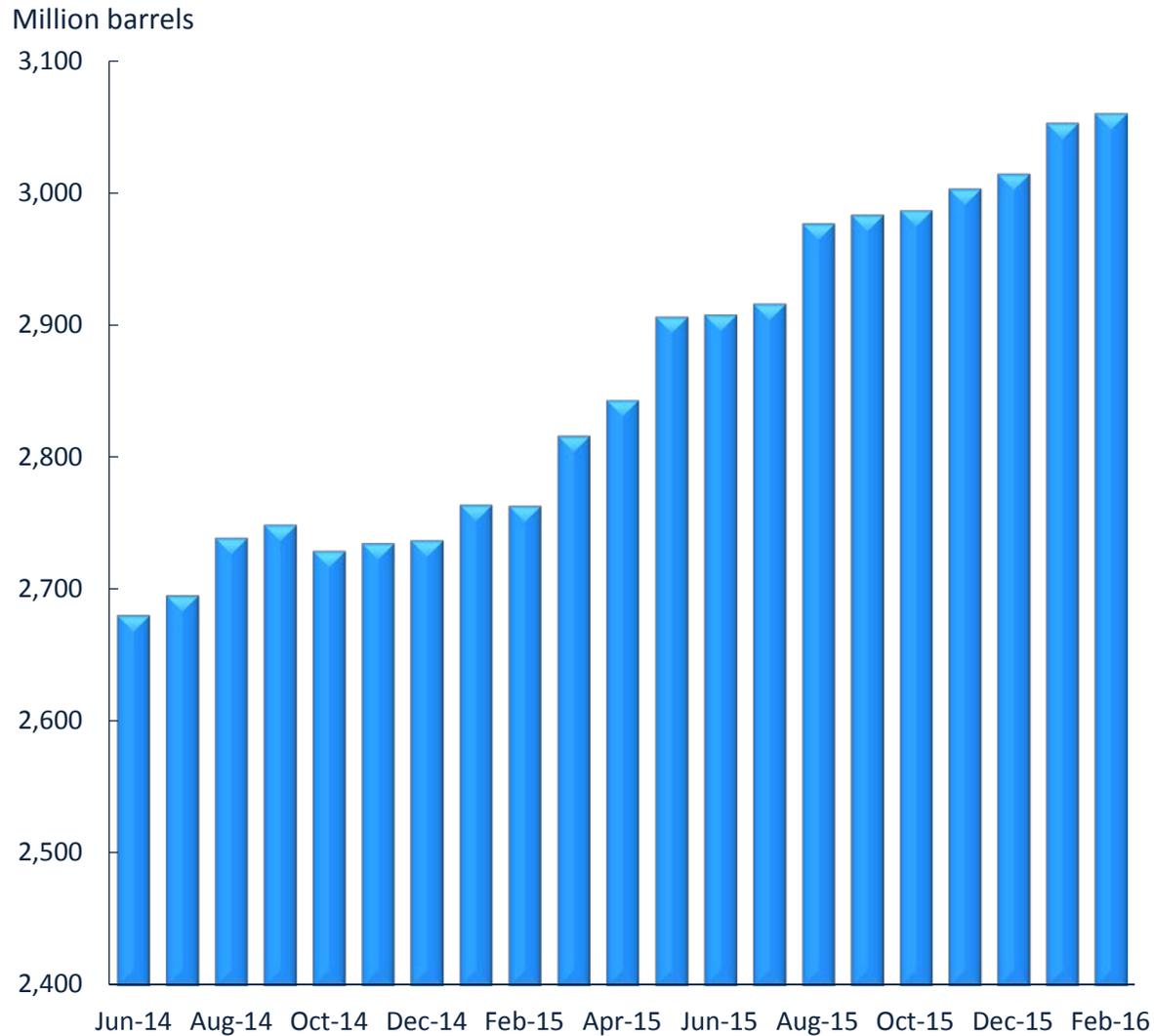
- US\$ (against major currencies) appreciated further, but weakened recently (down almost 7 percent since mid-January).

## ➤ POLICY

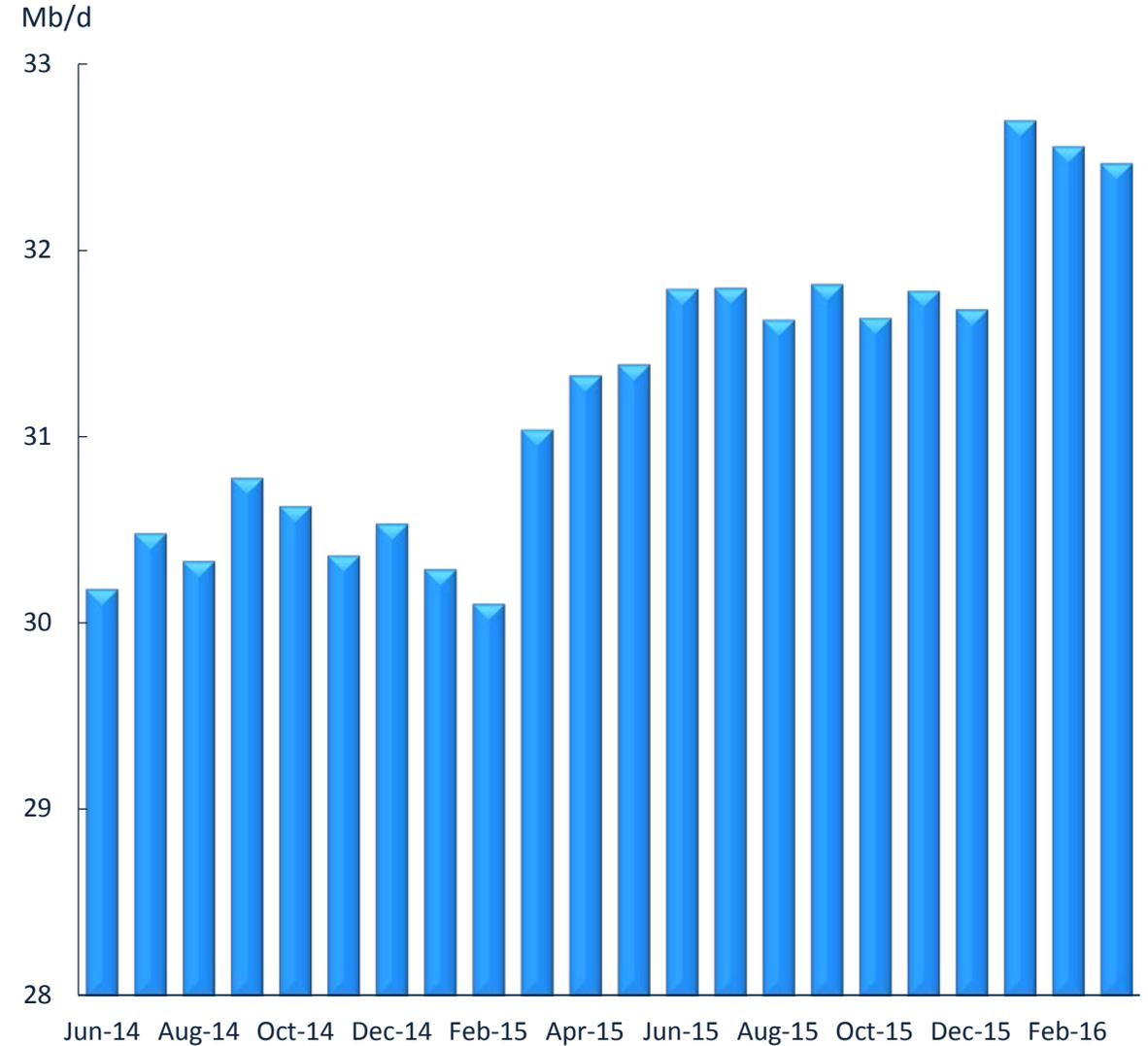
- OPEC reaffirmed retaining market share in its December 2015 meeting.
- OPEC & non-OPEC producers failed to agree on freezing production during their April 17 meeting in Doha. Politics appears to have played a key role.
- Sanctions on Iran were removed earlier-than-expected (it already increased exports).
- US lifted the effective ban on crude oil exports (no material changes, US is still a net oil importer).

# OECD stocks and OPEC crude production surged

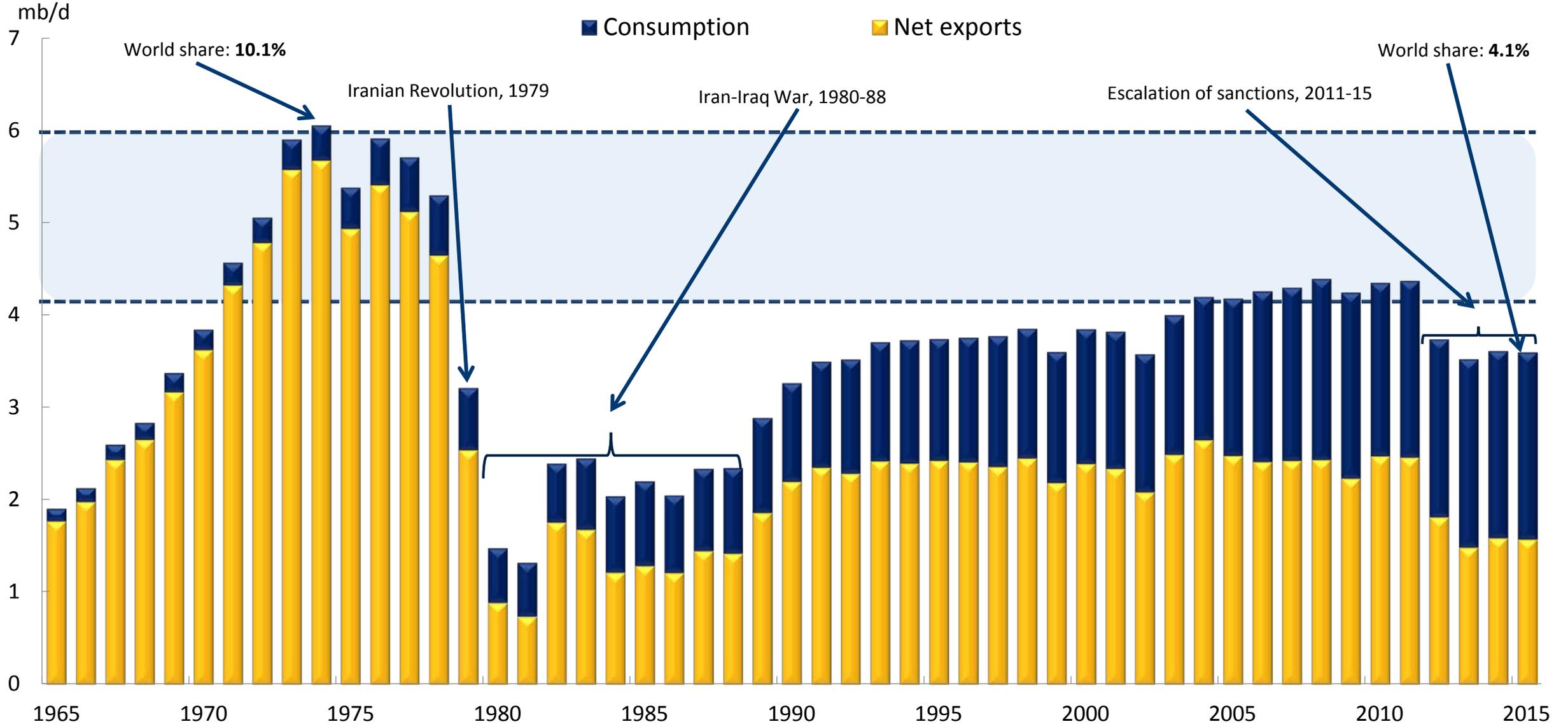
## OECD crude and product stocks



## OPEC crude oil production



# Iran's history

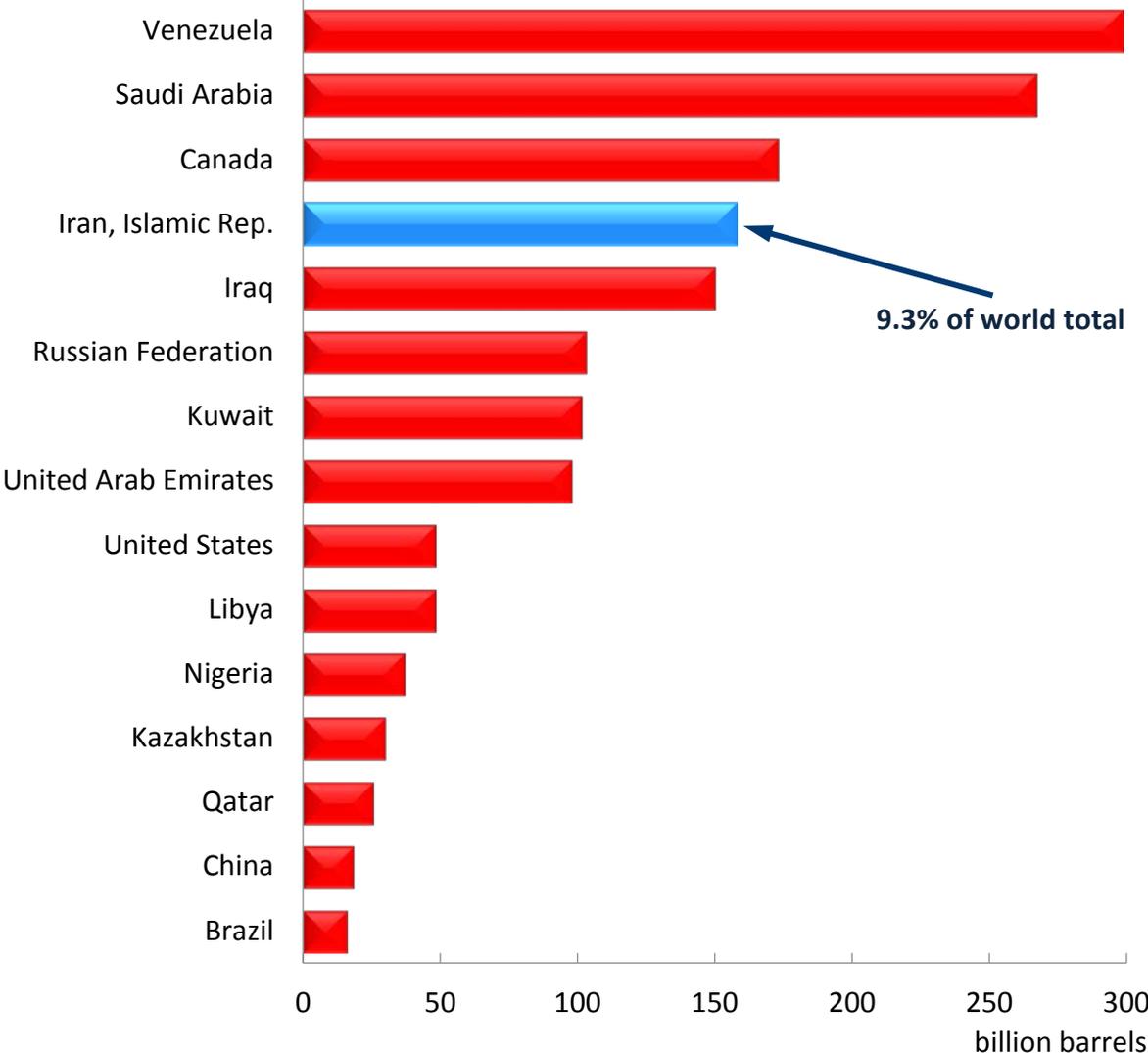


Source: BP Statistical Review.

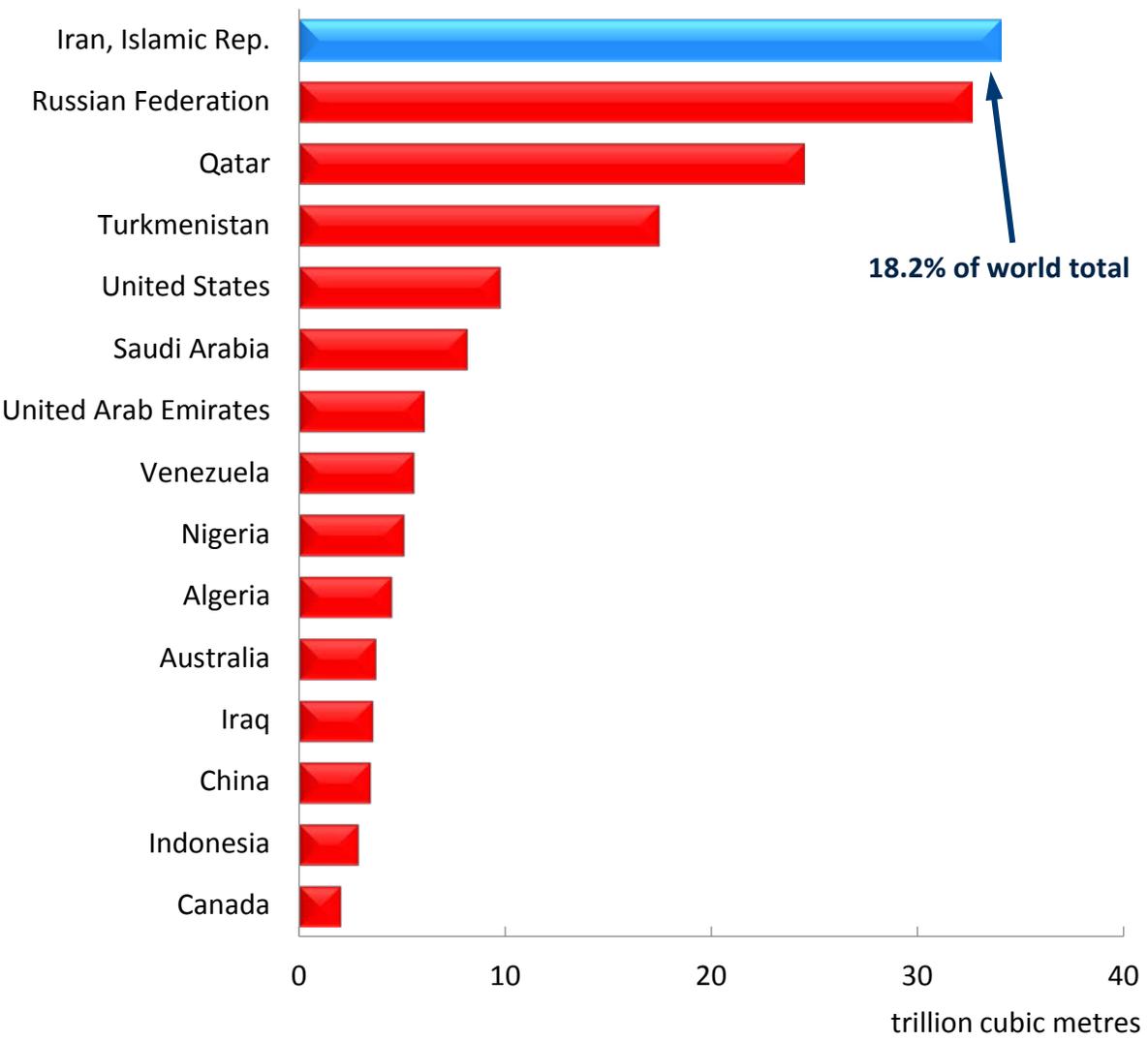
Note: Production includes crude oil and liquids.

# Iran's potential

## Proved oil reserves



## Proved natural gas reserves



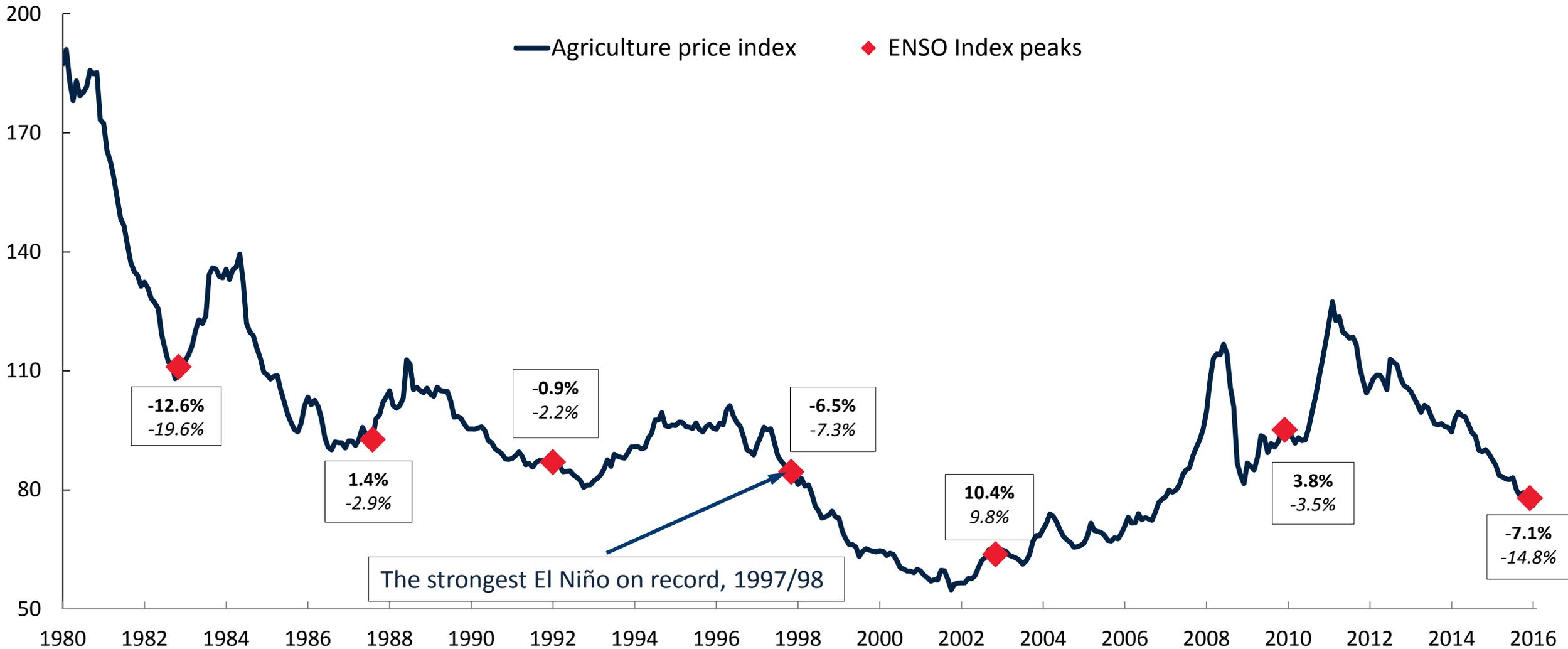
Source: BP Statistical Review and World Bank

# Global metal consumption



# Agricultural prices decline despite El Niño

Index, deflated by U.S. CPI, Jan. 2010=100



**Source:** World Bank and National Oceanic Atmospheric Administration.

**Note:** The numbers denote percent changes of the six-month average price index leading to the episode compared to the previous six-month period (bold) and the corresponding six-month period of the previous year (italic). The last observation is February 2016.

Thank you!