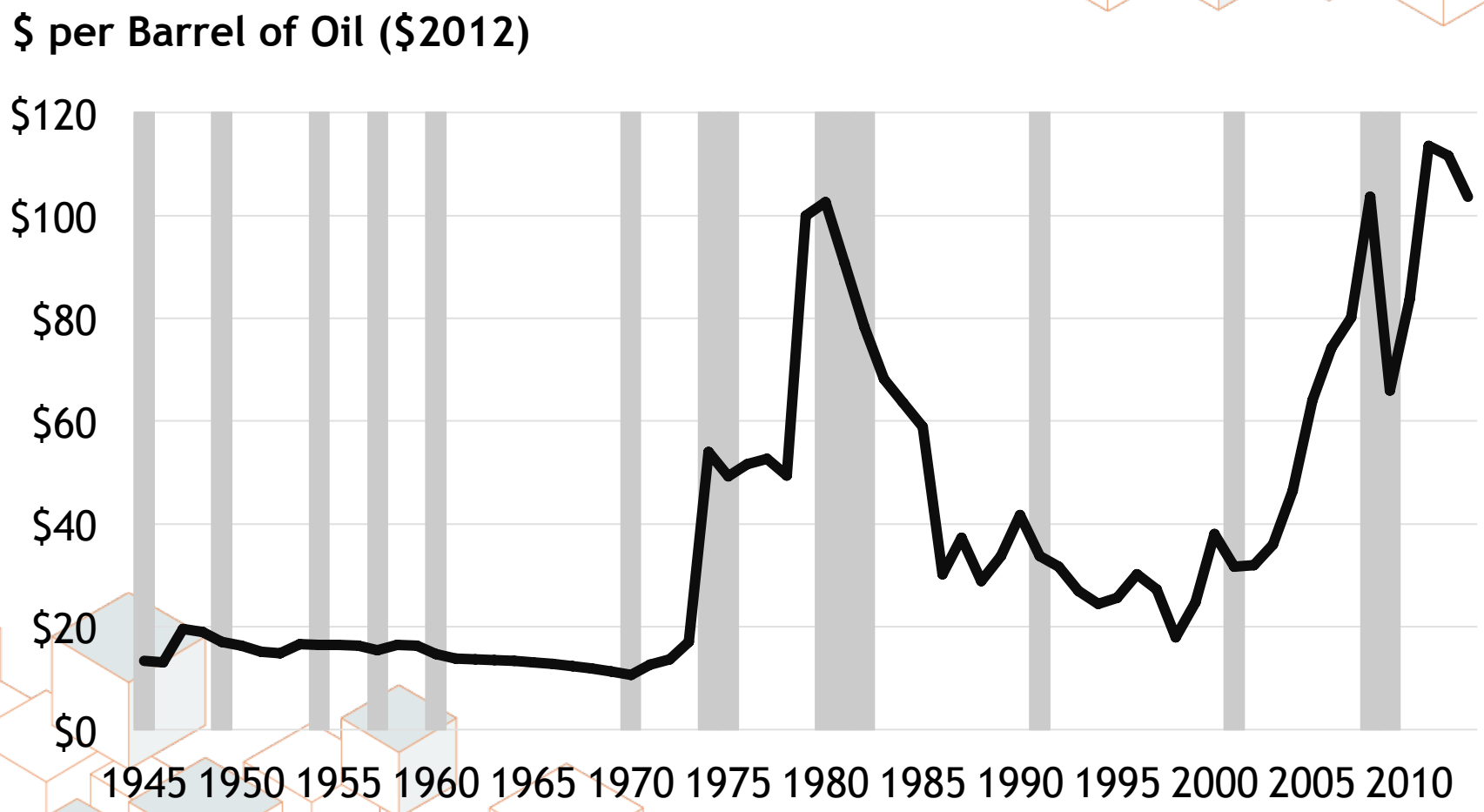
Sheboygan Economic Club
19 November2013

Will Unconventional Oil & Gas Reignite the Economy?

Dr. T.K. Swift
Chief Economist & Managing Director

American® Chemistry Council

Recessions Oil Price Associated with Spikes



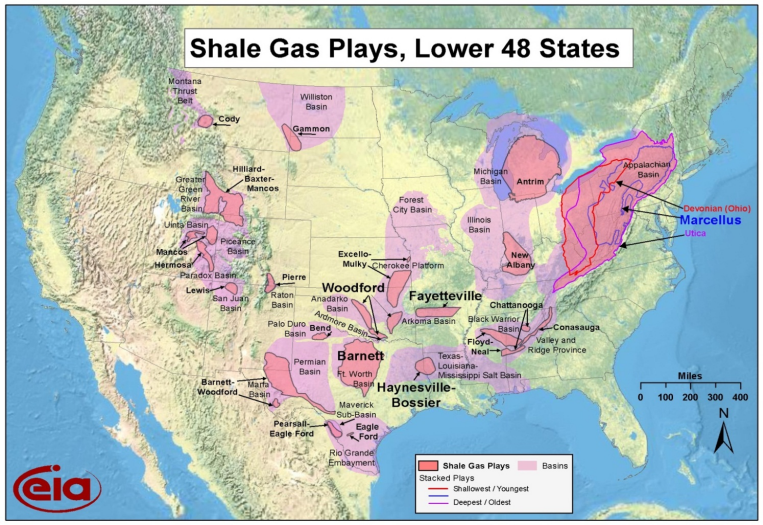
Source: BP

Shale Gas is Changing Everything

- Shale gas is possibly the most important energy development in the past 50 years
- Shale gas now accounts for more than a third of US natural gas production
- Abundant supplies of natural gas liquids are changing the economics of global petrochemical production patterns
- Lower natural gas costs are improving the competitiveness of not only chemical producers, but other gas-intensive manufacturers

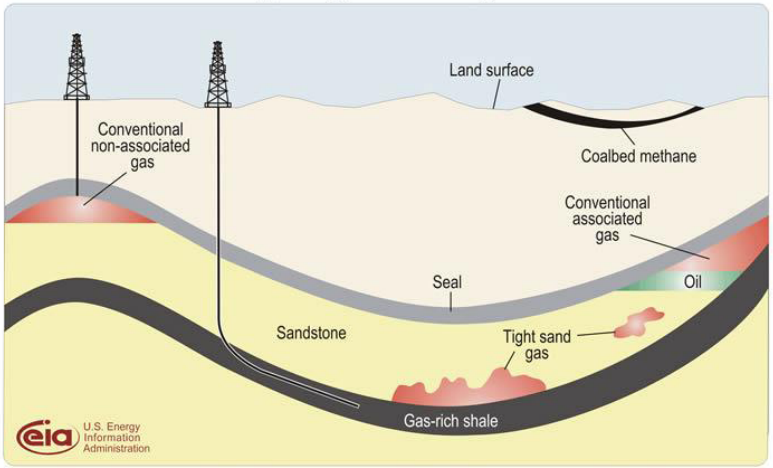
Shale Gas Resources and the Enabling Technologies

- New way of gathering natural gas from tight-rock deposits of organic shale
- Horizontal Drilling
  - Drill horizontal wells 1½ miles beneath the surface
  - And lateral lengths of 10,000 feet
- Hydraulic Fracturing
  - Fracture the rock by using water pressure aided by chemistry (polymers, gelling agents, foaming agents, etc.)
  - Typical well requires 2 to 3 million gallons of water and 1.5 million pounds of sand
  - About 99.5% of mixture is sand and water
- Computational modeling

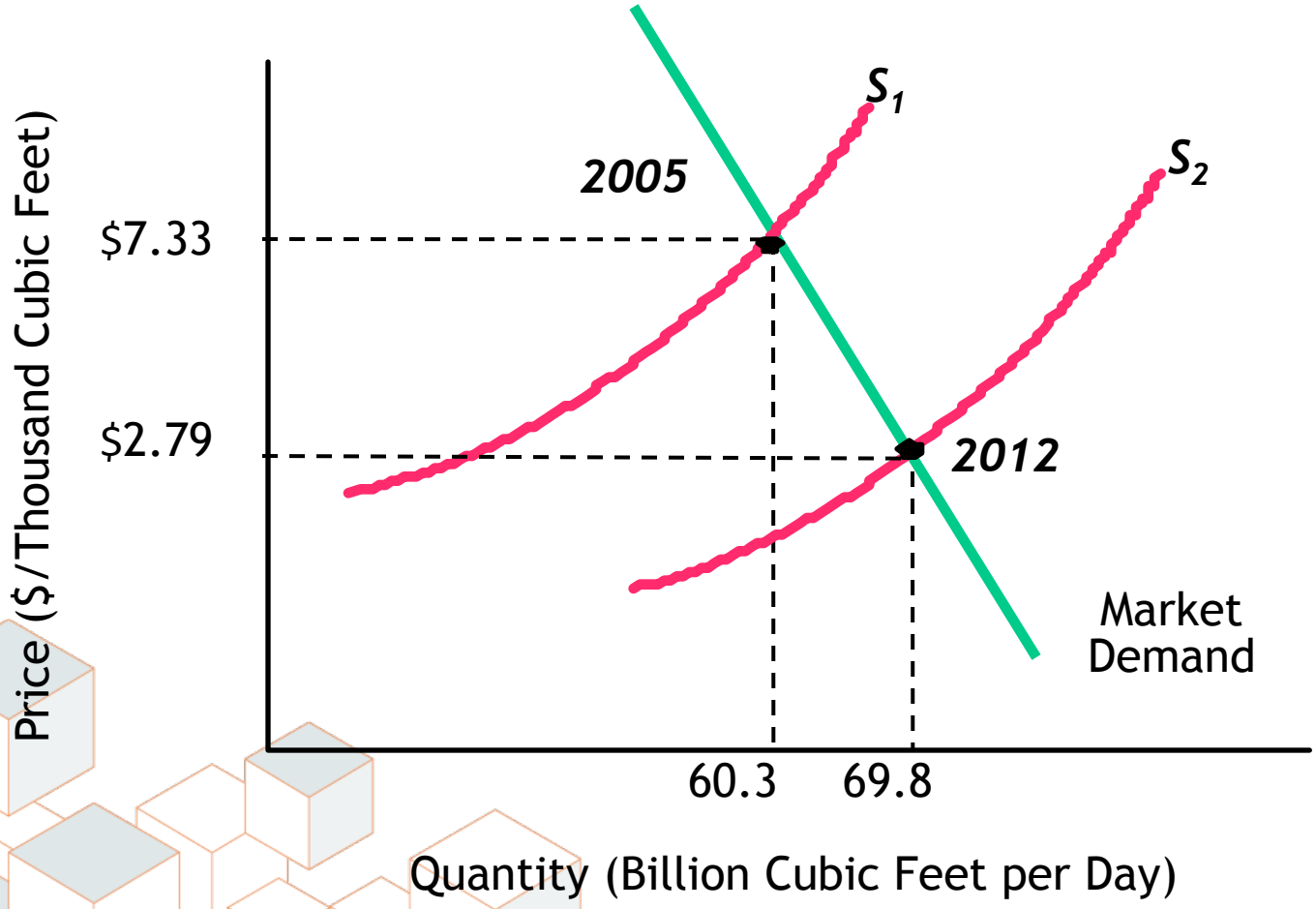


Source: Energy Information Administration based on data from various published studies.
Updated: March 10, 2010

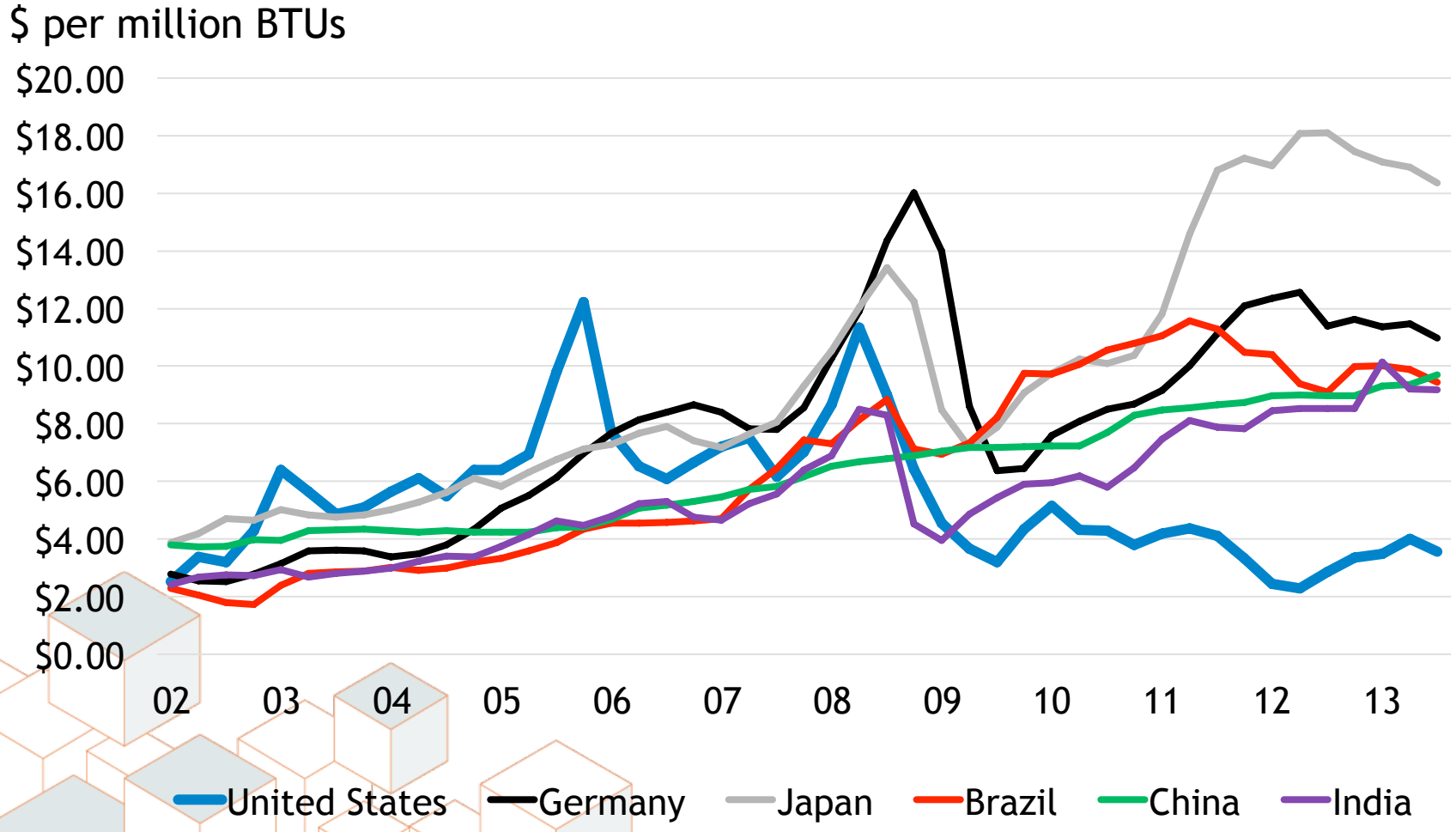
Schematic geology of natural gas resources



Technologies Push out the Supply Curve



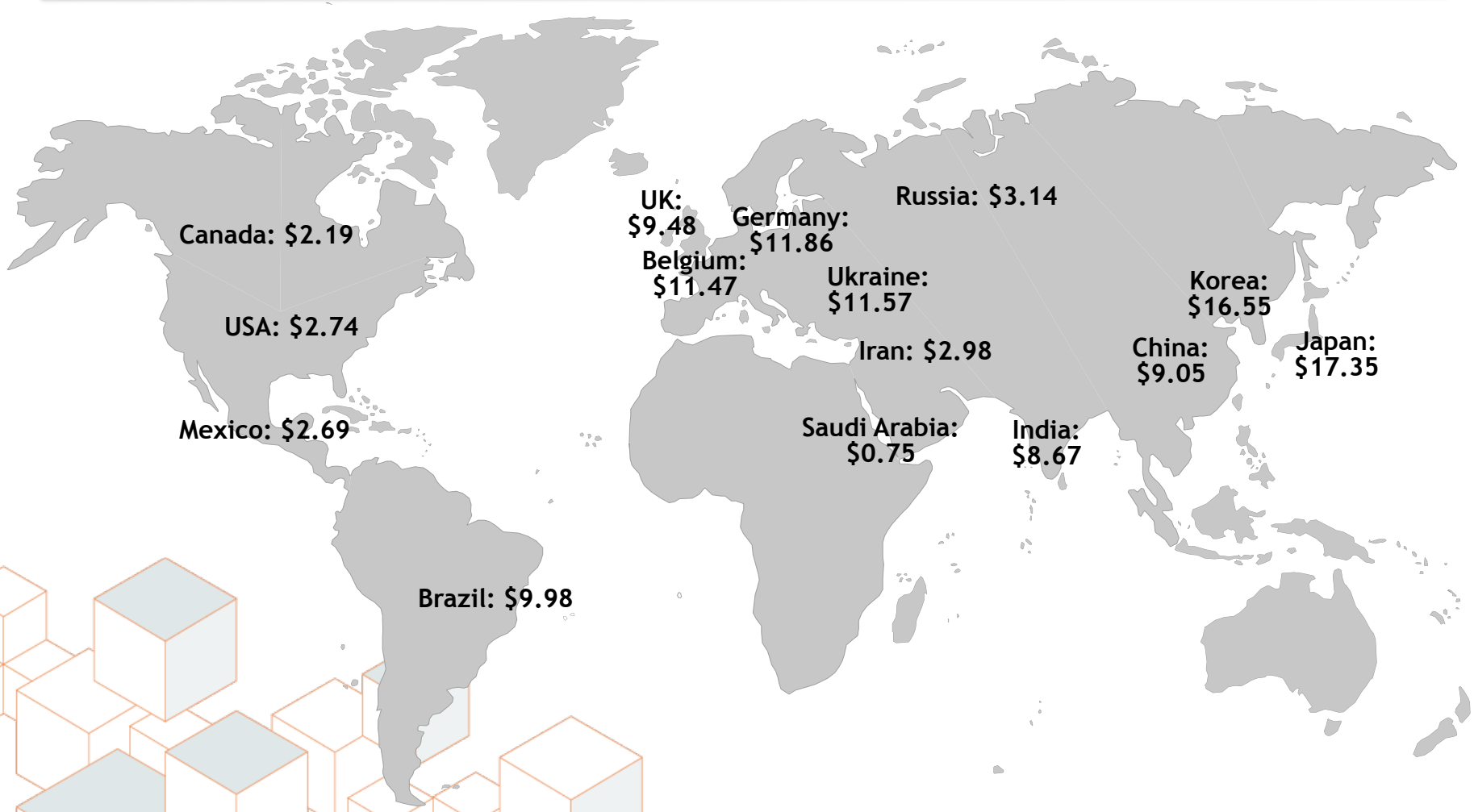
Global Natural Gas Price Trends



Source: EIA, Petrobas, IMF, World Bank, various national statistical agencies

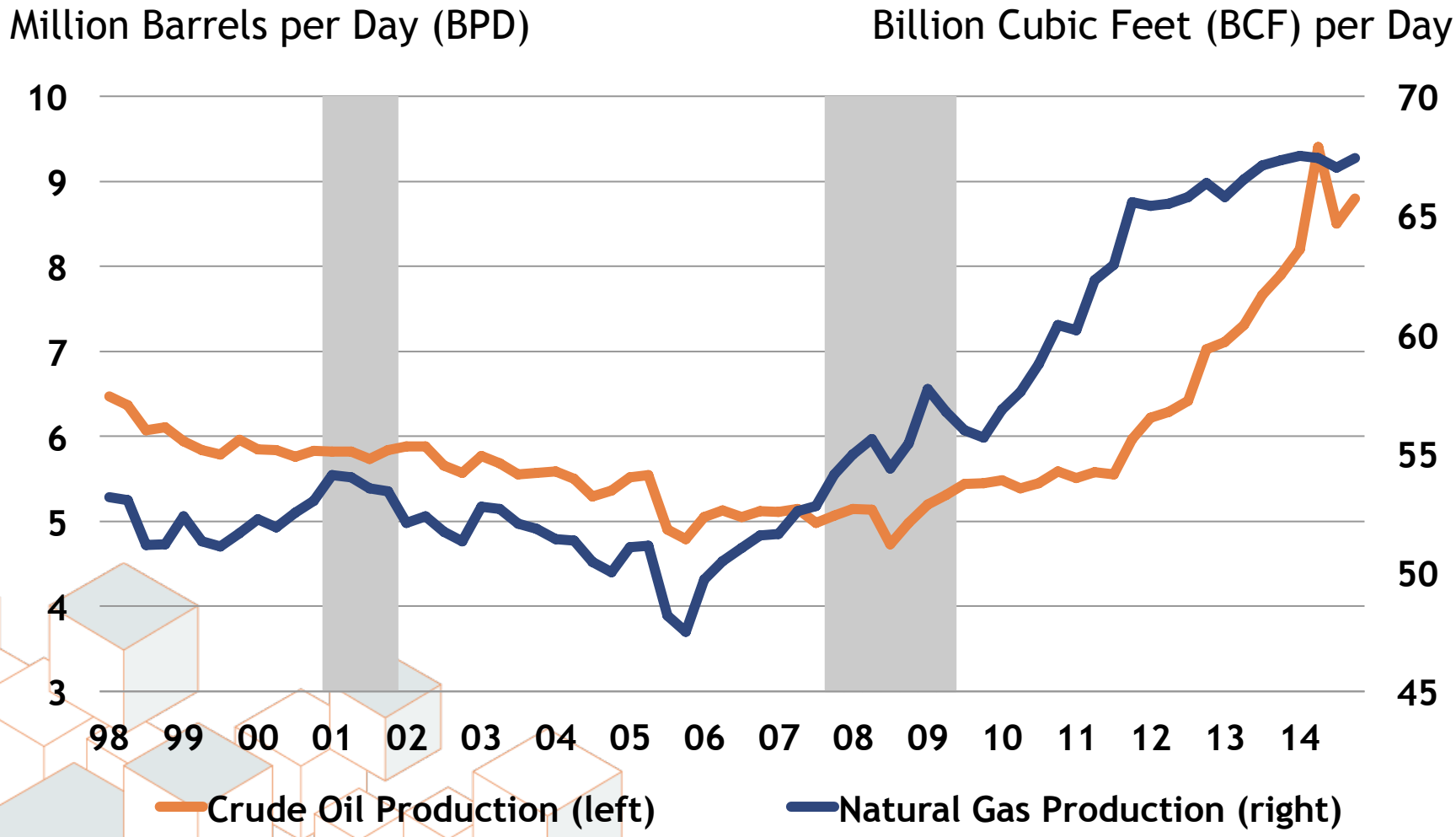
Global Natural Gas Costs: 2012

($US per million BTUs)



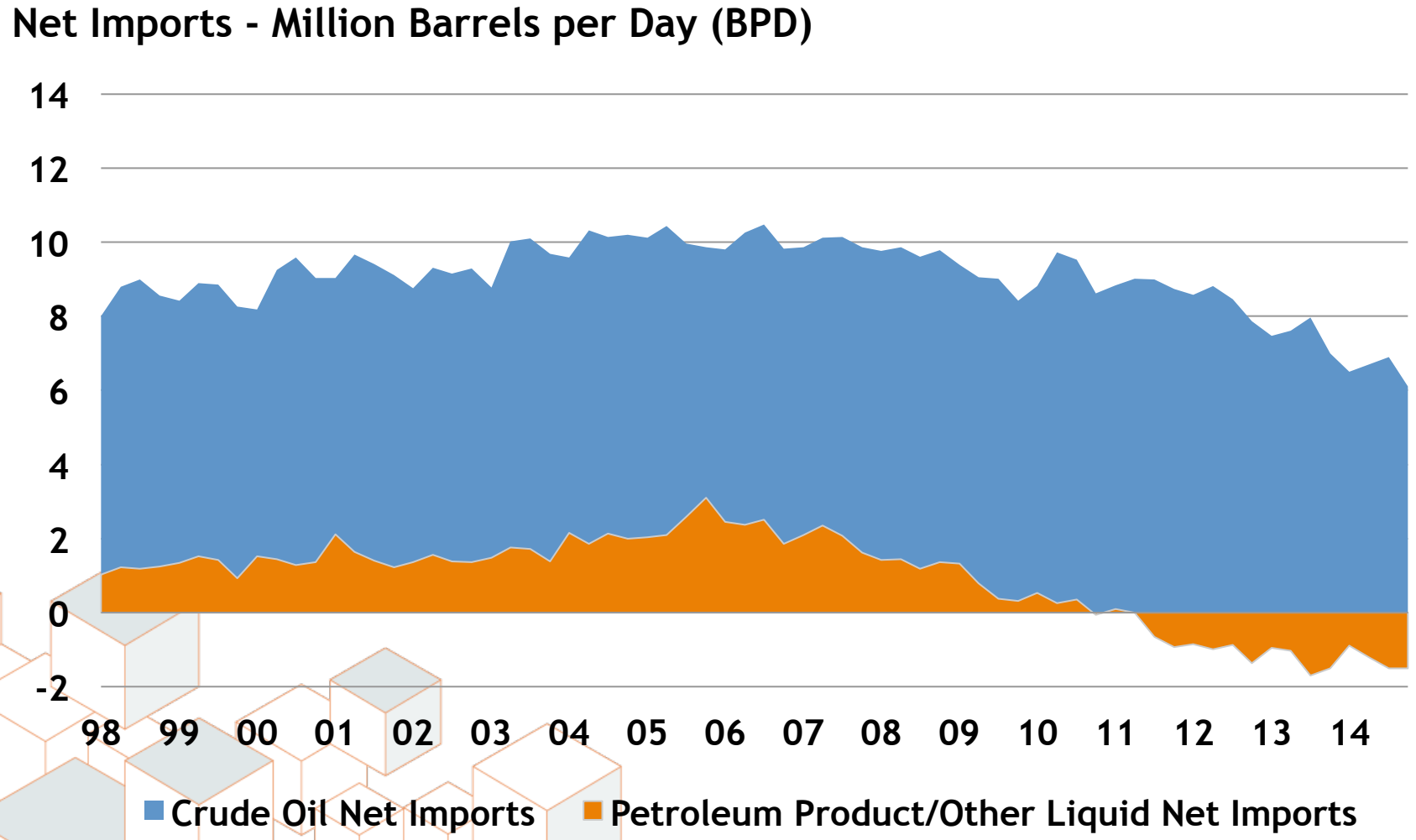
Note: Prices generally reflect domestic wellhead/hub prices or imported prices via pipeline. Some nations (e.g., Japan and Korea) import LNG. Thus, the higher prices. Other nations import LNG if it's a minor share of demand but these prices aren't generally reflected in the above.

A Surge in US Oil & Gas Production



Source: EIA November Short-Term Energy Outlook

Resulting in Lower Crude Oil Imports and Finished Petroleum Product Exports



Source: EIA November Short-Term Energy Outlook

Summary of the Unconventional Oil & Gas Boom

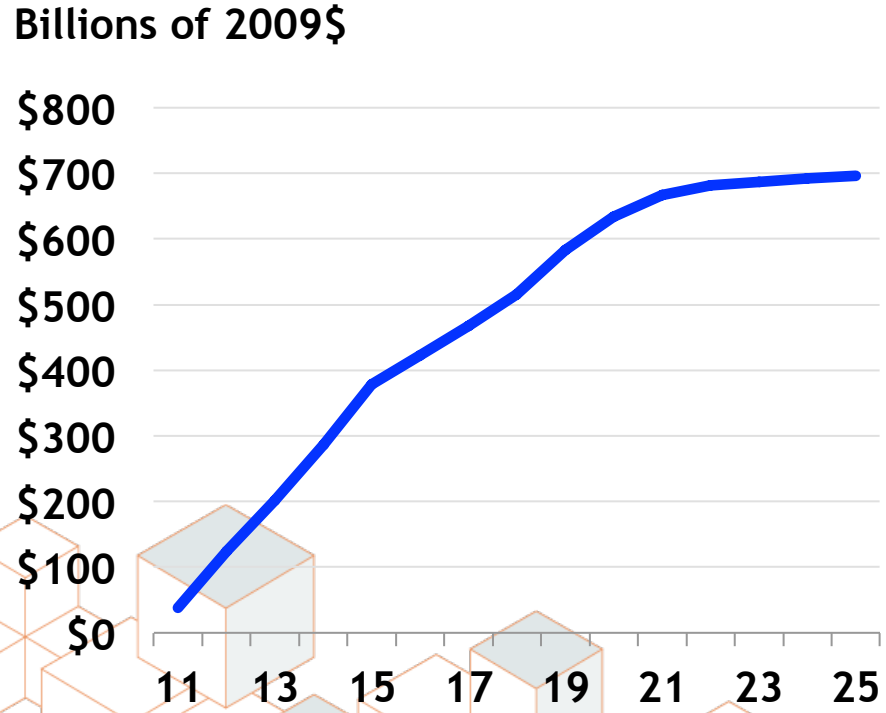
- Production of oil in the United States is outpacing expectations thanks to growth in shale oil (where break-even costs of production have fallen on technological advances)
- It's an unprecedented structural change
- Leading to lower crude oil imports from the Middle East and the rise of finished petroleum product exports (US Gulf Coast light crude imports could drop to zero by 2015)
- Unconventional gas production has turned the United States from a net importer to self-sufficiency…
- Changing the United States is a surplus natural gas producing nation – essentially forever
- US unconventional production has boosted the availability of natural gas worldwide
- Natural gas prices in the United States are trading along the breakeven cost of shale gas production
- In summary, a promising future!

Analyses Show Significant Macroeconomic Effects

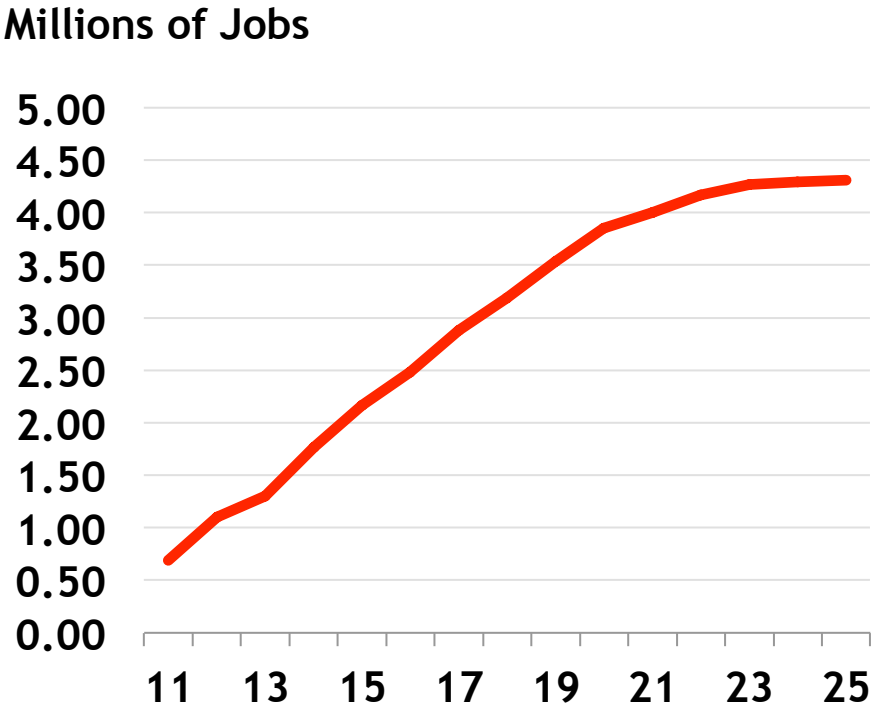
- An analysis by PWC found that US manufacturing companies could employ approximately one million more workers by 2025 due to benefits from affordable energy and demand for products used to extract natural gas.
- Citigroup released a study which examined the effects of the domestic energy supply revolution and found new production and associated activity will accelerate economic growth by 30-40 basis points. By 2020, the cumulative impact will boost real GDP by 2.0% to 3.3%, creating from 2.7 million to as high as 3.6 million net new jobs, and reduce (by 60%) the current account deficit to 2.4% of GDP.
- A Boston Consulting Group study uncovered a "tipping point" in cost-risk among seven key industries (computers and electronics, appliances and electrical equipment, machinery, furniture, fabricated metal products, plastic & rubber products, and transportation goods) and that as these industries "re-shore" to the USA, the USA will gain $80 billion to $120 billion in added annual output and 2.0 million to 3.0 million jobs.
- IHS released a series of studies and finds that unconventional oil and gas add 2.0-3.2% to GDP (over $3,500 per household) and nearly 4.0 million jobs by 2025.

Unconventional Oil & Gas Impact on the Economy

Incremental GDP due to Unconventional Oil & Gas



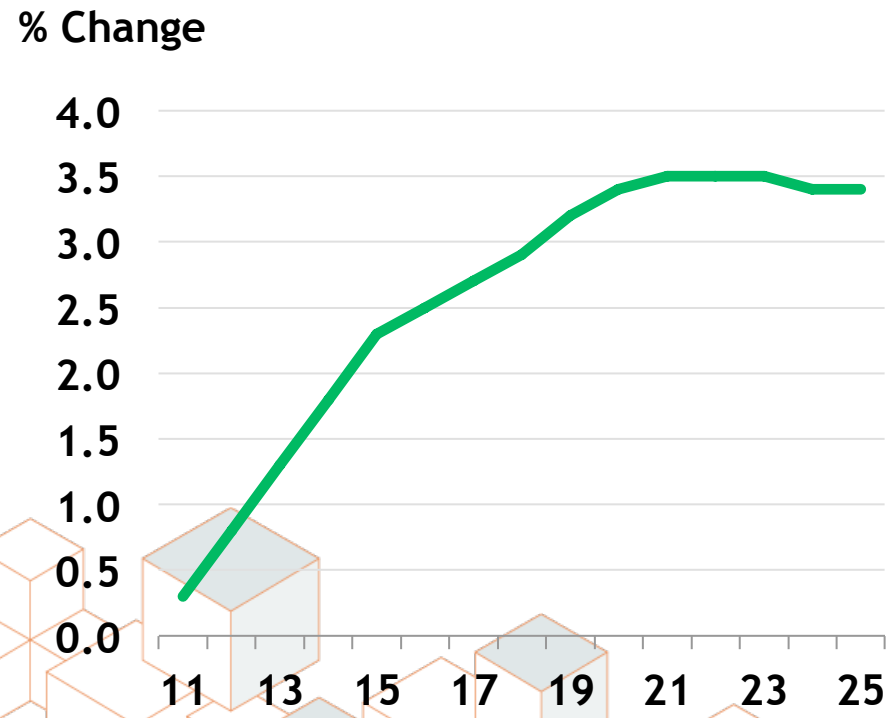
Incremental Employment due to Unconventional Oil & Gas



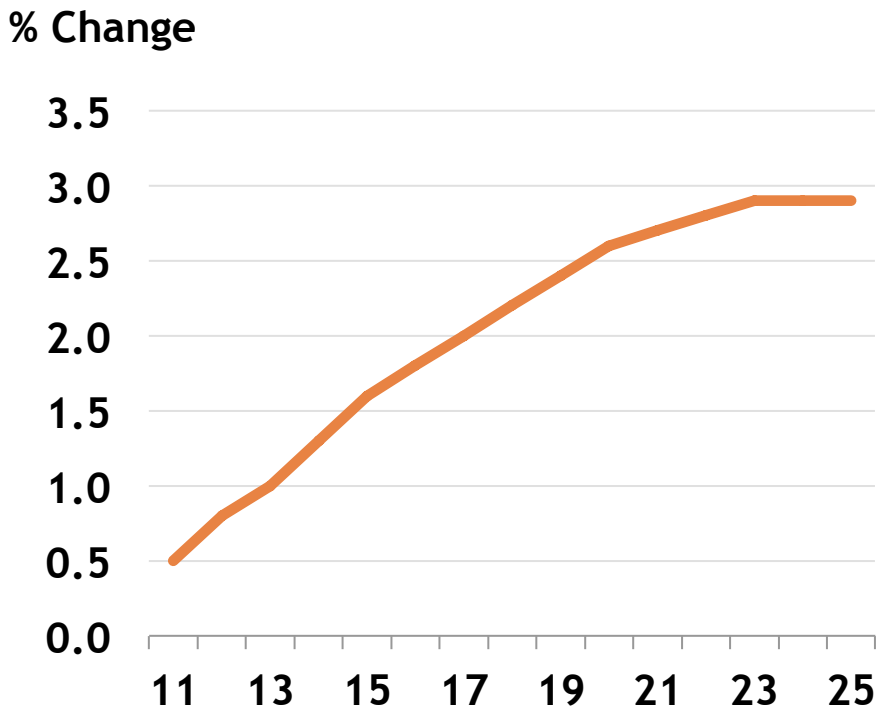
Note: Based on an analysis of the published literature and expressed as incremental to a baseline.

Unconventional Oil & Gas Impact on the Economy

Incremental GDP due to Unconventional Oil & Gas



Incremental Employment due to Unconventional Oil & Gas



Note: Based on an analysis of the published literature and expressed as incremental to a baseline.

Shale Gas

A Game Changer

"Manufacturing plants are returning to the US to take advantage of cheap natural gas, spurring major investments in petrochemical and steel production." -- Wall Street Journal February 2012

"We think lower natural gas price are creating a structural economic advantage for the US. It's a new competitive strength for US manufacturers." -- Reynders McVeigh Capital Management February 2012

"Big industry may be coming back to the northeast United States." -- Associated Press September 2011

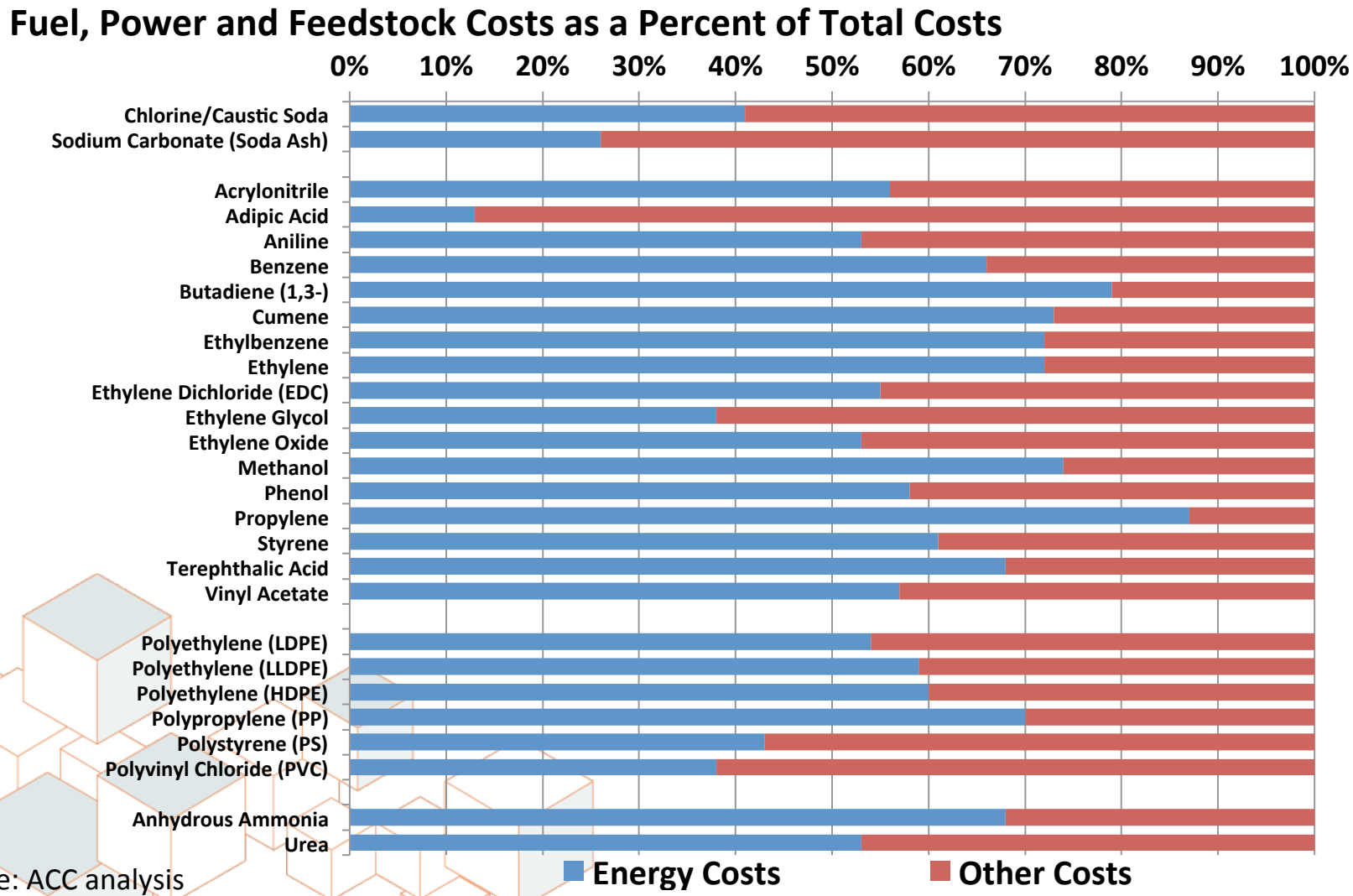
*"**A renewed U.S. ethane advantage has lifted the fortunes of North American petrochemical makers.** A surge in supply from unconventional gas sources has increased the availability and reduced the cost of ethane and other natural gas liquid (NGL) feedstocks." --Chemical Week Cover Story March 18, 2011*

*"Some believe **the potentially tremendous economic impact of the Marcellus shale will be a 'game-changer'** for a state long dependent on the coal industry." -- Times-Herald, Charleston, WV, March 3, 2011*

*"Cheap U.S. shale gas production could deliver massive spill-over benefits to the U.S. chemicals industry. … **Cheap natural gas will make U.S. chemicals companies cost competitive against just about everyone except the Middle East.**"*

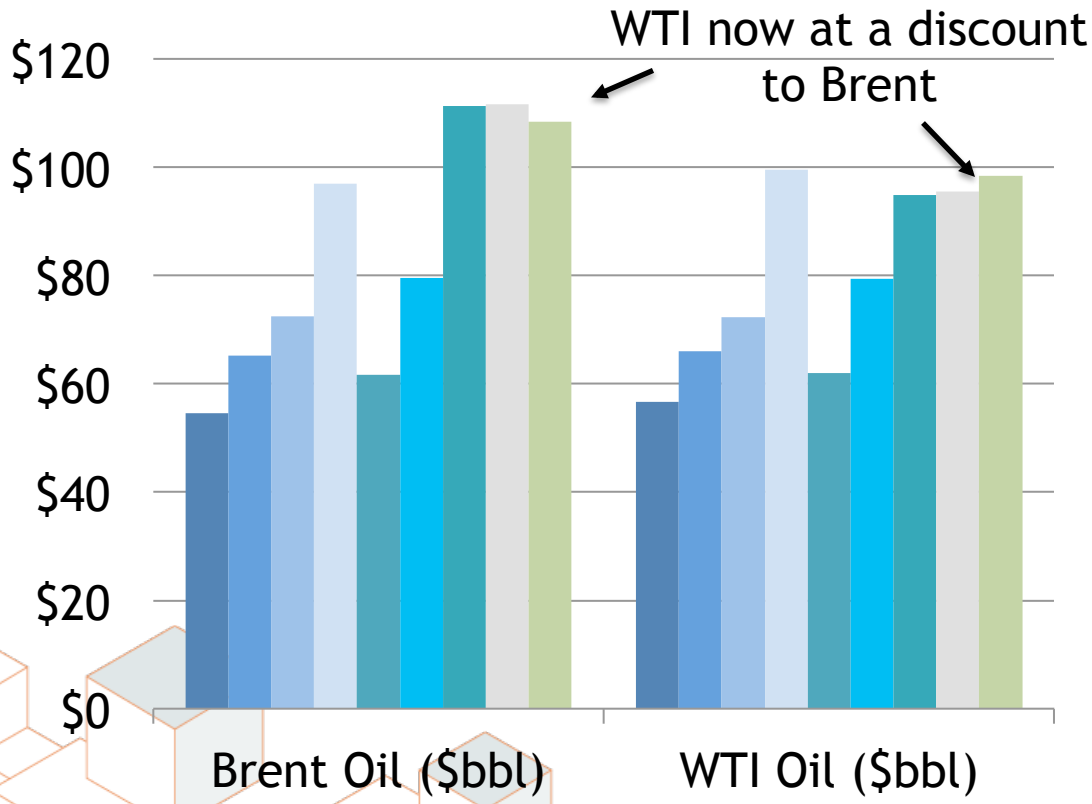
--Citi, "Shale Gas: A Game Changer for the Chemical Industry?," P.J. Juvekar, March 11, 2010

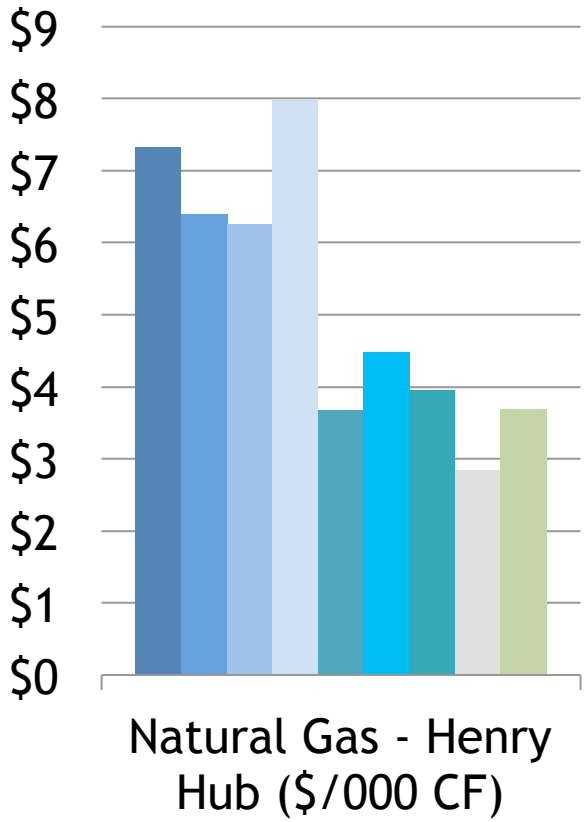
The Chemical Industry is Energy-Intensive



Source: ACC analysis

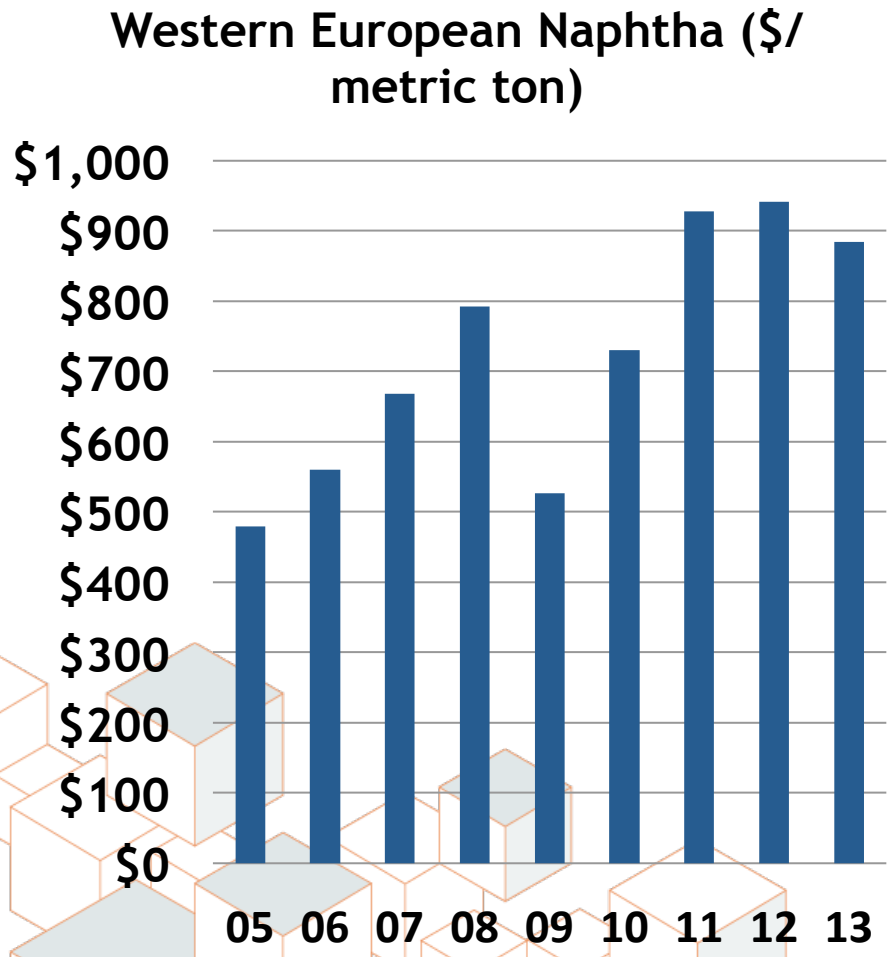
2005-13: US Energy Prices Falling in Either Absolute / Relative Terms

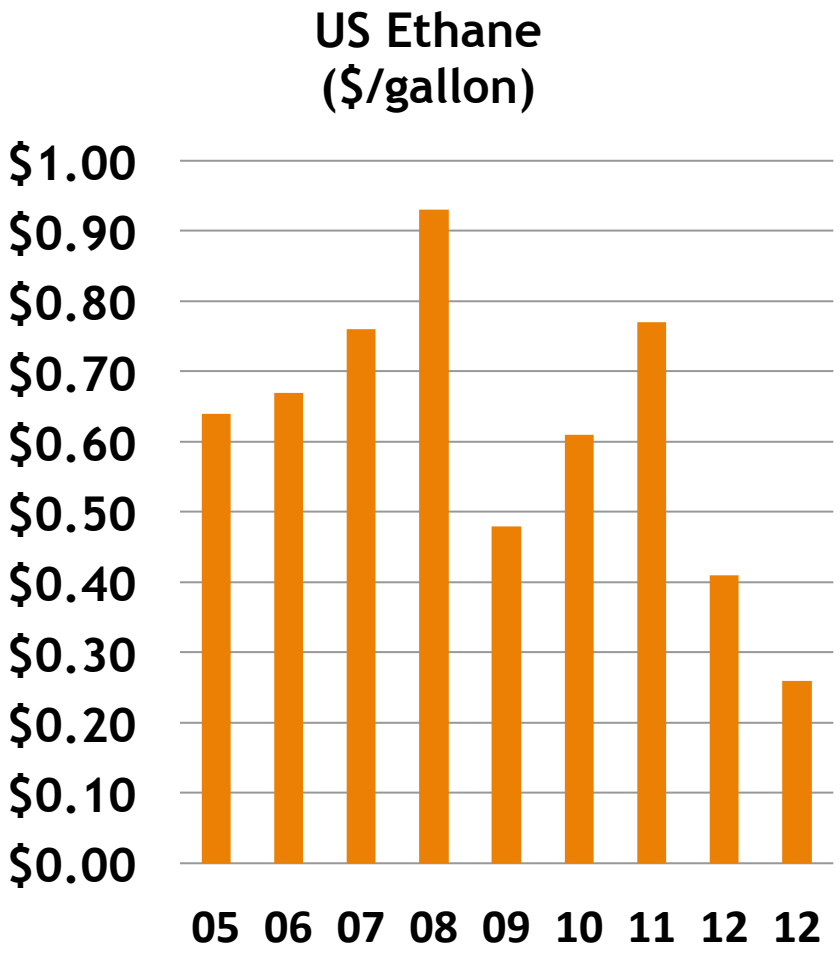




Source: EIA (Note 2013 data are YTD)

Leads to Falling US Feedstock Costs

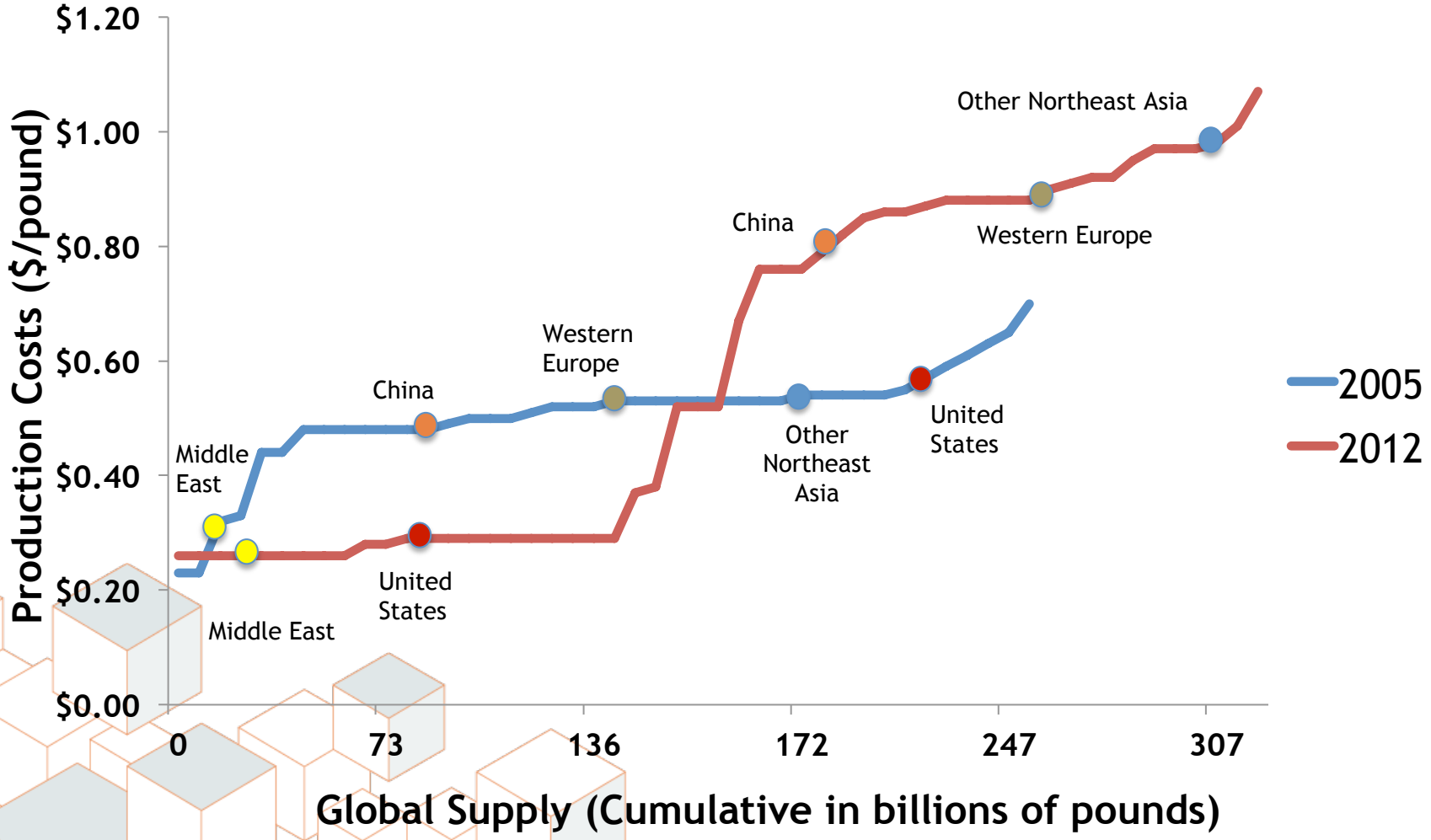




Source: Chemical Week (Note 2013 data are YTD)

Global Ethylene Supply Curve

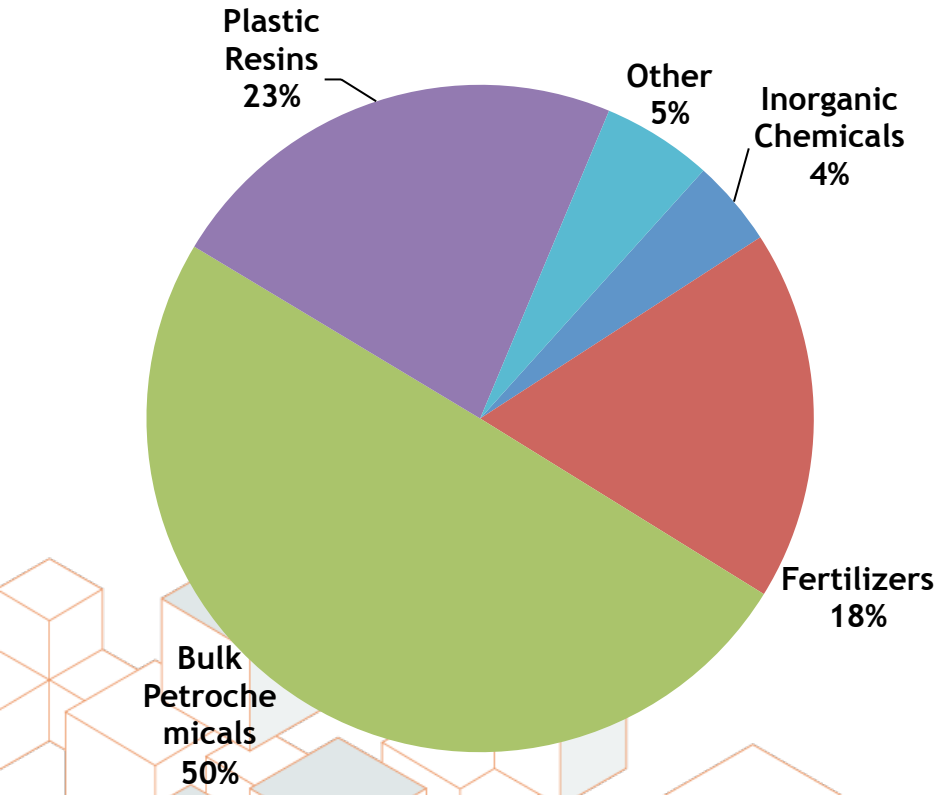
(Petrochemical Production Costs by Country/Region)



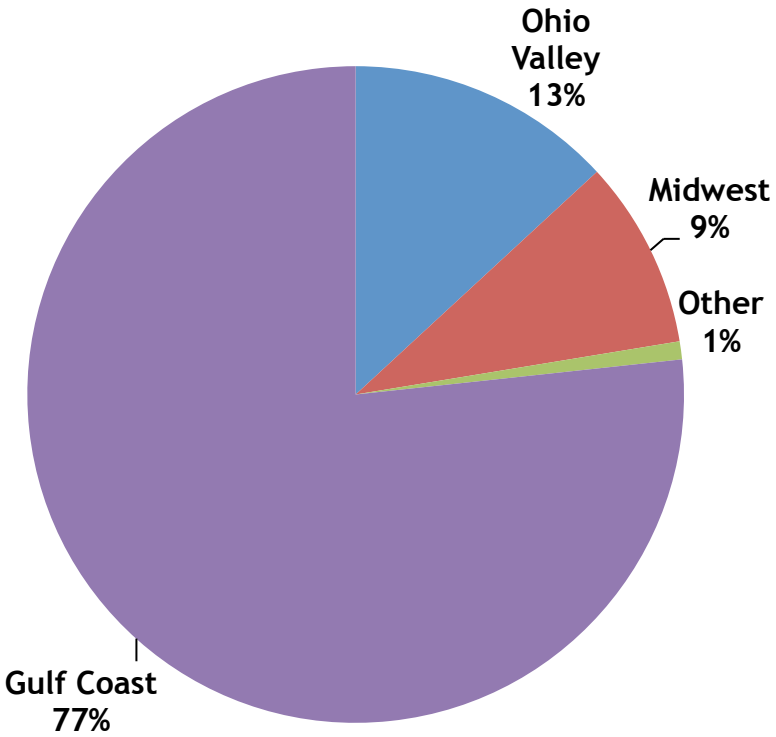
Source: ACC analysis

Composition of Announced Projects

Investment by Industry Segment

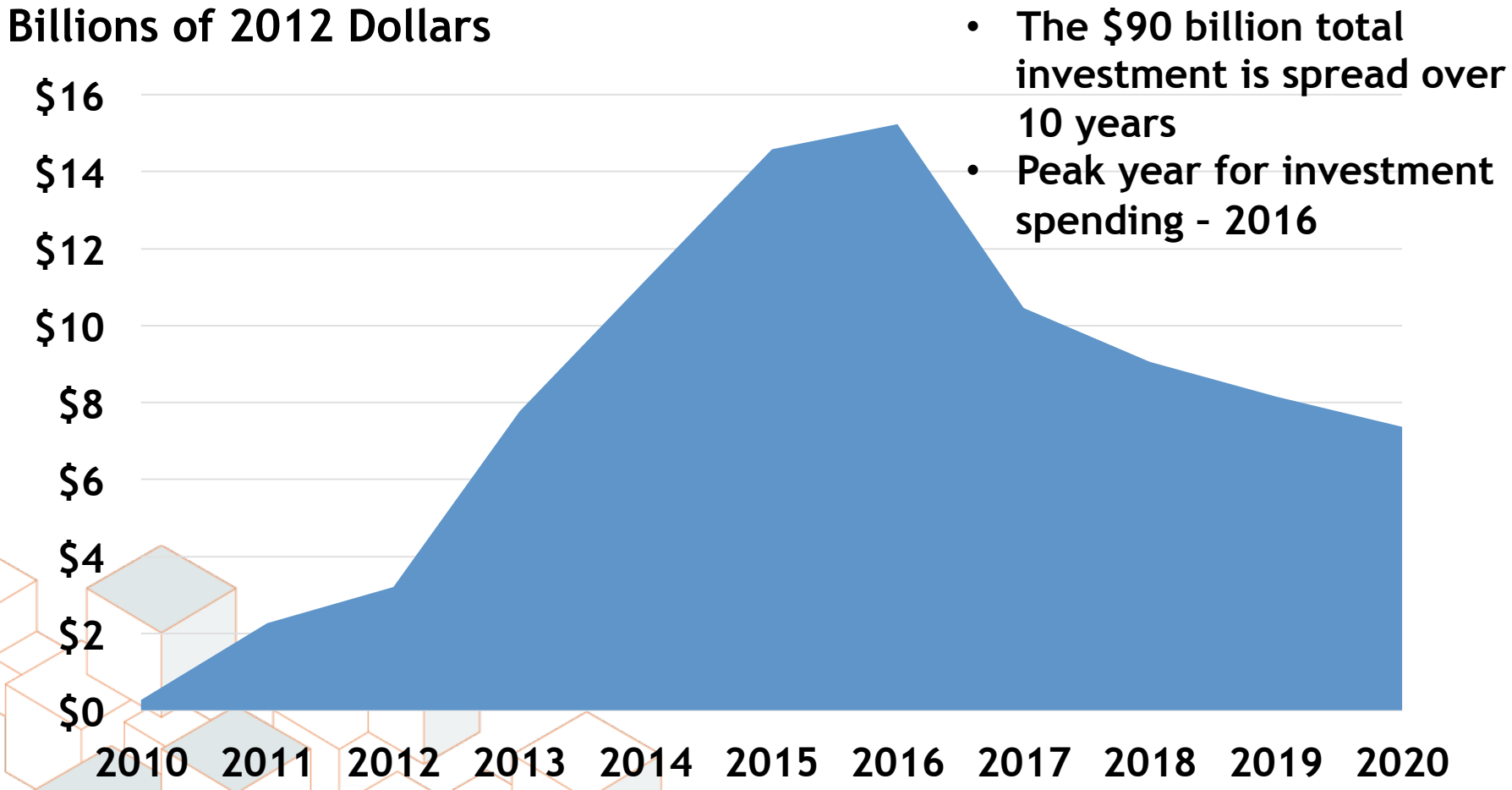


Investment by Region



Source: ACC analysis of 135 Announced Projects

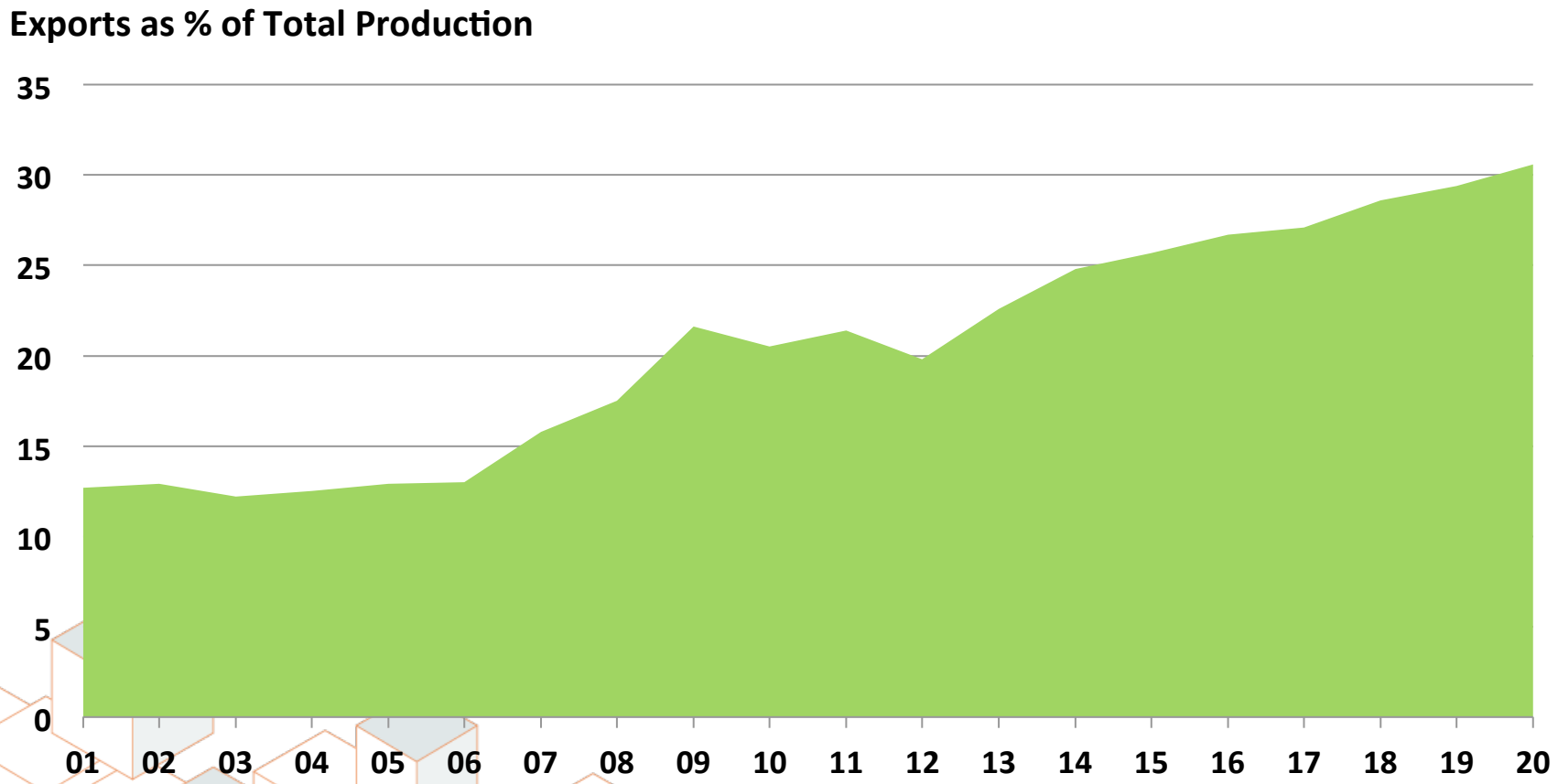
US Chemical Industry Capital Investment: Incremental Due to Shale Gas



- The $90 billion total investment is spread over 10 years
- Peak year for investment spending - 2016

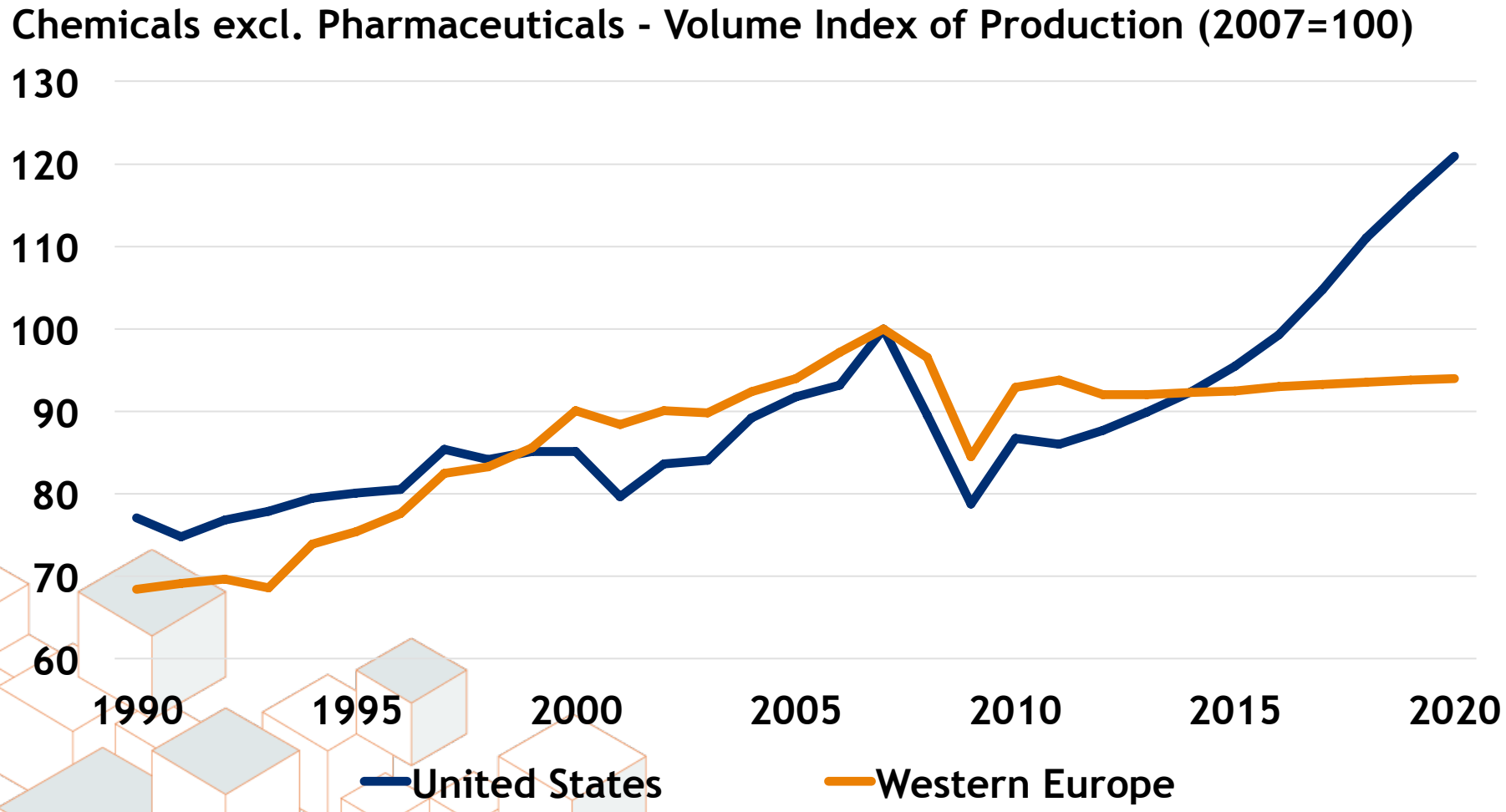
Source: ACC analysis

US Exports as Share of Plastic Resins Set to Expand



Source: ACC analysis

In One Scenario, the US Captures Market Share Away From Western Europe



Sources: Eurostat, Federal Reserve, ACC analysis

Concluding Thoughts

- **Revolution in unconventional oil and gas is supporting economic growth and job creation**
- **Shale gas has been a game changer in US natural gas markets with US first mover advantages**
- **Shale gas has improved the competitiveness of the US manufacturing, especially chemicals**
  - Over135 major chemical industry projects have been announced (perhaps 150-175 when it's all said and done)
  - Location of shale gas will foster new greenfield investment, generating new business, jobs, and tax revenues
- **With global integration and renewed competitiveness, US exports gain as share of output with reaccelerating growth and US capturing global market share**
- **In addition to shale gas, new materials (e.g., nanotechnology) and processes (e.g., bio-based chemistry) will also lead to enhanced growth**
- **In summary, a promising future!**
- **But challenges remain…**

Questions?

Telephone: 202.249.6180

Email: kevin_swift@americanchemistry.com