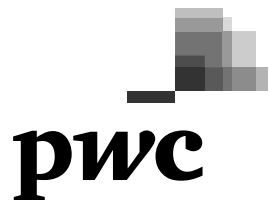


**strategy&**

Formerly Booz & Company

May 2014

*Feedstock Disruptions in  
Chemicals chains necessitate  
business model innovation*



# *Strategy& has based findings on its proprietary feedstock model*

## Strategy& global feedstock model

Feedstock developments and petrochemicals supply

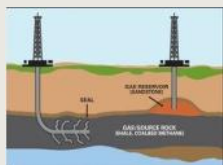
Macro market drivers and global petrochemicals demand

- Feedstock sources
- Cracker by cracker
- Reformers
- On-purpose capacity
- Demand projections
- Price projections

The image shows a screenshot of a data table titled "Global Baseline". The table contains multiple columns of data, likely representing different petrochemical products and their associated metrics such as capacity, demand, and price. The table is presented as a stack of two overlapping sheets, with the top sheet being more prominent.

# The chemicals industry is facing a number of game changing discontinuities

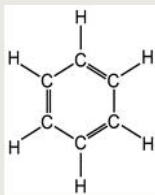
## Supply trends



- **Shale Gas in the United States, Associated Gas in Iraq and Russia** leading to increased NGL supply



- **Coal and Shale Gas in China** leading to increased supply of light olefins



- **Tightening aromatics supply**

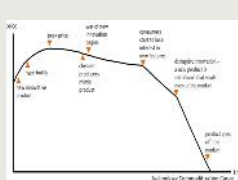
## Demand trends



- **Sustained growth in the chemicals industry driven by Asia**

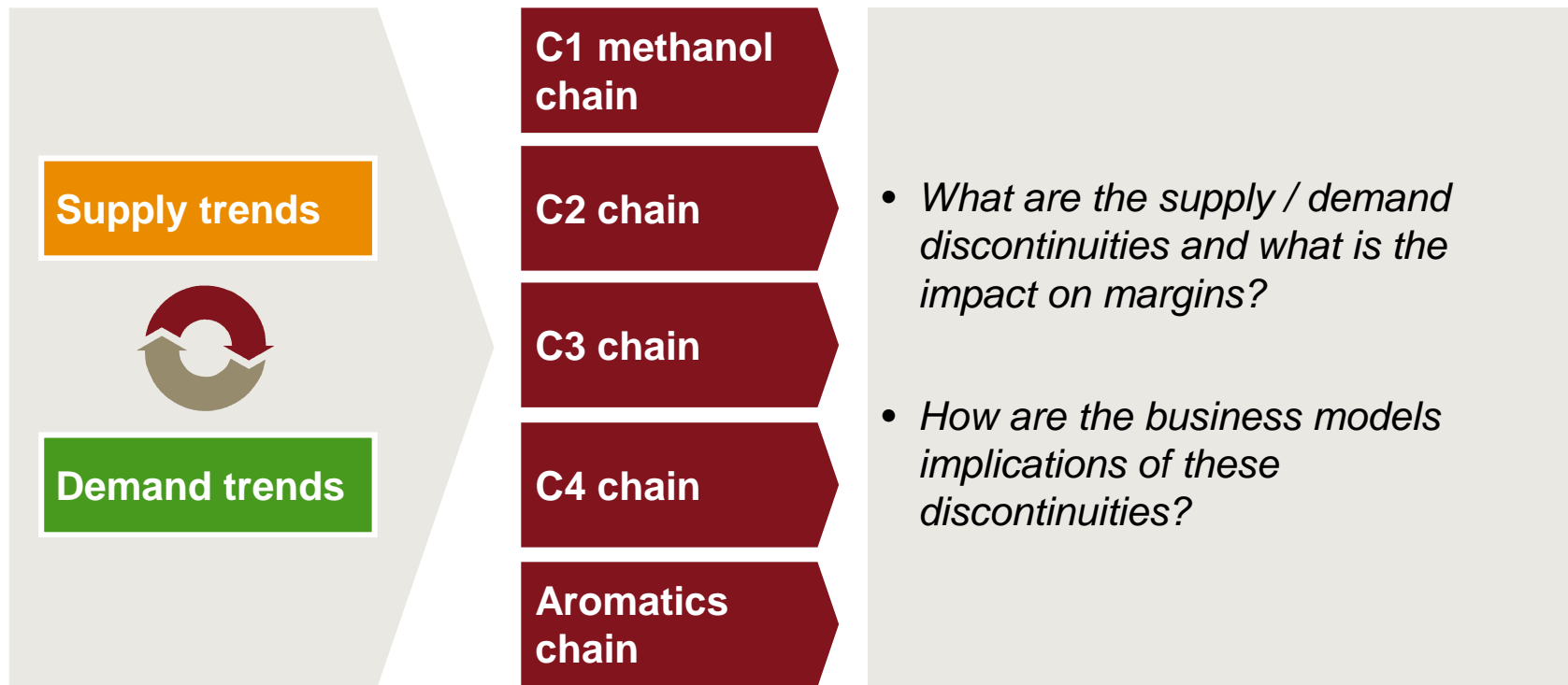


- **Discontinuities in consumer end-market**

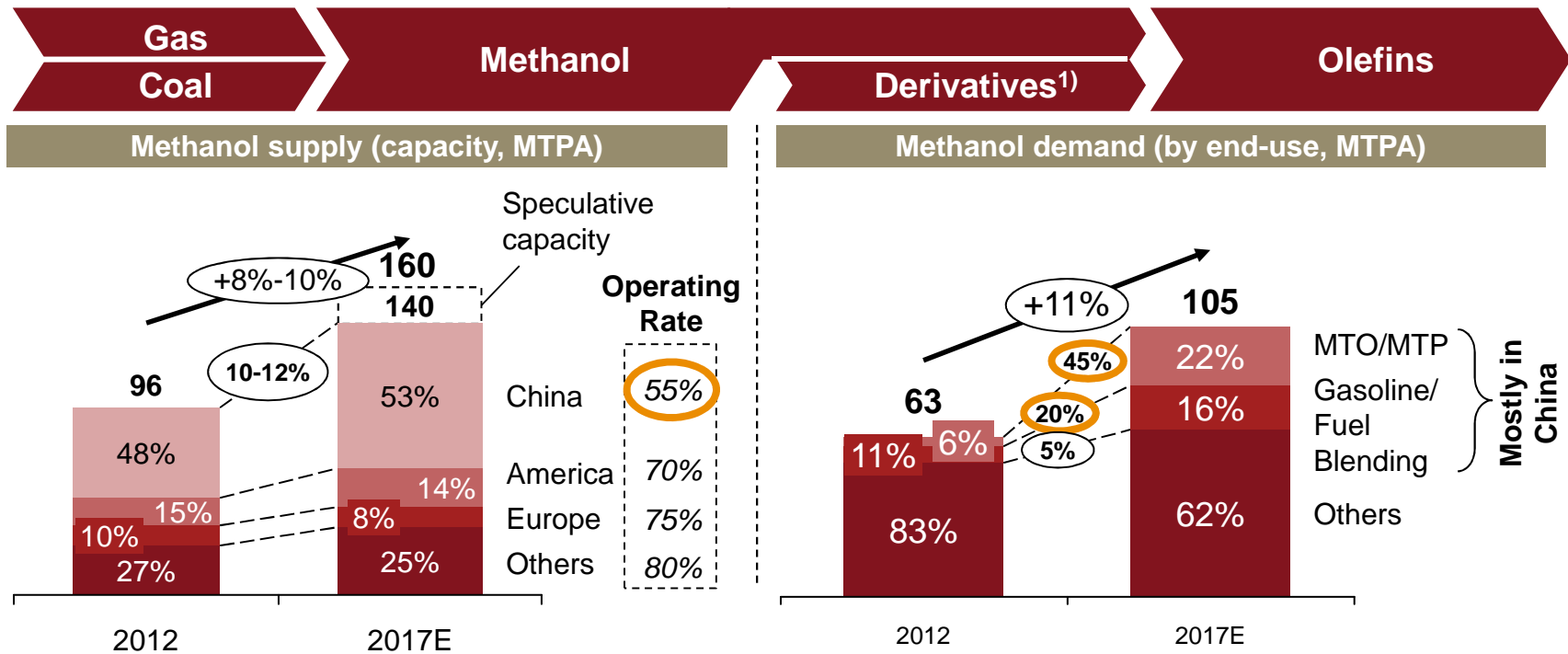


- **Commoditization eroding margins in performance and specialty chemicals**

***Going forward, these trends will have implications on supply/ demand of petrochemicals building blocks and business models***



***Methanol market is driven by China: MTO/P, fuel blending and capacity additions are the key market drivers***

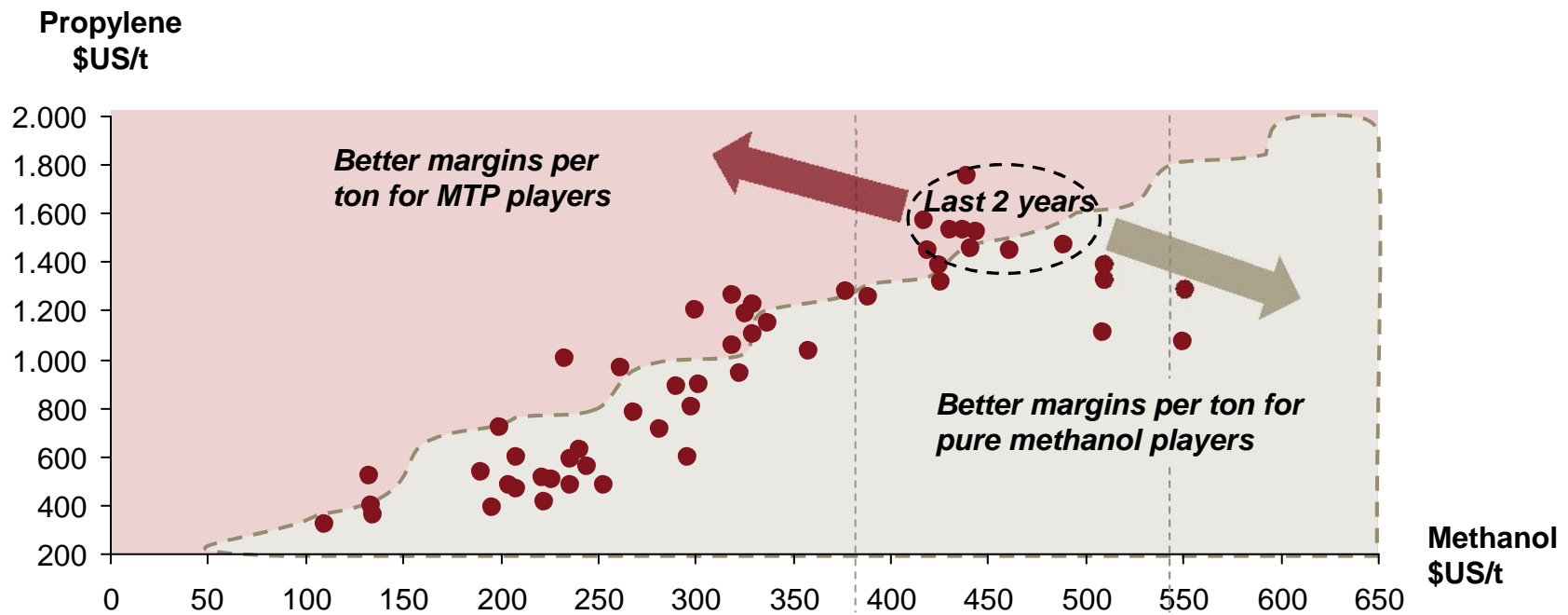


**Impact on methanol price** → **Likely to be capped in Base Case – risk of downward pressure in case of significant operating rate increase in China**

1) MTBE, Formaldehyde, Acetic Acid, Chloromethanes, others  
Source: Strategy& analysis

***For pure methanol players, moving into MTP can be attractive in case of major increase in methanol supply or C3 prices***

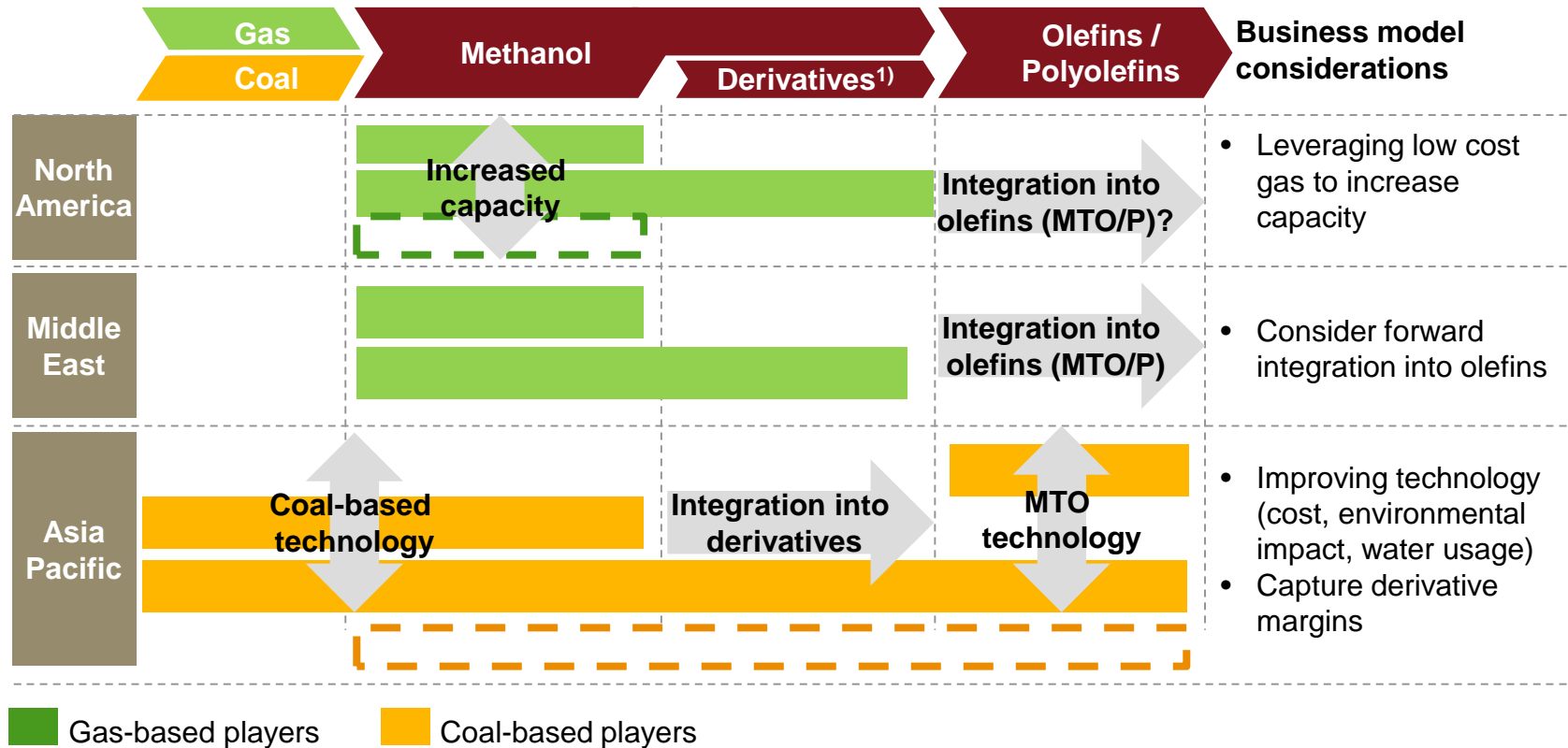
**Propylene vs. methanol prices and margins \$US/t – 2000 - 2012**



Source: Strategy& analysis

## C1 methanol chain

***In such market conditions, methanol players along the value chain should consider new strategic options***

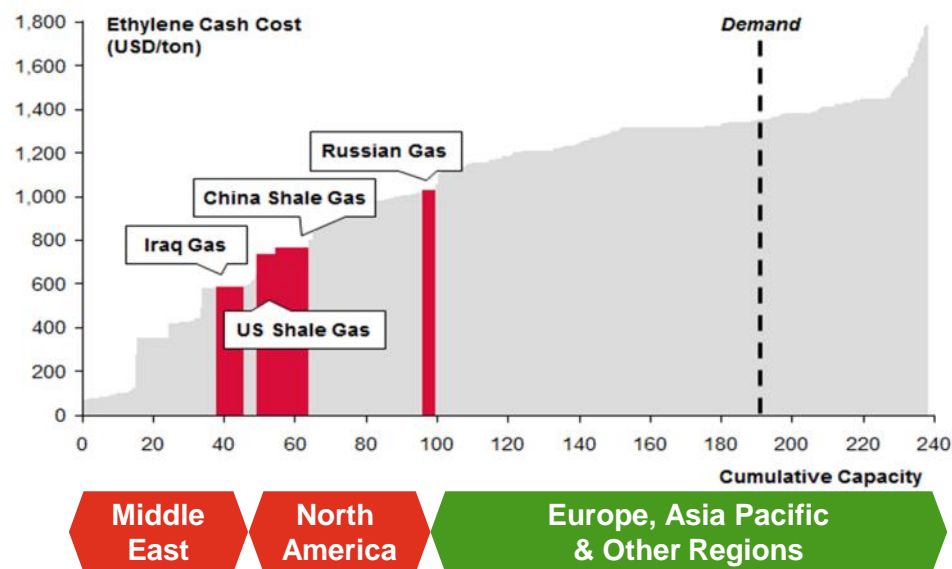


<sup>1)</sup> MTBE, Formaldehyde, Acetic Acid  
Source: Strategy& analysis

**Ethylene is expected to be in oversupply as a result of growing light feedstock availability**



Global Ethylene Industry Cost Curve Oil Price at USD 90 / bbl, 2025

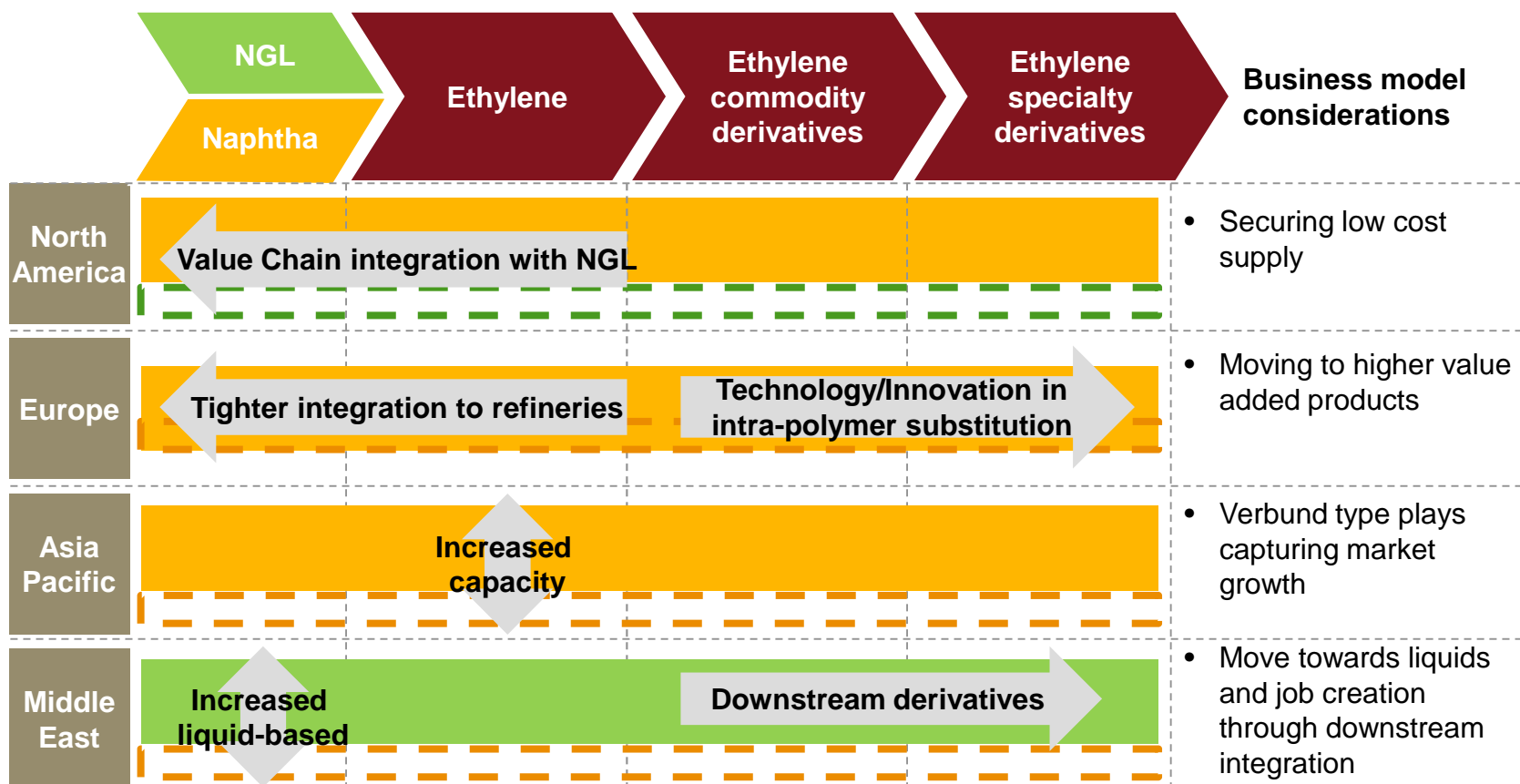


Impact on ethylene price Likely to continue on a downward trend due to increased supply

Source: Strategy& analysis



*These disruptions will result in changes in the ethylene chain business models*



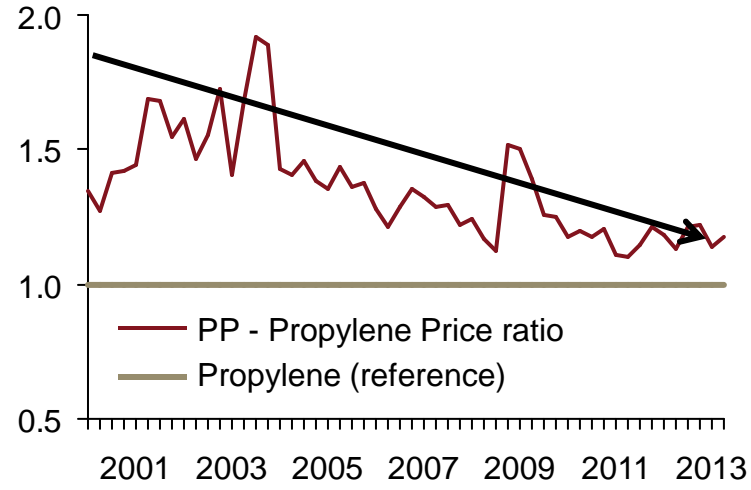
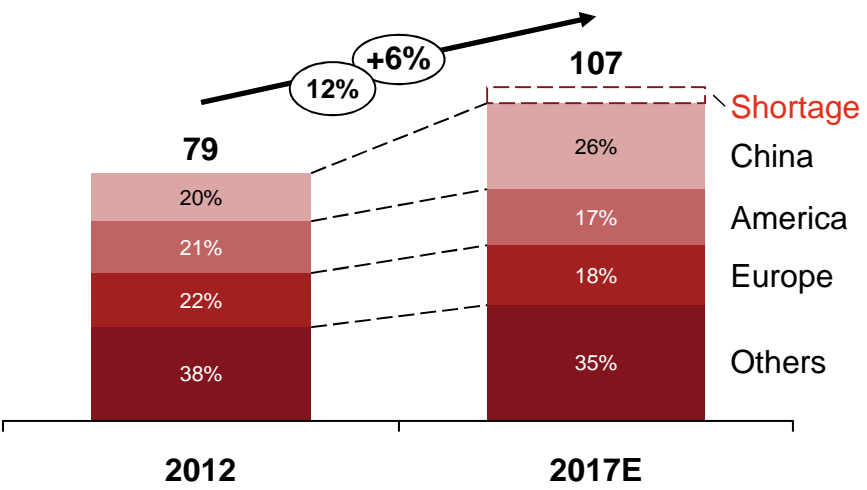
***Propylene is expected to be in shortage in the future – upwards price pressure is squeezing derivatives margins***

**C3 chain supply and demand dynamics**



Propylene demand (MTPA)

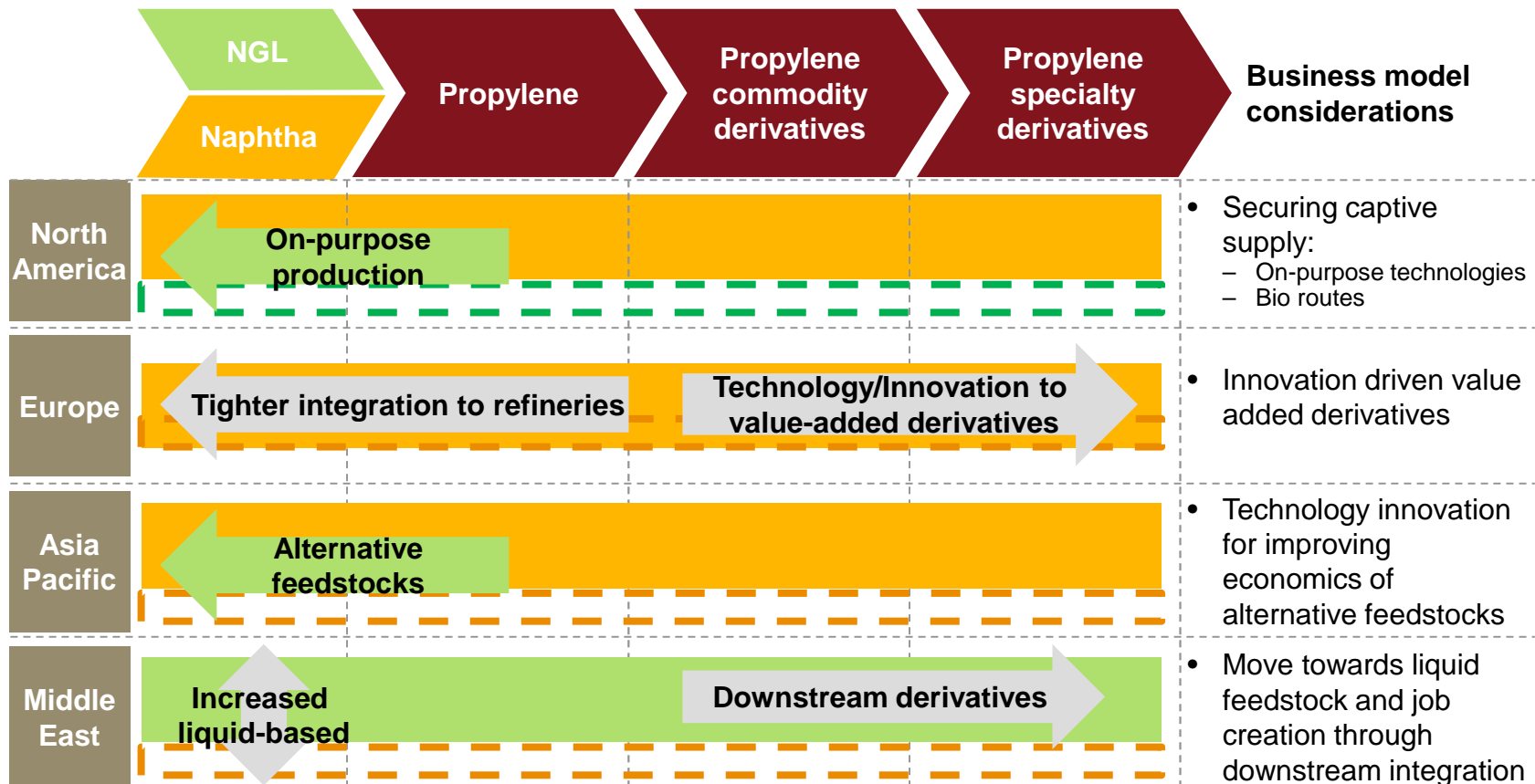
Propylene vs. polypropylene prices



**Impact on propylene price** → **Likely to sustain high levels**

**Impact on polypropylene margin** → **Under downward pressure vs. propylene**

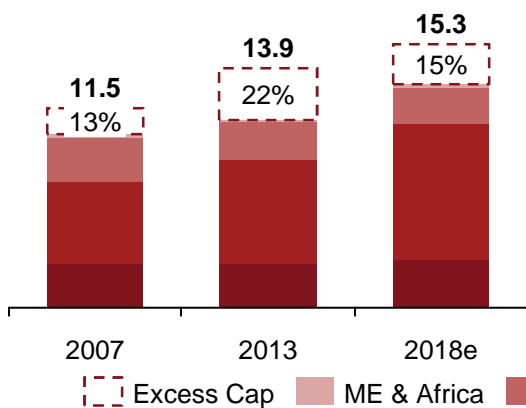
*These disruptions will result in changes in the propylene chain business models*



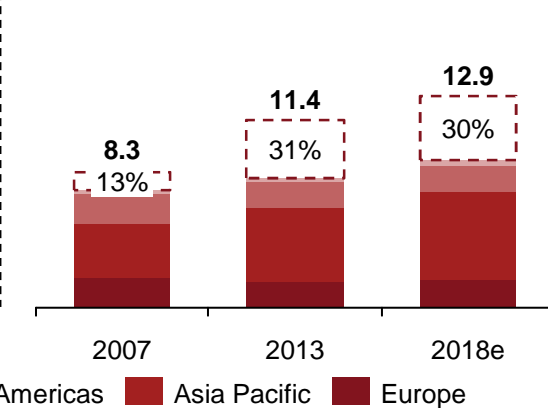
***Butadiene & derivatives have significant overcapacity – this is expected to improve for Butadiene going forward***



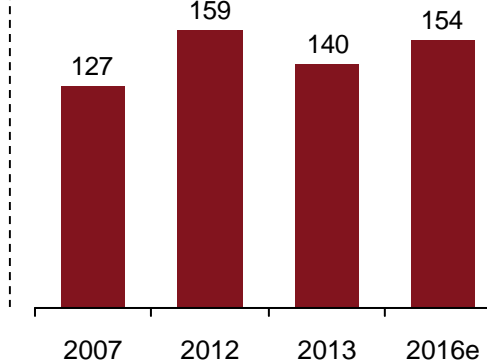
**Supply & demand**  
(2007-2018, Million tons)



**Supply & demand**  
(2007-2018, Million tons)



**Global market size**  
(2007-2016, USD billion)



Excess Cap ME & Africa Americas Asia Pacific Europe

**Impact on butadiene price**

**To recover**

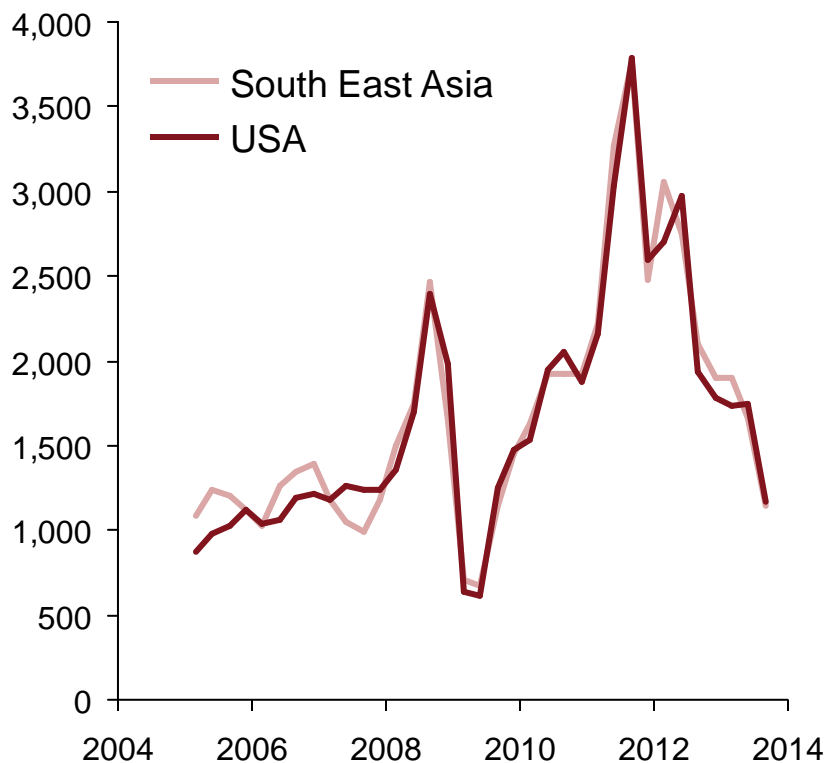
**Impact on SBR/BR price**

**To remain under downward pressure**

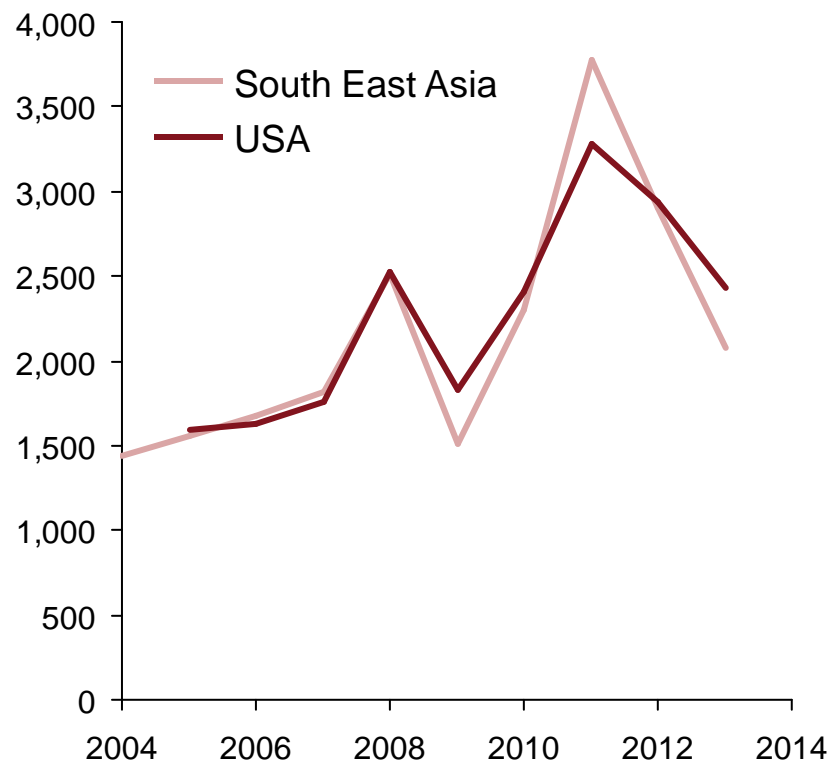
Note: Only 50% of additional planned capacity in Butadiene and SBR / BR is assumed to come online by 2018  
Source: Chemsystems; Strategy& analysis

***Recent demand and supply movements have resulted in significant price fluctuations in Butadiene and derivatives***

**Butadiene prices USD / ton, 2004 - 2013**

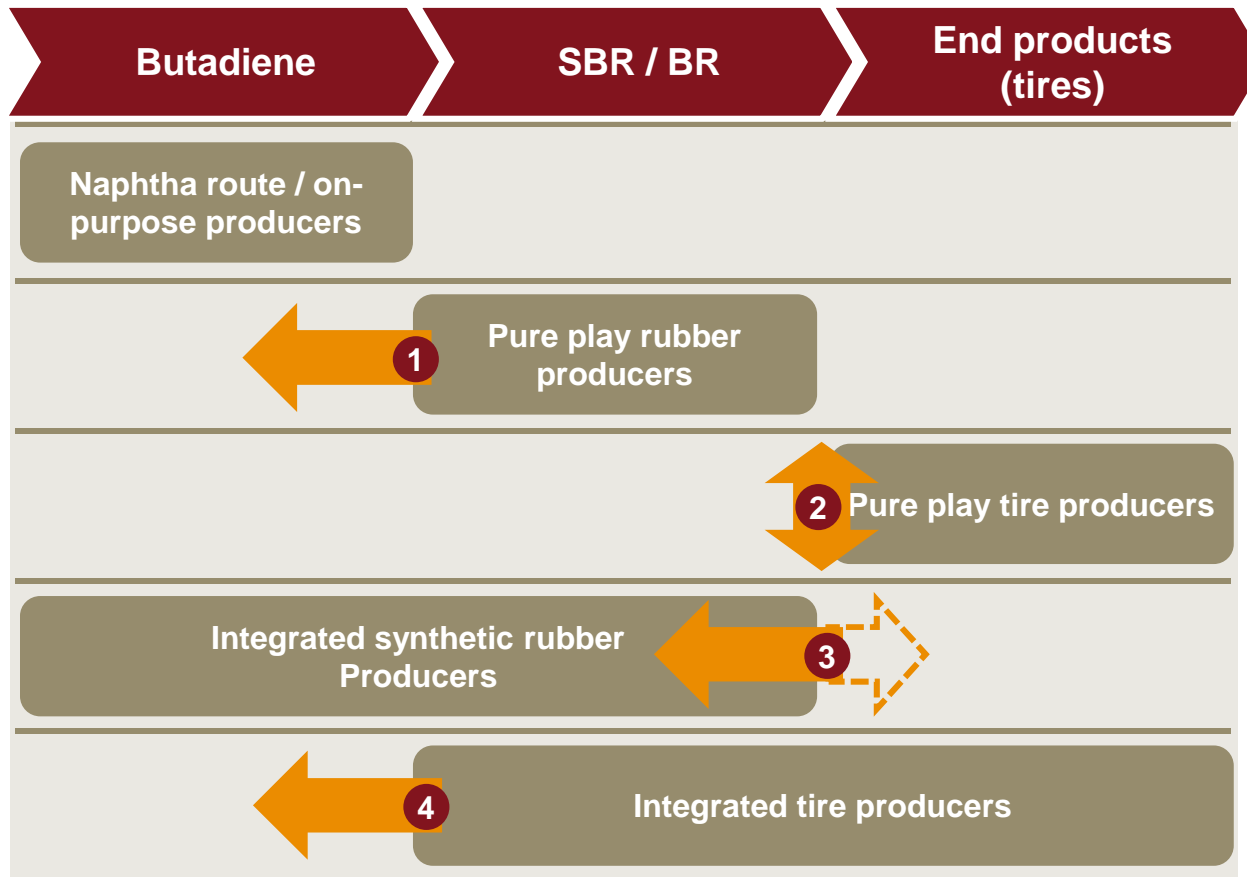


**SBR prices USD / ton, 2004 - 2013**



Source: Nexant; Strategy& analysis

***Vulnerability of SBR / BR producers might result in co-location of entire value chains closer to demand centers***



Source: Strategy& analysis

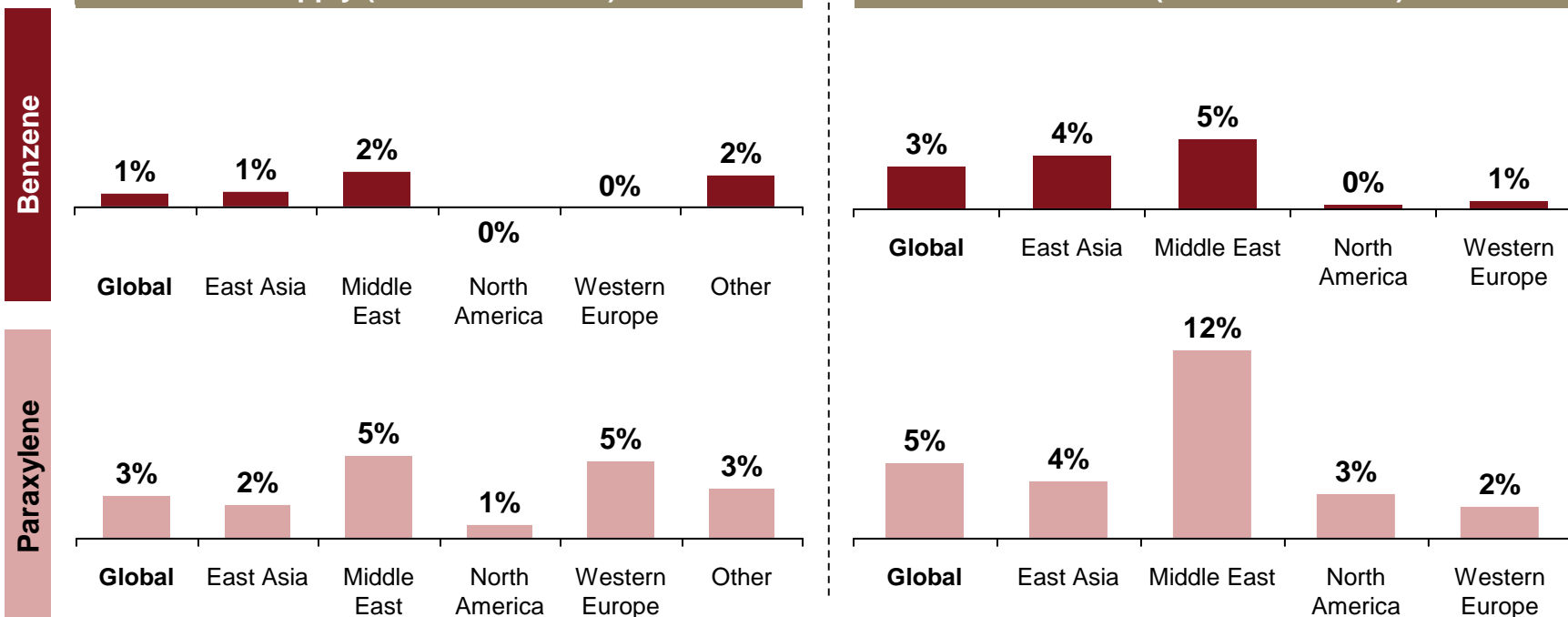
# BTX demand growth, particularly in Asia and Middle East, is outpacing capacity additions

## BTX chain supply and demand dynamics



Supply (CAGR 2013-2025)

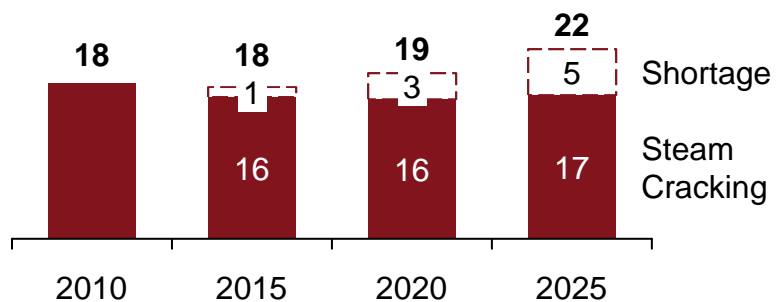
Demand (CAGR 2013-2025)



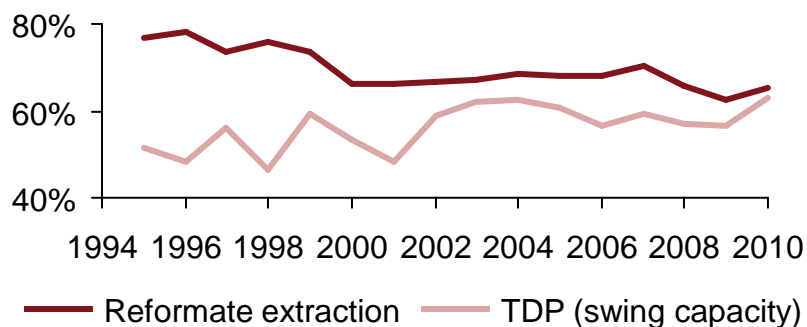
Source: Strategy& analysis

***Feedstock constricting supply from steam crackers, while environmental regulations are limiting refinery output***

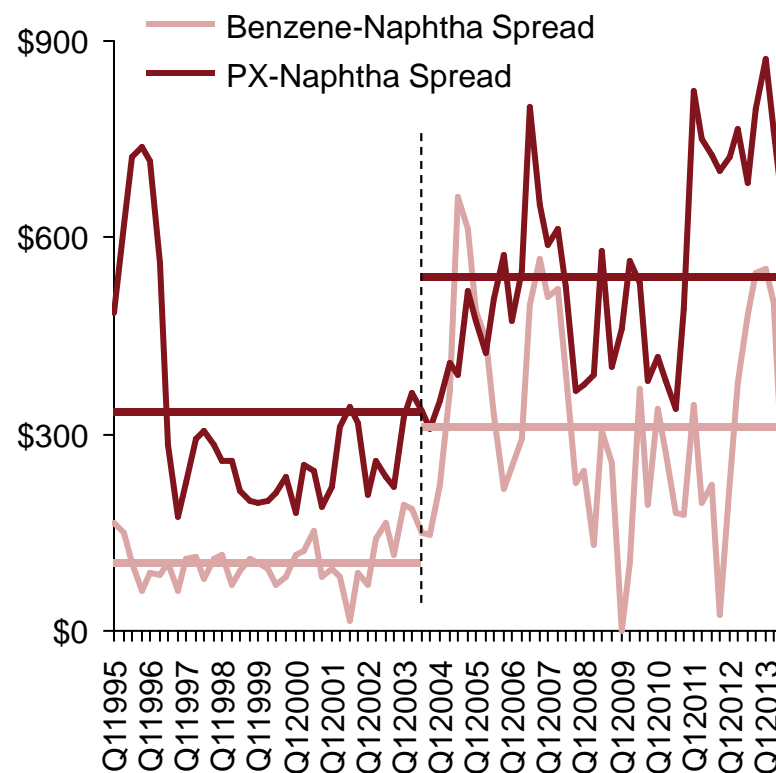
**Potential benzene shortage from steam crackers** In mmtpa



**Utilization rates of refining processes**  
Global basis



**Benzene and PX price spreads** US prices, in USD / ton





*These developments have implications for all players across the value chain; many opportunities lie upstream*

