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State of the Chemical and Petrochemical Industry – Is India the next driver?

Presentation to IOC Conclave

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- Economy, Energy and Geopolitics
- Global Chemical Industry Trends
- India in the Context of the World

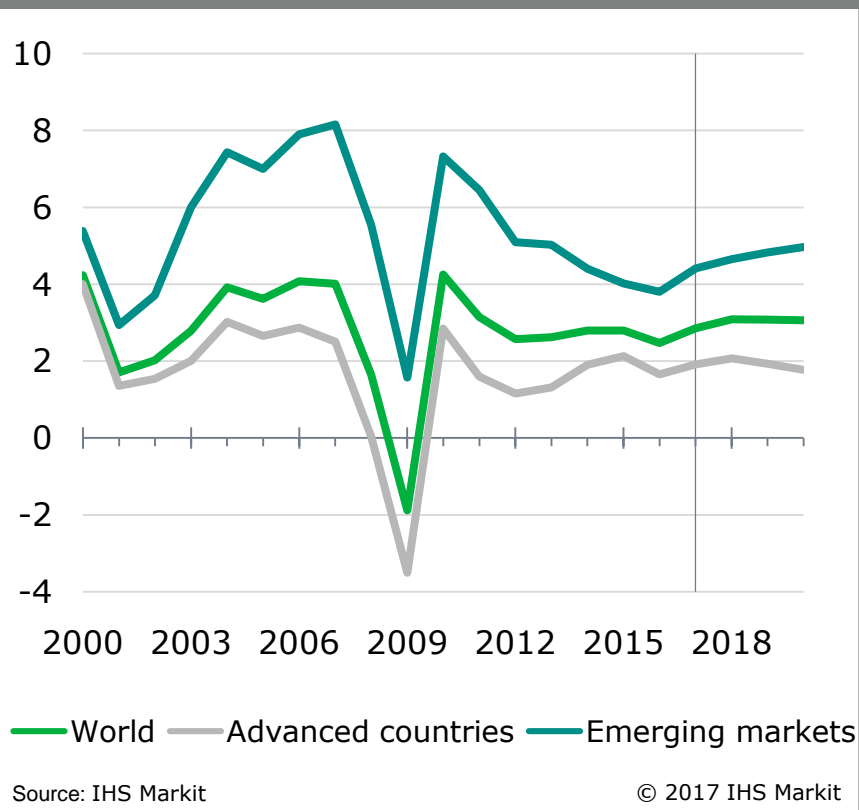
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Global economies poised to accelerate, but not to the levels seen in the last decade

Real GDP, Annual % Change



Annual % Change in GDP

	2014	2015	2016	2017	2018	2019
World	2.8	2.8	2.5	3.0	3.2	3.1
USA	2.4	2.6	1.6	2.3	2.7	2.3
Canada	2.6	0.9	1.4	2.7	2.3	2.3
Eurozone	1.2	1.9	1.7	2.0	1.8	1.7
UK	3.1	2.2	1.8	1.4	1.0	1.2
China	7.3	6.9	6.7	6.6	6.3	6.1
Japan	0.2	1.2	1.0	1.3	1.0	0.7
India	6.9	7.7	7.0	7.3	7.4	7.6
Brazil	0.5	-3.8	-3.6	0.2	1.7	3.5
Russia	0.8	-2.8	-0.2	1.5	2.1	1.8

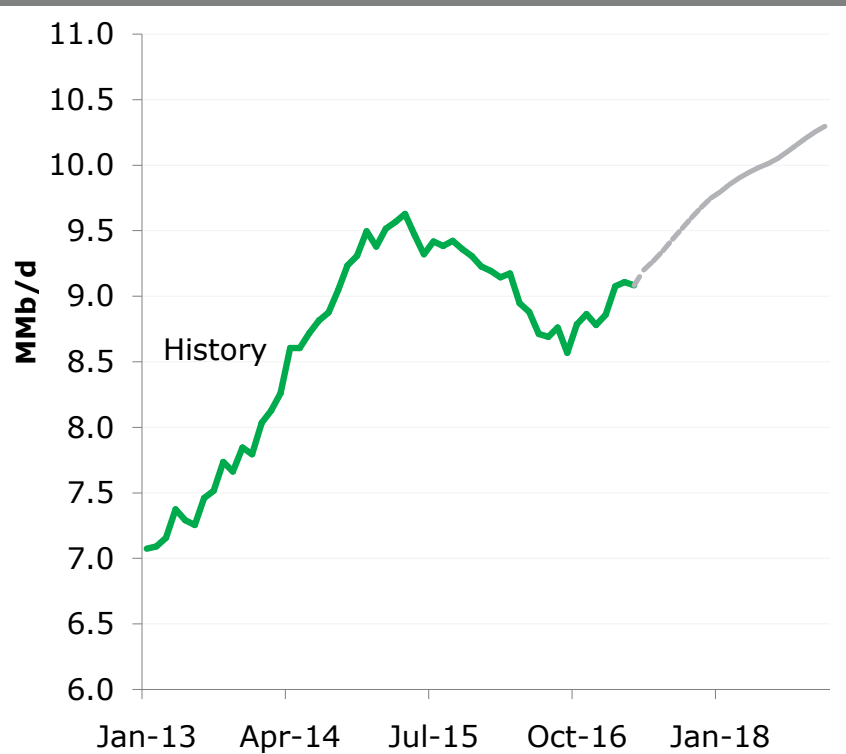
Geo-political, economic and regulatory uncertainty impacts investment decisions



- Extent and degree of trend toward economic isolationism
 - Goods movement - Global trade framework
 - Labor movement
- China's economic pivot
 - Reduced export reliance
 - Push toward service
 - Inter-Asia integration – 'One-belt/One Road'
- Climate policy

How will OPEC manage the reactivity and velocity of US shale production?

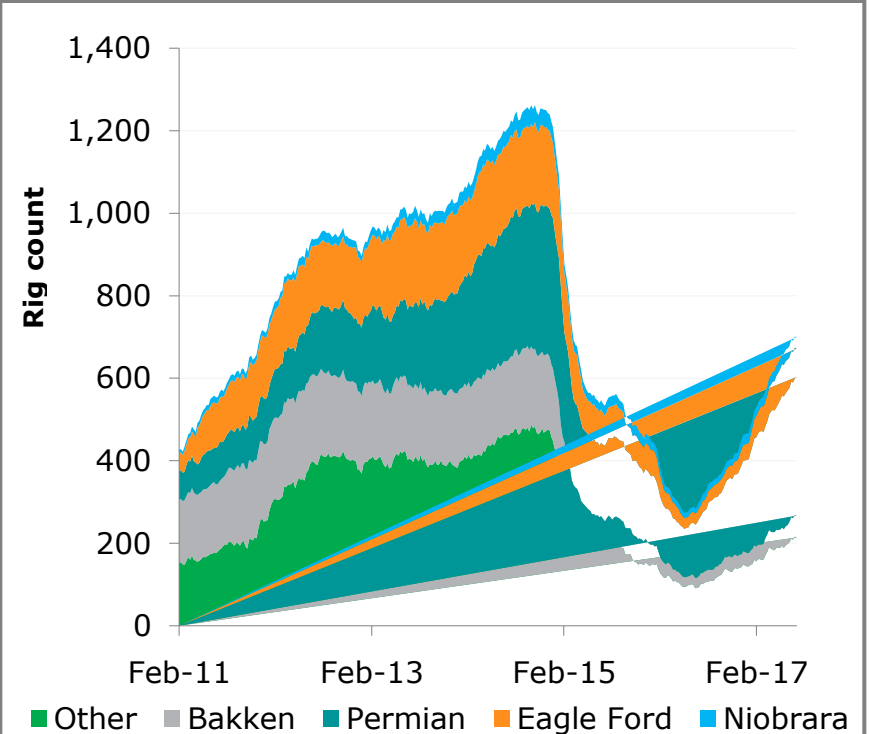
Monthly US crude oil production



Source: IHS Markit, EIA

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US horizontal oil rig count by play

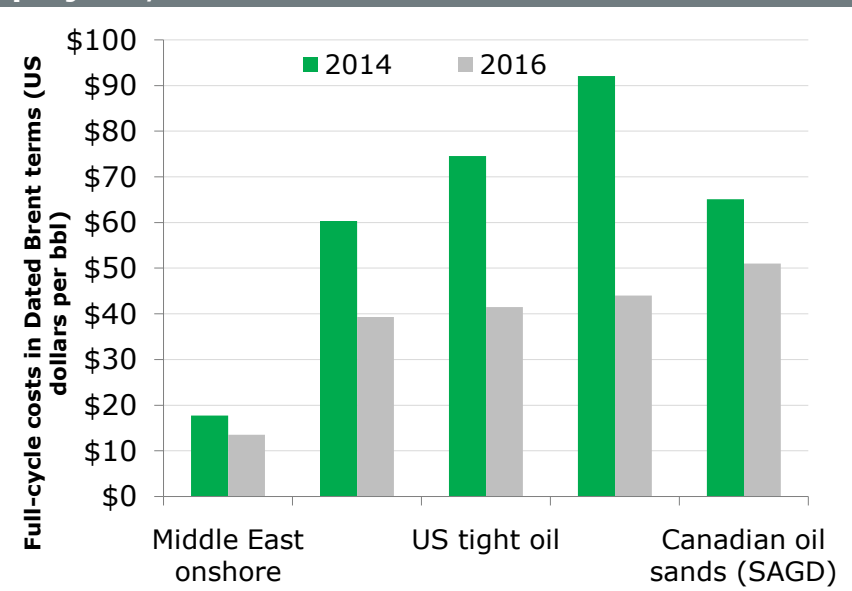


Source: Baker Hughes, IHS Markit

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The oil industry is cutting costs to make up for lower prices

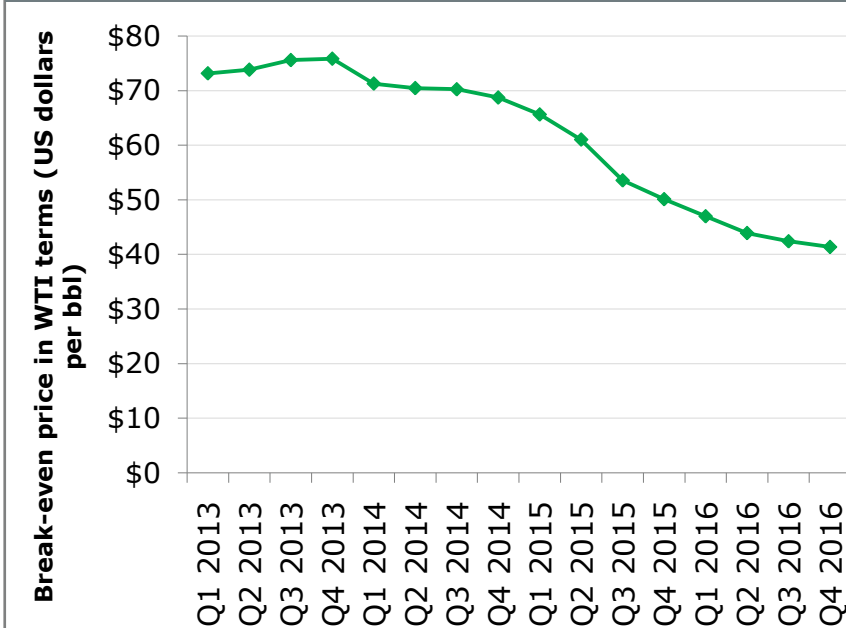
Break-even prices for representative new projects, 2014 and 2016



Notes: Full-cycle costs are expressed in terms of the Dated Brent price necessary for a project to break even, assuming a 10% internal rate of return. The 2014 and 2016 break-even estimates for these supply sources are intended to broadly depict the change from the start of the oil price collapse in mid-2014 to the latter part of 2016. For details on how break-even prices of representative new projects for each supply source are estimated, please see the box "How we estimated the break-even prices in this report."

Source: IHS Markit © 2017 IHS Markit

Median well break-even prices of several US tight oil wells



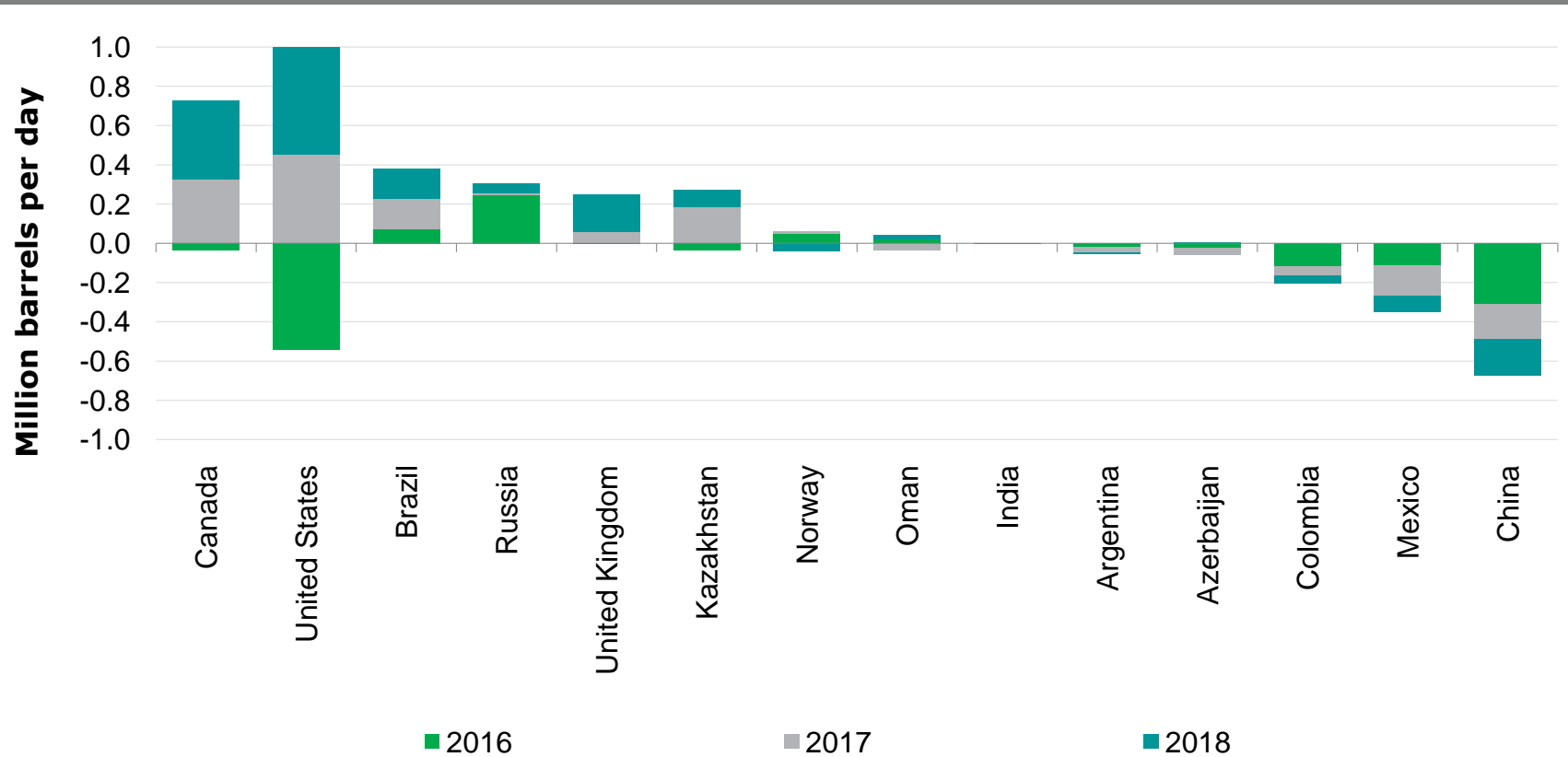
Notes: The break-even price is the WTI price required for the project to cover all of its estimated capital and operating costs and generate a 10% rate of return. The plays are the Bakken, Bone Spring, Eagle Ford, Niobrara/Wattenberg, Scoop, Stack, Wolfcamp Delaware, and Wolfcamp Midland.

Source: IHS Markit © 2017 IHS Markit

- The "cost of oil" – the oil price needed to justify investment – has fallen across the board, but by different degrees depending on the geography and type of development
- Lower service sector costs and improvements in how projects are designed, built and operated are two central forces that have pushed down the cost of oil around the world

Non-OPEC supply growth neutralizing OPEC cut impact

Annual change in crude oil production for selected non-OPEC countries, 2016-18

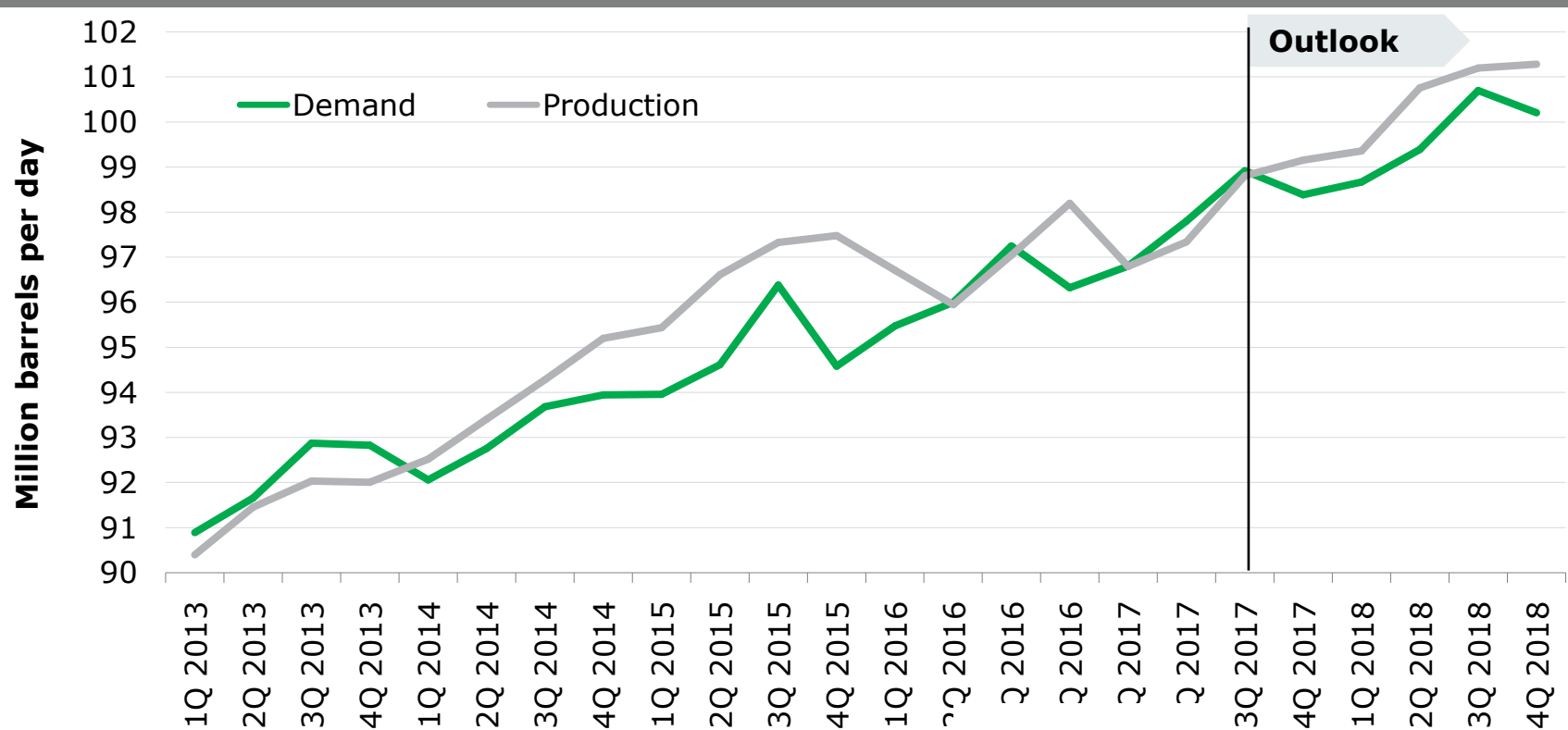


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A near-term global supply surplus is set to re-emerge

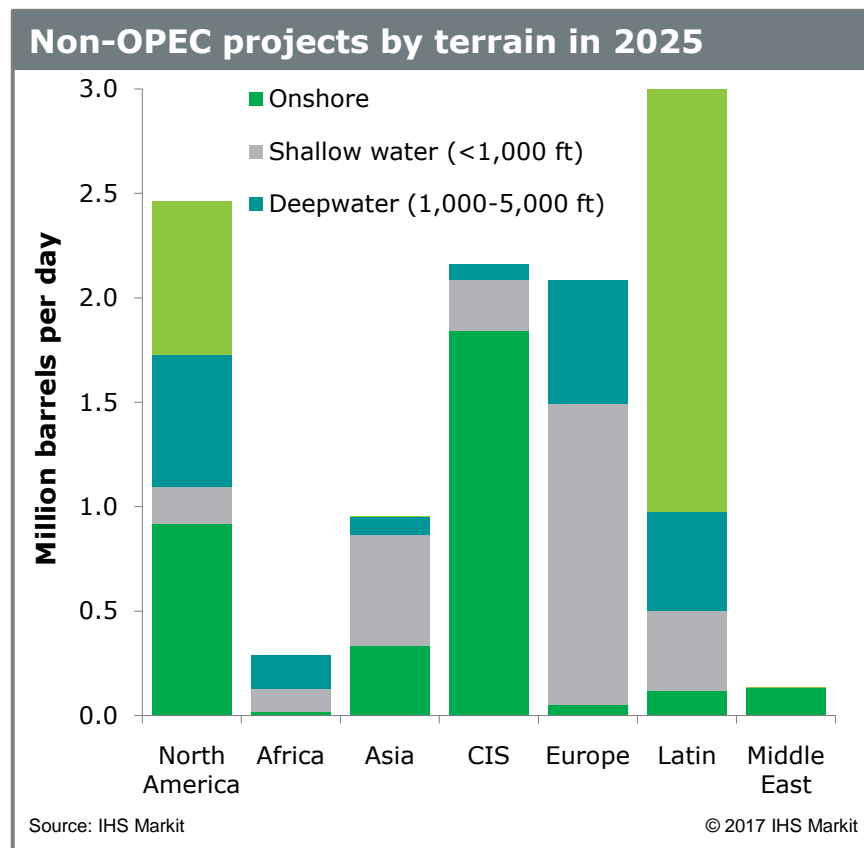
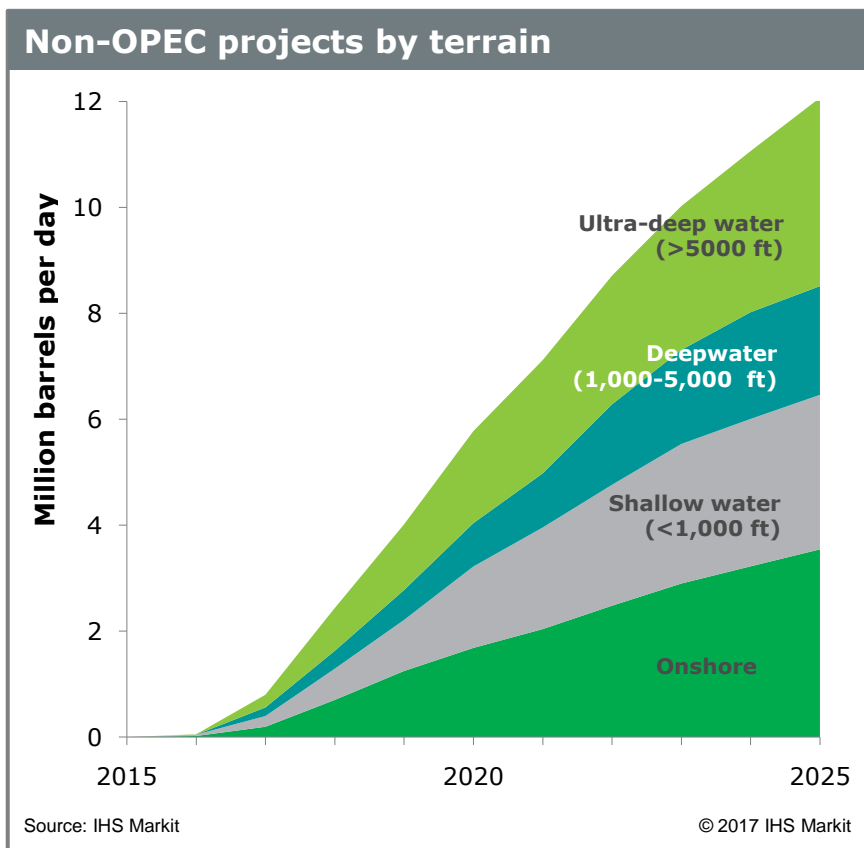
World oil (liquids) demand and production by quarter



Source: IHS Markit

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New non-OPEC supply needs sanctioning by 2019; half is deep water and ultra-deep water (mainly Brazil and DWGoM)



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Uncertainty driving some common reactions across the industry

Dynamic

Increasing protectionism

Uncertain gas-oil spreads

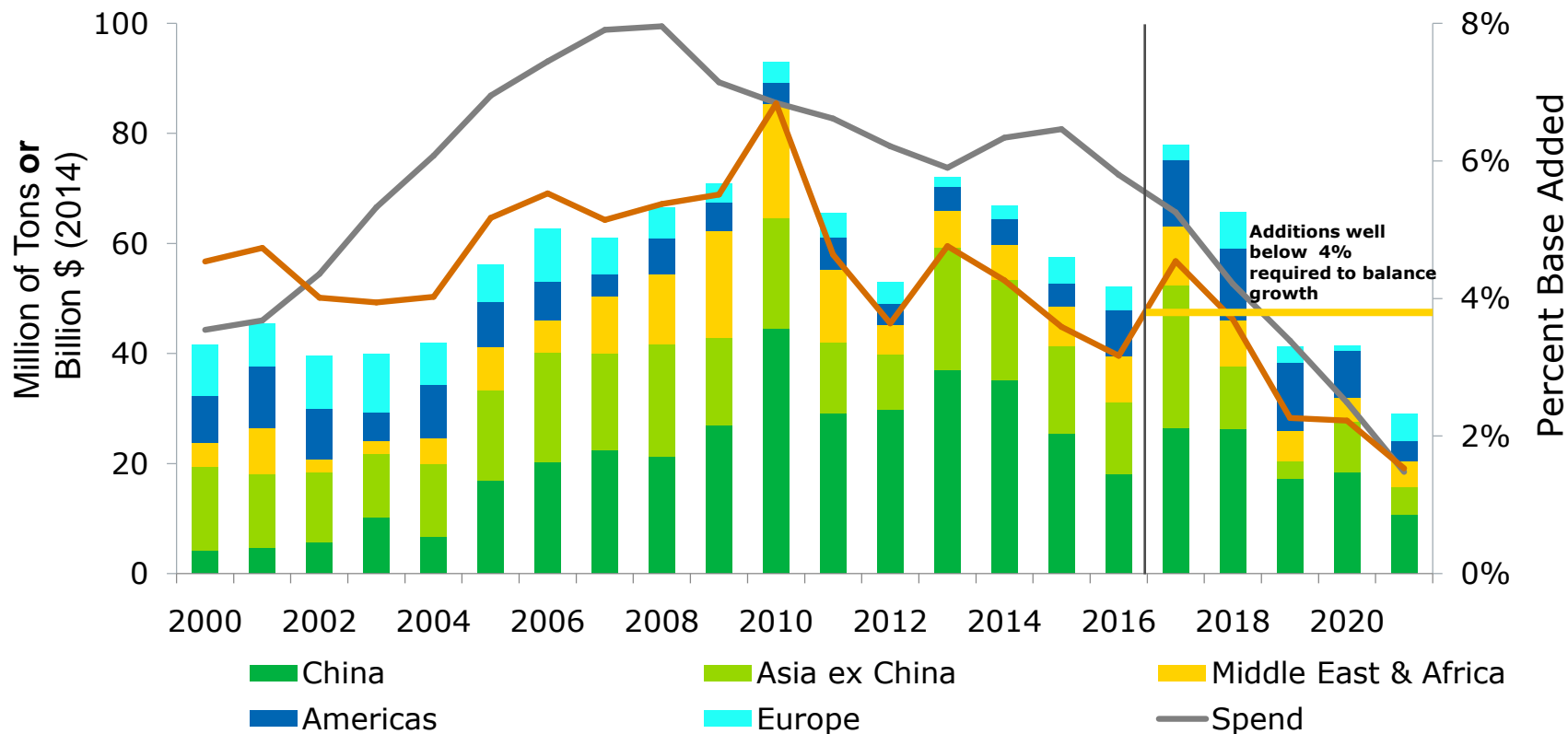
Economic mediocrity,
policy uncertainty

Strategy

- Defensive: domestic-focus except for clear areas of competitive advantage
- Asset optimization via feedstock flexibility
- Focused opportunistic investment
- Inorganic expansion via M&A
- Corporate and industry restructuring

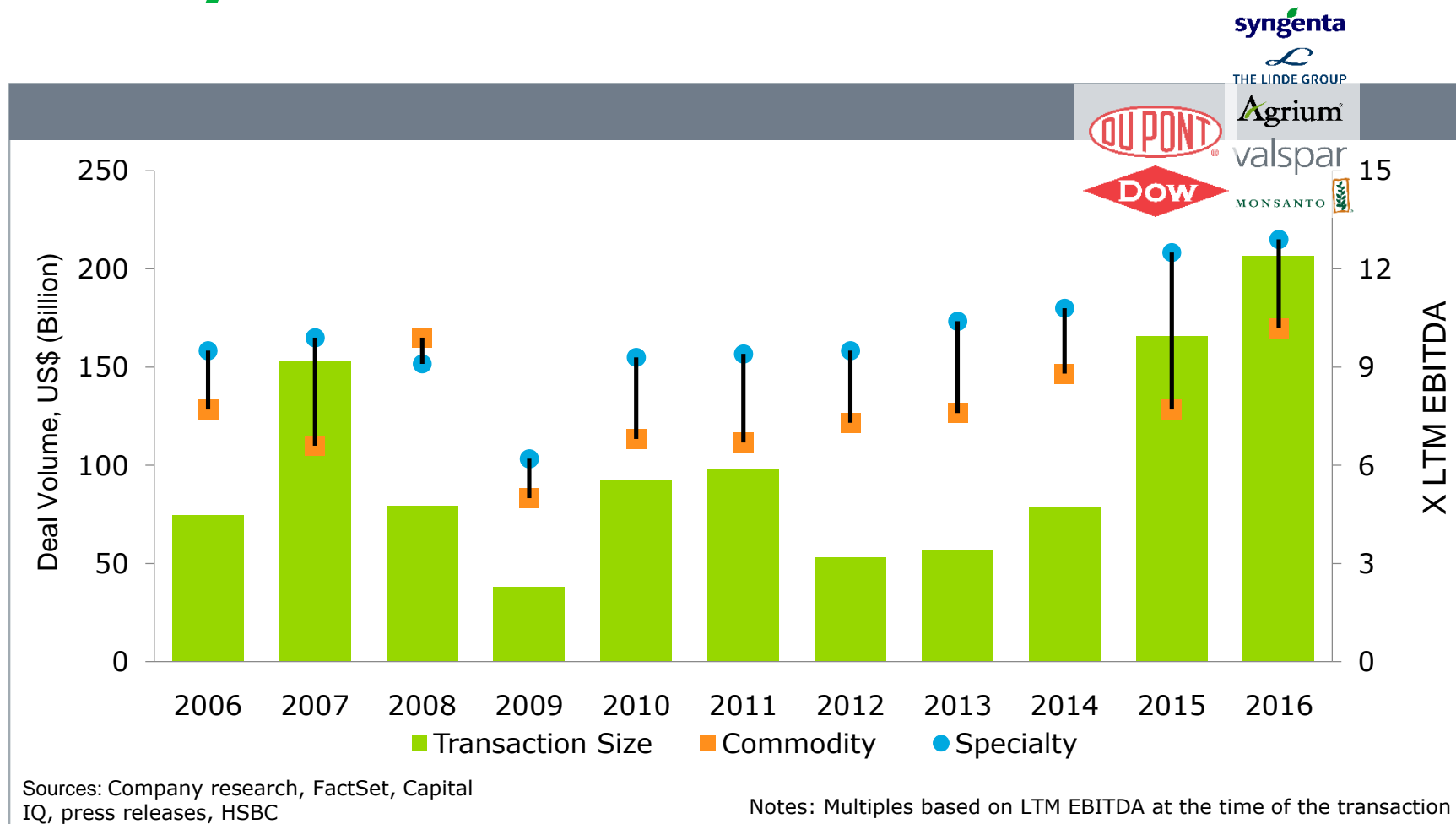
Capital investment has fallen to the lowest levels since Y2K – recent uptick toward 2021

Capital Spending in the Chemical Industry



Source: IHS Markit

Money flows move M&A to record levels



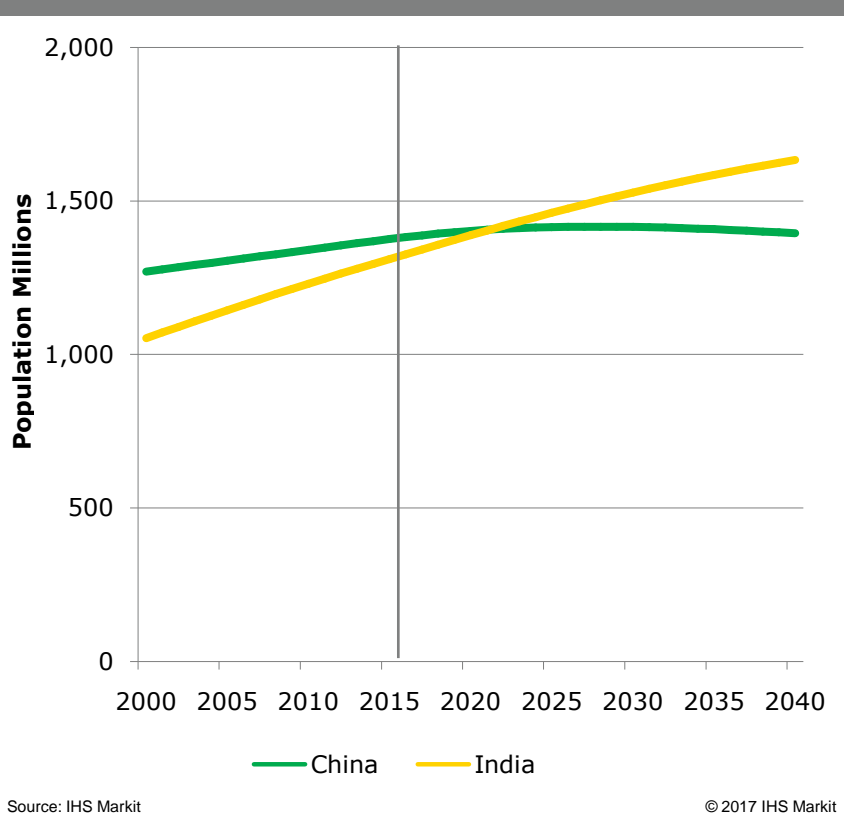
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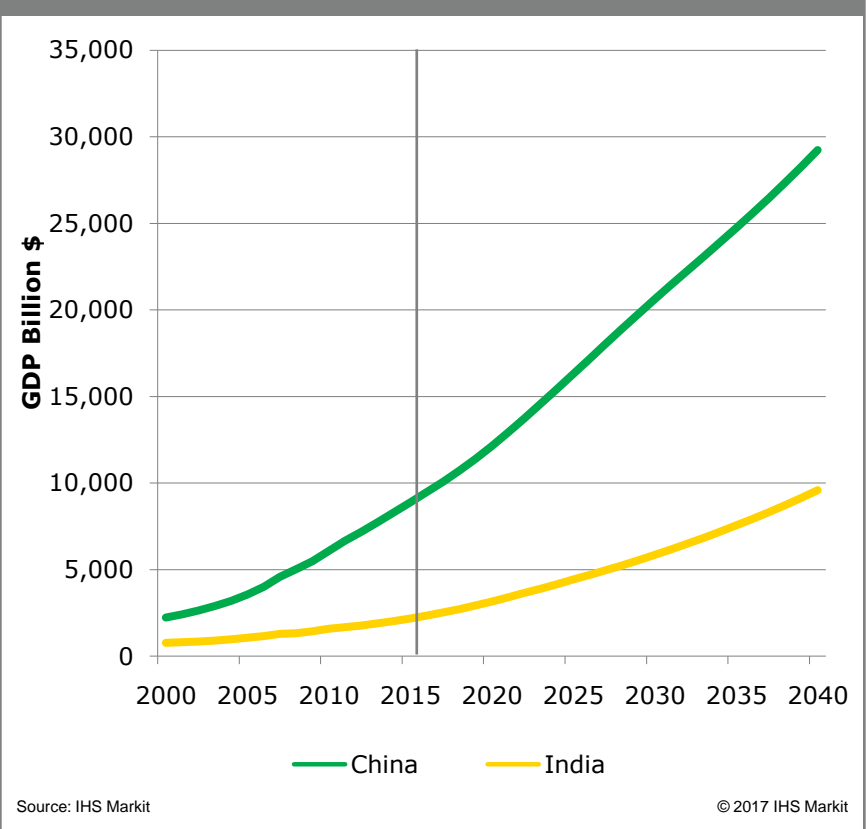
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Customers: India population to exceed China within ten years; GDP lags but turning up

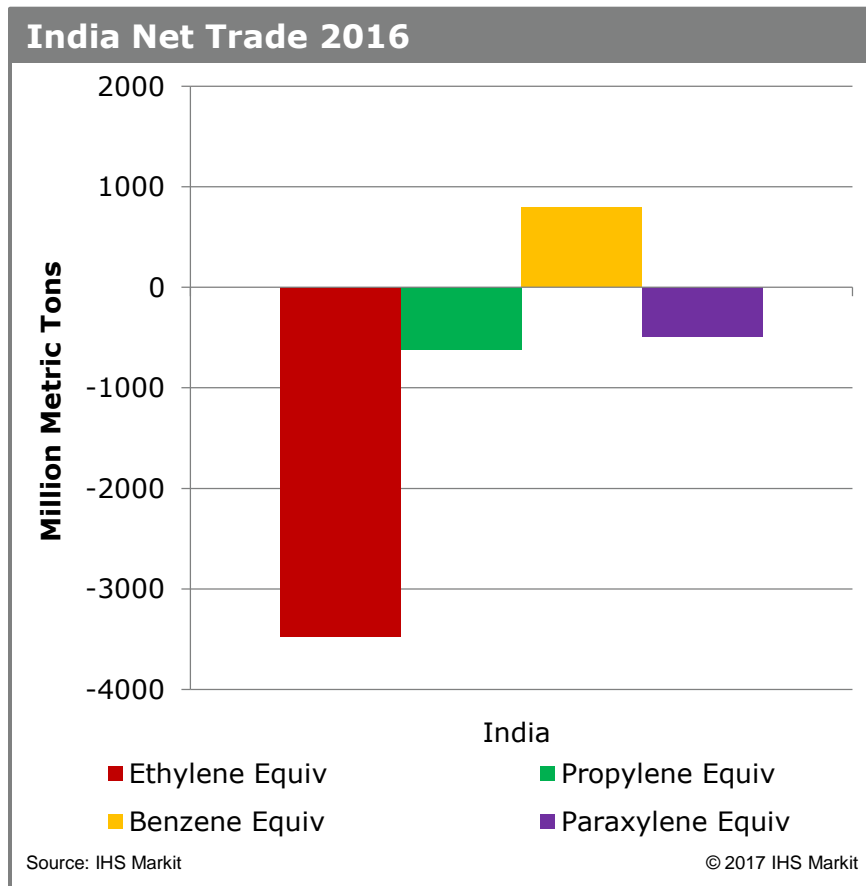
China and India Population 2000-2040



China and India GDP Growth Rate 2000-2040

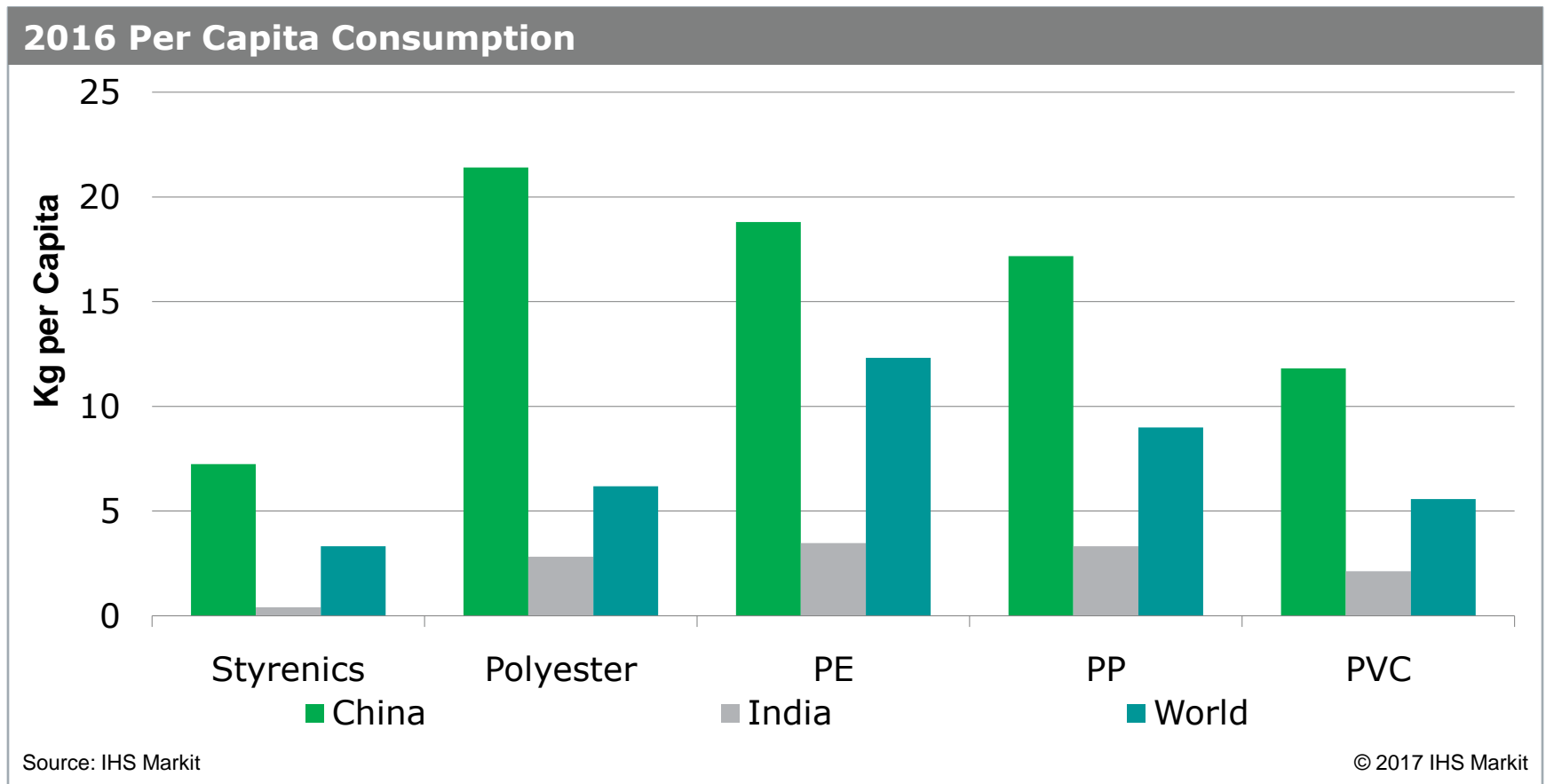


Industry not meeting domestic demand



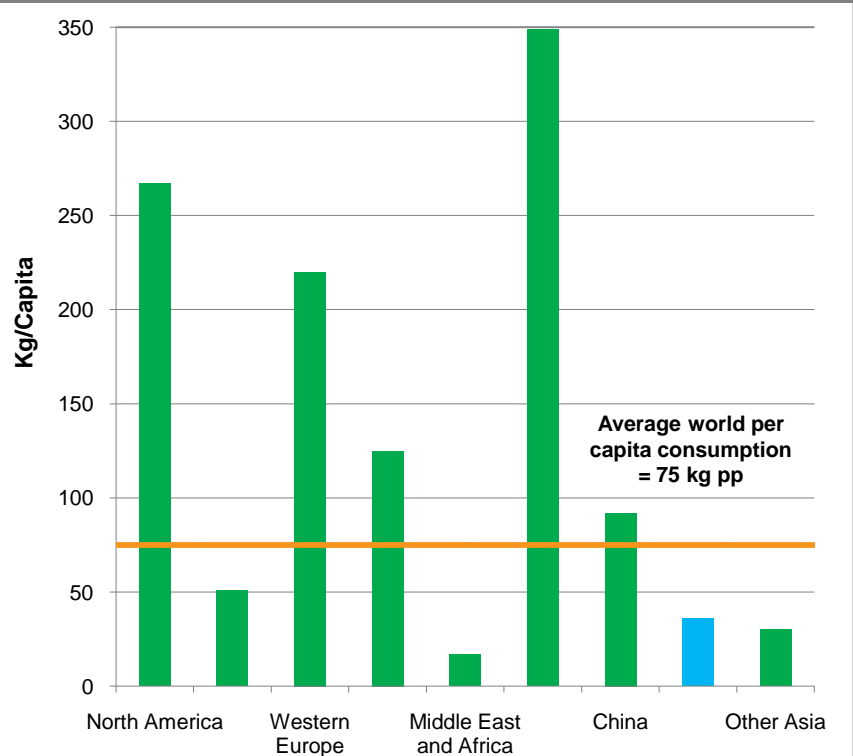
- Decision making and permitting remains a slow process in India
- Although India is a naphtha exporter, new cracker projects struggle to source sufficient feeds; feedstock pooling required
- C3 derivatives (ex PP), chloralkali, styrene – little/no capacity in India. Investment would stimulate downstream demand
- Not much petchem investment by foreign companies in India

Growth headroom exists for all value chains



Specialties also have opportunity for strong demand growth – leading the world

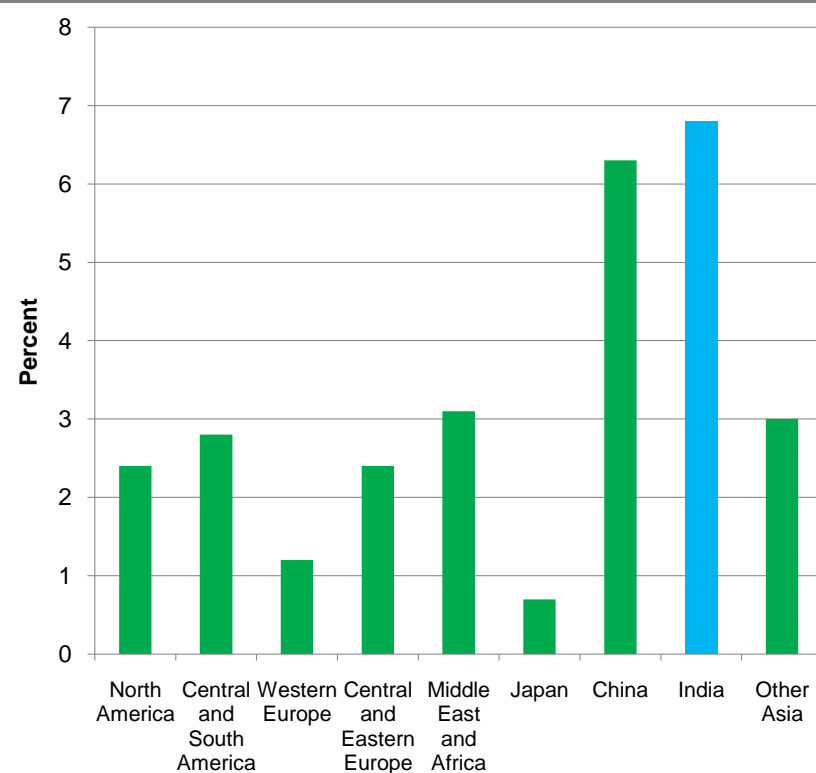
Regional specialty chemicals consumption per capita: 2016



Source: IHS Markit

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Forecast specialty chemicals volume growth rates by region: 2016–21

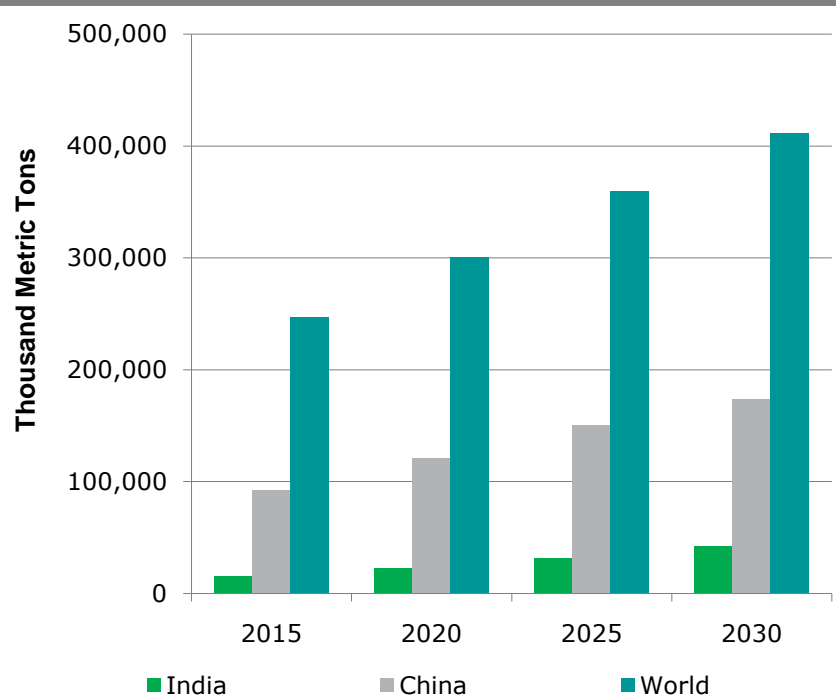


Source: IHS Markit

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Demand growing from a small base; current capacity quickly outpaced

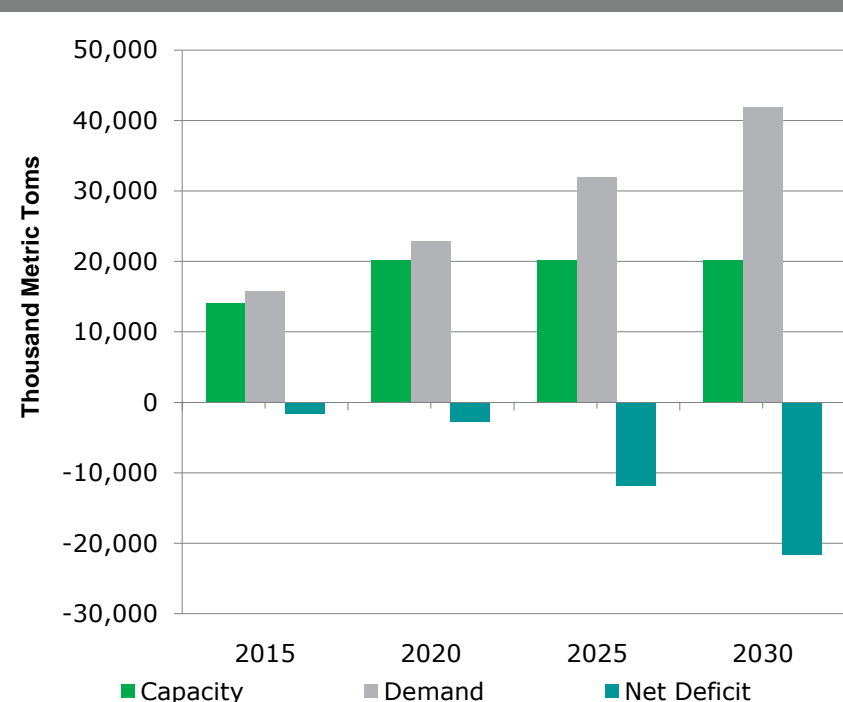
PVC, PTA, PP and PE Demand, '000 Tons



Source: IHS Markit

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India: PVC, PTA, PP & PE Capacity, Demand and Net Deficit



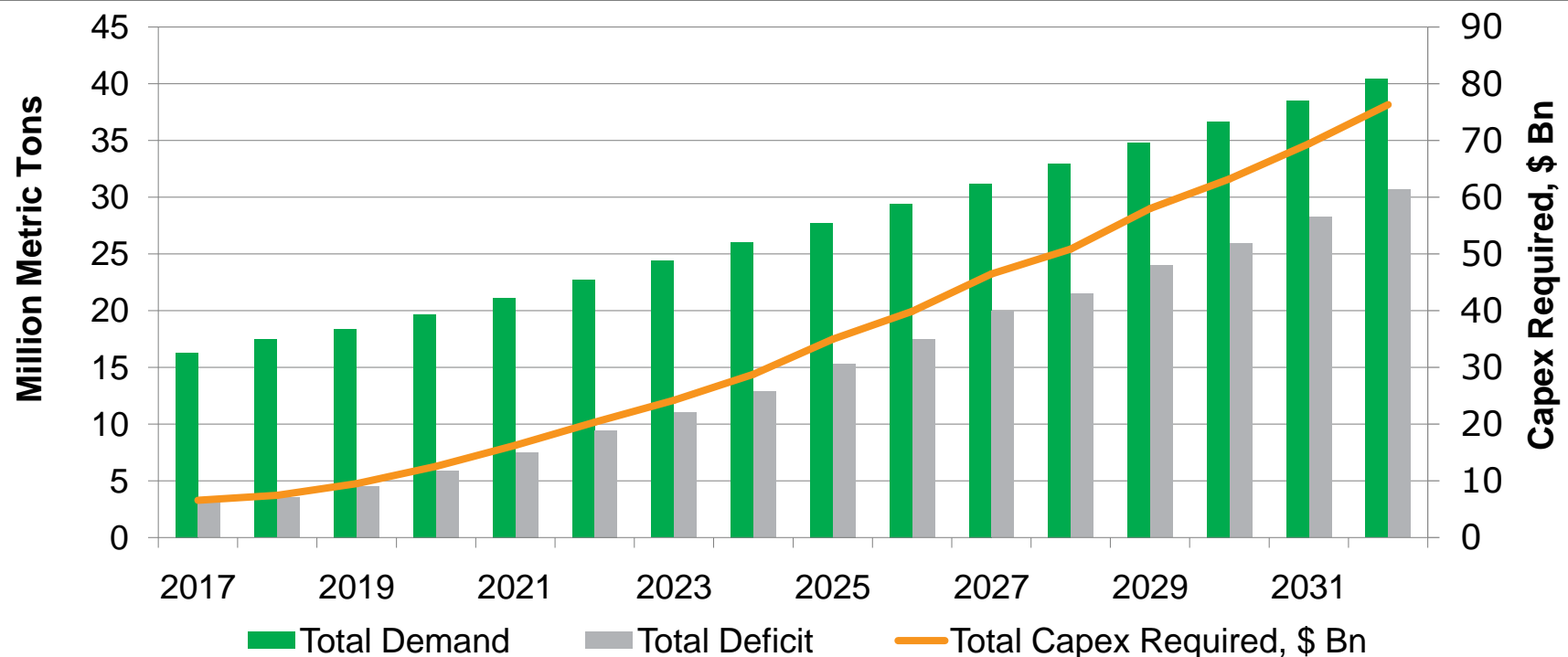
Source: IHS Markit

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- Healthy demand growth will lead to a net deficit of about 24 million tons by 2030 for PVC, PTA, PP & PE

Maintaining a reasonable trade balance will require massive investment

India : Opportunity and Capex Requirement (PE, PP, MEG and PVC)



Source: IHS Markit

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Challenges exist, but not insurmountable with policy and planning

Attribute	Issue	
Feedstock Availability	Availability constrained	→ Growing refined product demand creates refinery integration options
Feedstock Cost	No advantage; but CAPEX advantaged	→ Competitive with global liquids investment; need scale/integration
Demand/Demand growth	High Demand Growth Potential	→ Large growing local market a substantive structural advantage
Technology Access	Low	} Needs policy support for efficient regulatory framework, incentives and public investment
Ease of doing business	Low but improving	
Infrastructure	Below average	

Conclusions

- Economic outlook trending higher
- Oil pricing still uncertain; shale retards upward price movement
- uncertainty impacting chemical investment and changing industry structure via M&A
- India's improving fundamentals stand out as a bright beacon in a 'sea of uncertainty'
- The time is now for policy and investment planning to capture the chemical potential

