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Benzene pricing and styrene competitiveness: A global benchmark analysis

May 2025

Opening questions

> What sets the benzene price in a structural oversupplied by-product market?

> Who is starving in the global styrene glut?

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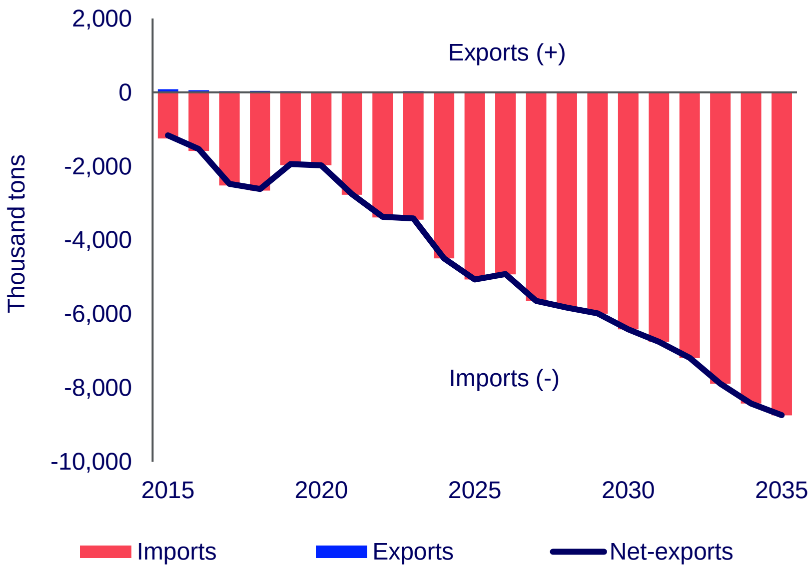
Benzene’s by-product nature drives trade imbalance

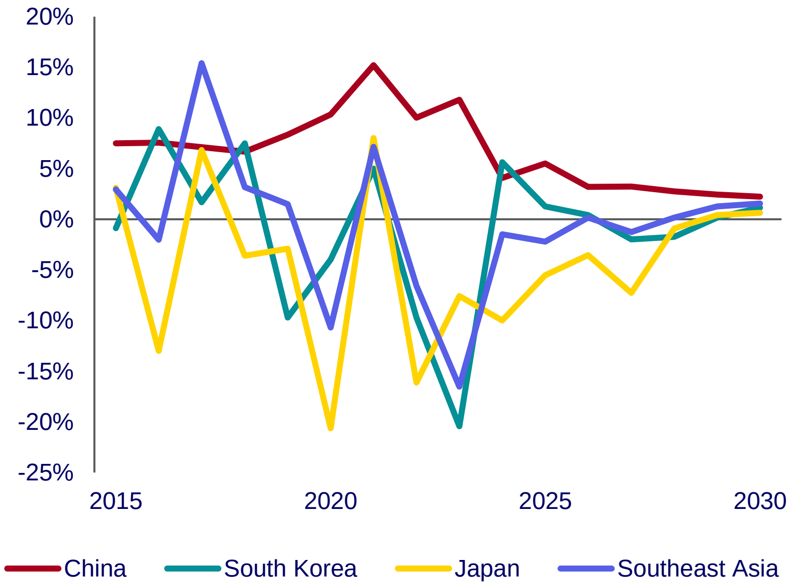
China's benzene net imports are set to rise, coupled with growing export potential in nearby markets

China benzene trade



Source: Wood Mackenzie Chemicals

Benzene consumption growth rates in Asia



Source: Wood Mackenzie Chemicals

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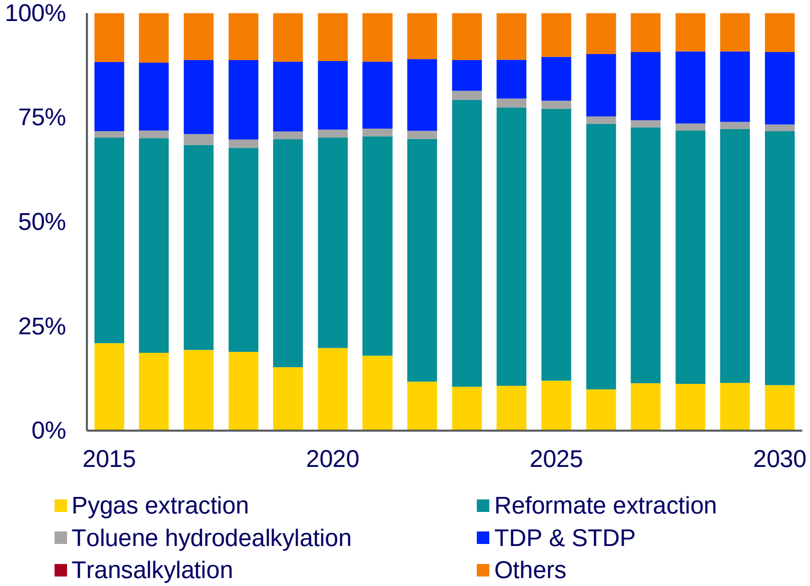
Benzene price volatility rises due to recurring supply-demand gaps

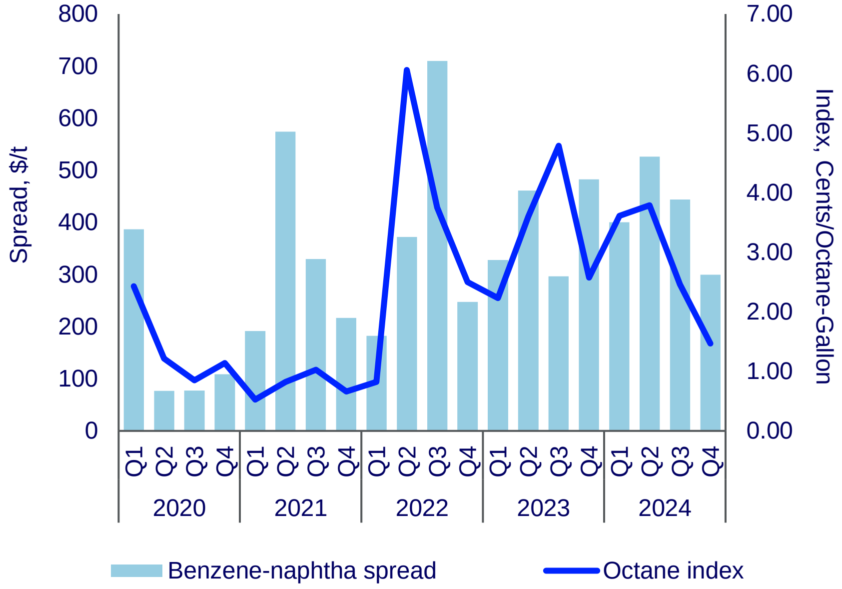
Benzene producers may still struggle to adapt locally despite favourable production economics

North Americas benzene production by technology



Source: Wood Mackenzie Chemicals

North America benzene-naphtha spread vs. octane index



Source: the Argus Media group, Wood Mackenzie Chemicals

Major output sources don't drive benzene supply shifts

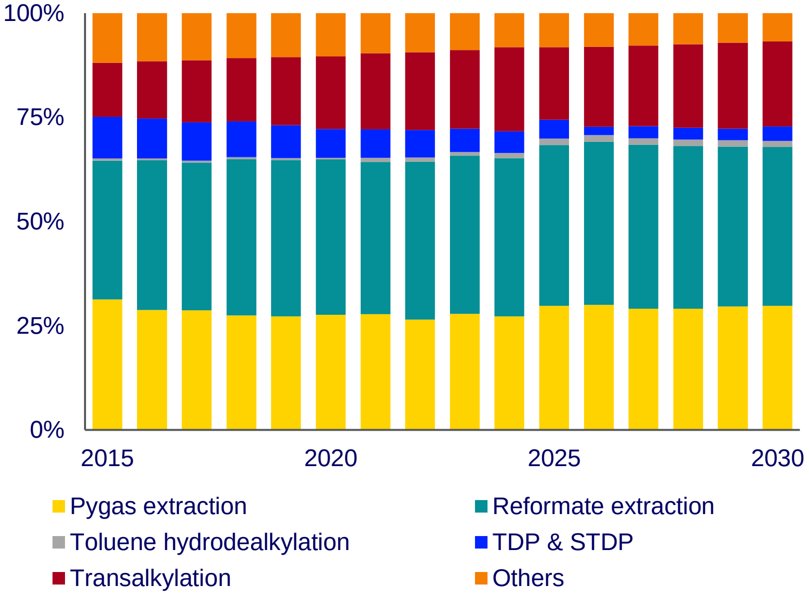
Conversion production routes provide flexibility to meet shifting supply and demand, but face notable limitations

Fact sheet of benzene production

Production route	Driving factors and constrains
Pygas extraction	The feedslate and operating rate of ethylene crackers determine pygas output available for extraction units
Reformate extraction	Reformer utilisation depends on octane demand for gasoline and integrated paraxylene needs. However, a minimum operating level is required as reformers are key hydrogen sources in refineries
Conversion routes (transalkylation, TDP, STDP)	On-purpose xylene production economics drive benzene co-production. Producers adjust yields or utilisation rates to optimise output
Toluene hydrodealkylation (HDA)	Production economics drive output, with feedstock toluene availability as the primary constraint.
Coke oven	Coke production drives coke oven light oil output, from which nearly all benzene can be recovered

Source: Wood Mackenzie Chemicals

Asia benzene production by technology

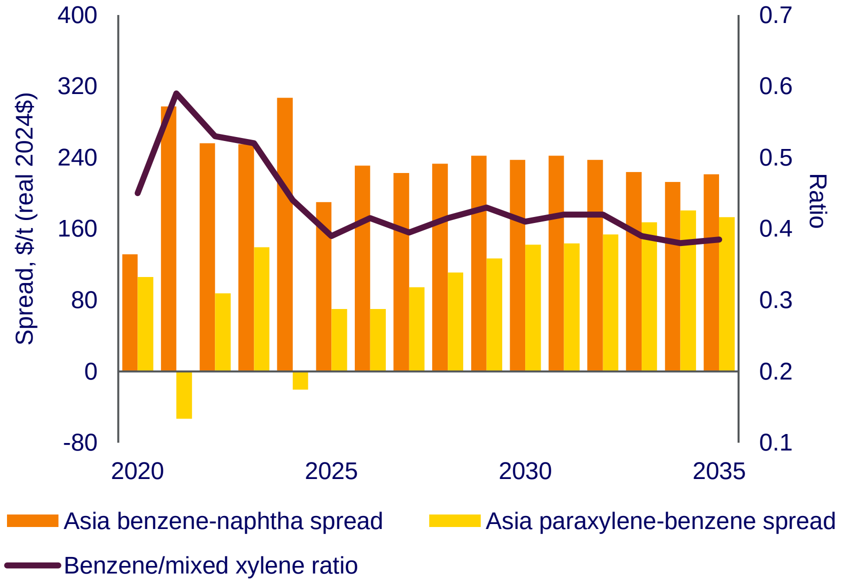


Source: Wood Mackenzie Chemicals

Recent Asian benzene market developments strengthen its global influence

Transalkylation is crucial for managing benzene supply in Asia and balancing the global market

China transalkylation benzene/mixed xylene yield ratio



Source: the Argus Media group, Wood Mackenzie Chemicals

- ✓ Asia's influence on global benzene pricing continues to grow
- ✓ Asian transalkylation leads the benzene production from conversion routes, with its market share expanding
- ✓ Lower benzene/mixed xylene yield ratios are needed to ensure a stable supply-demand equilibrium in our forecast
- ✓ This suggests narrower price spreads between benzene and its feedstock, as well as other aromatics

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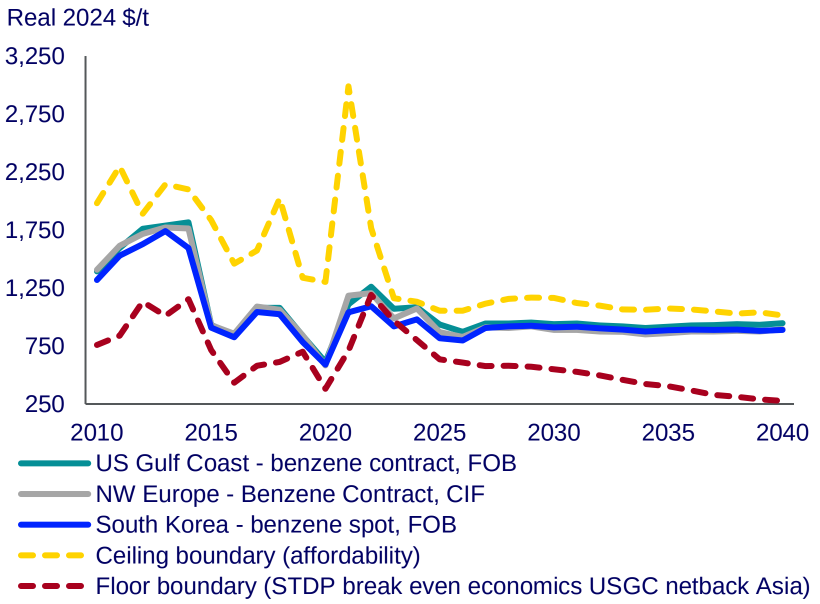
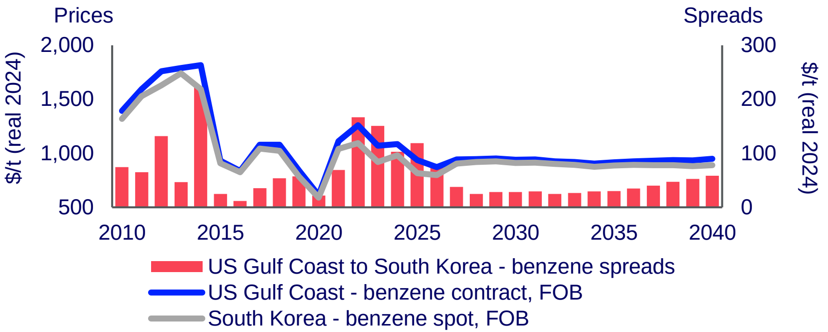
Asia plays a pivotal role in setting global benzene prices

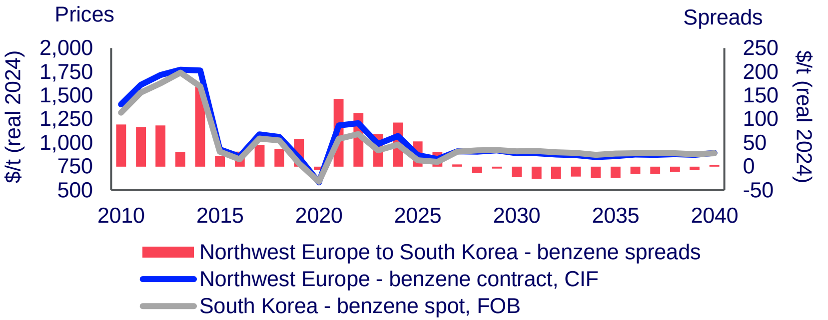
Changes in net trade positions across regions shape the pattern of price differentials worldwide

Regional benzene prices



Regional benzene spreads

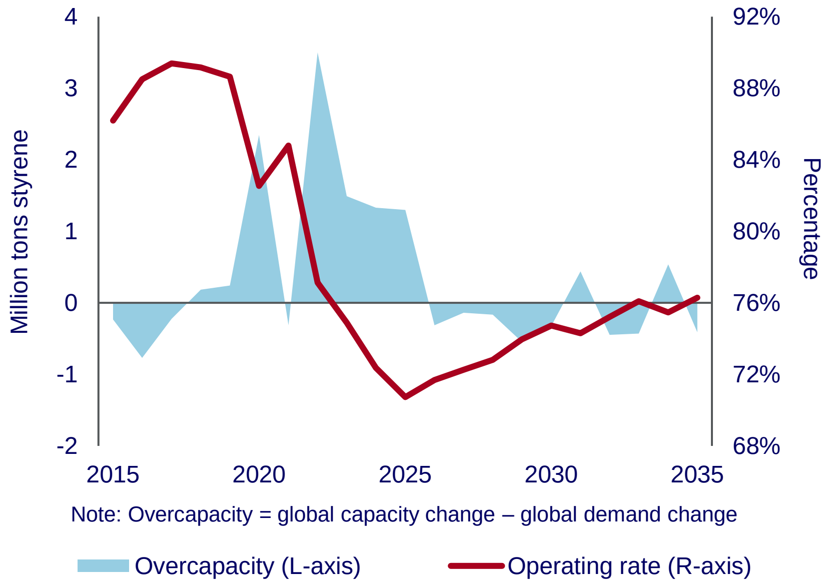




Global styrene market grapples with mounting overcapacity

Producers operating at marginal costs capture a predominant share of the global styrene market during the current downturn

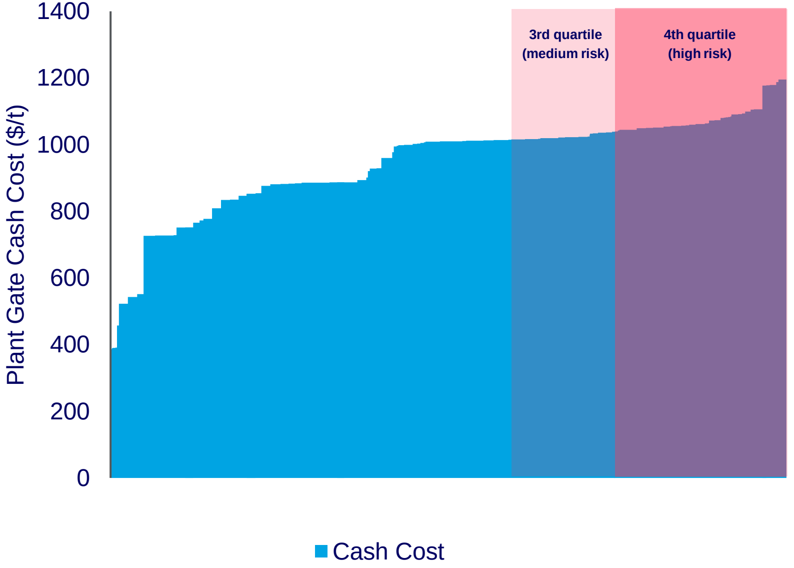
Global overcapacity profile for styrene



Note: Overcapacity = global capacity change – global demand change

Source: Wood Mackenzie Chemicals

World styrene plant gate cash cost curve*, 2025



Source: Wood Mackenzie Styrene Asset Benchmarking Tool H2 2024

*The cost curve is on a “Fully loaded” basis. Costs are in “dollars per ton of styrene”. Integrated ethylene and propylene feedstock sources are considered on a cost basis, and co-product credits are factored (e.g. PO is included as a co-product credit in POSM cost assessment)

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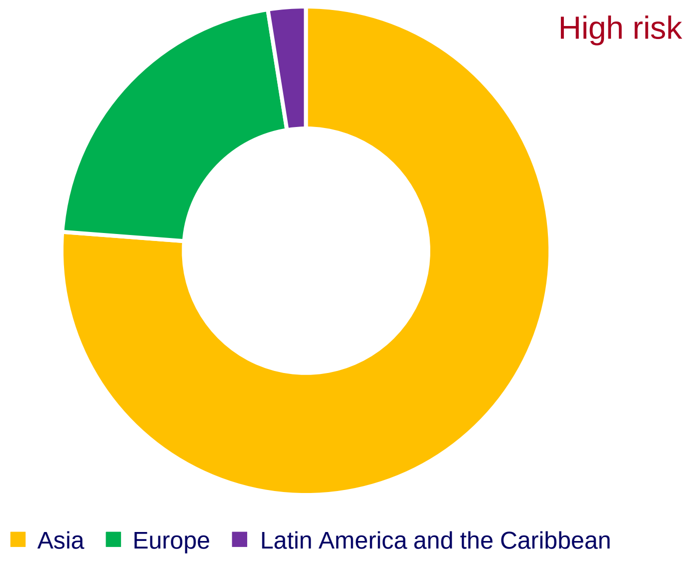
Identify high-cost regions – composition of risky assets

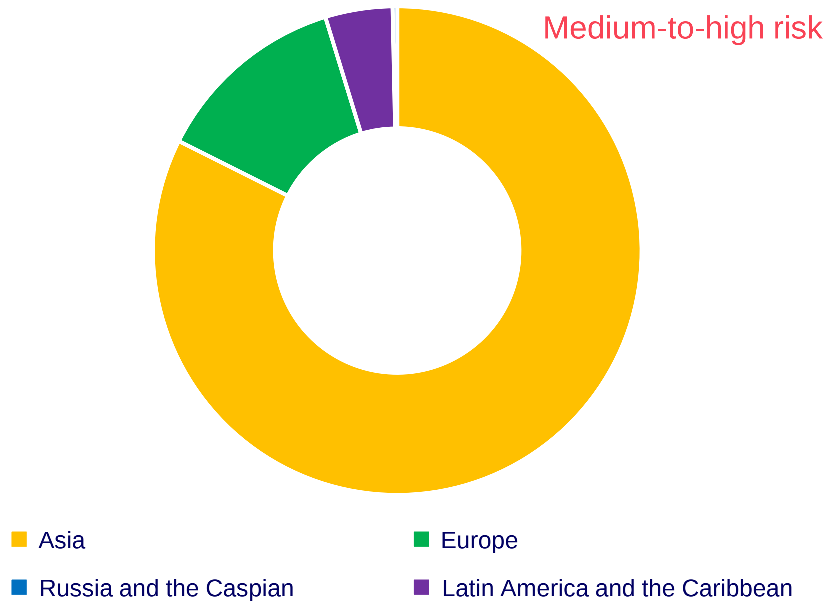
Several styrene assets in Asia are being considered for a possible market exit, with China representing 33 percent in the high-risk category and 52 percent in the medium-to-high-risk category, respectively

Composition of the 4th cost quartile by region



Source: Wood Mackenzie Styrene Asset Benchmarking Tool H2 2024

Composition of the 3rd and 4th cost quartiles by region

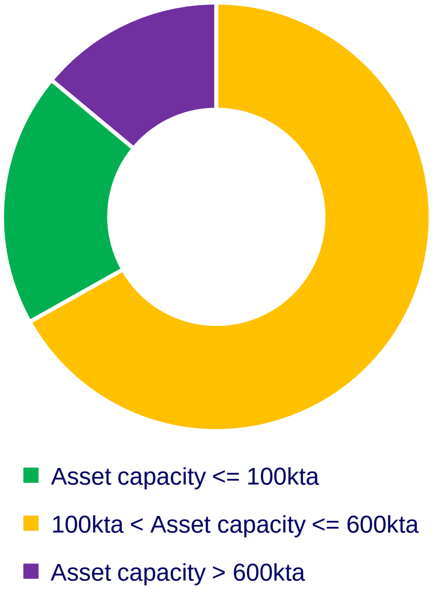


Source: Wood Mackenzie Styrene Asset Benchmarking Tool H2 2024

Identify high-cost regions – a deep dive into China

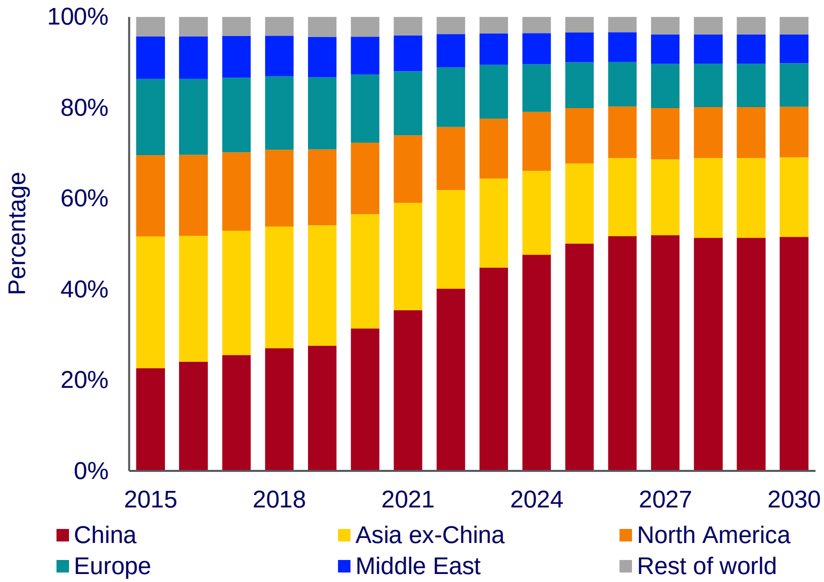
The cost advantages linked to local distribution and import substitution enhanced the competitiveness of Chinese assets, while several mid-to-small producers are likely to be pushed out of the market

Assets with medium-to-high exit risk in China by size



Source: Wood Mackenzie Styrene Asset Benchmarking Tool H2 2024

Global styrene capacity by region

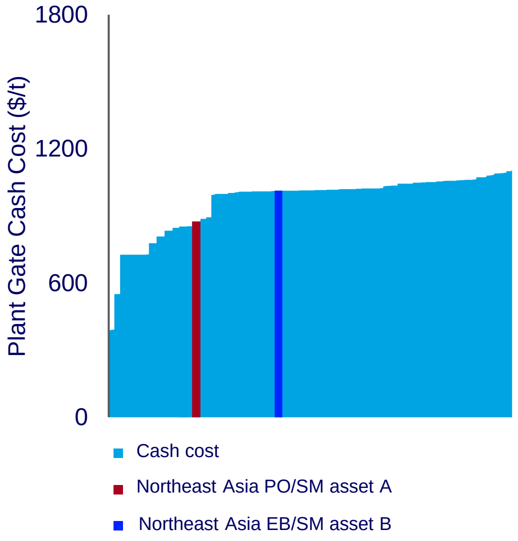


Source: Wood Mackenzie Chemicals

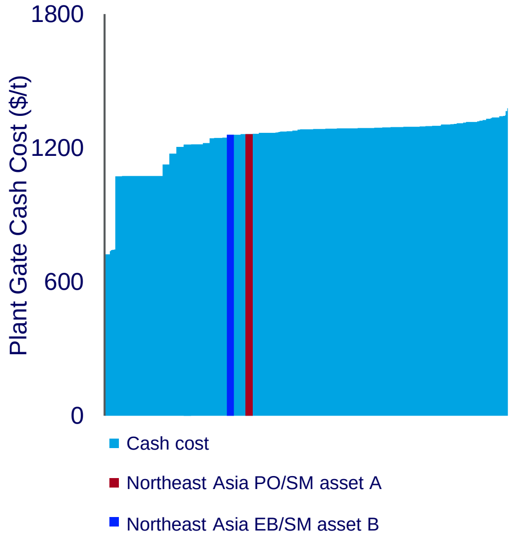
Several factors pose long-term challenges for the surviving styrene assets

In Asia, propylene oxide profitability remains crucial for PO/SM assets, and export-oriented assets face growing competitiveness challenges from carbon taxes and trade barriers

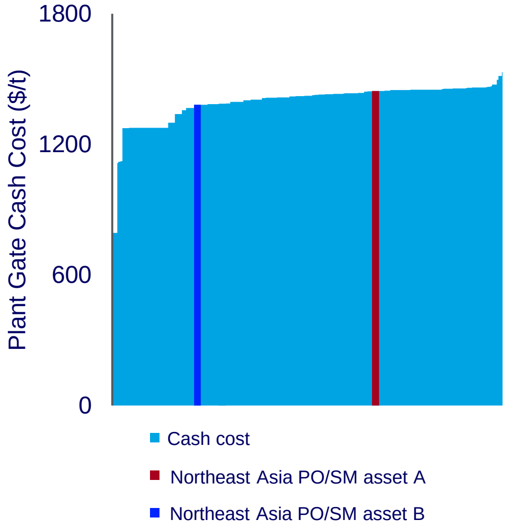
Asia styrene plant gate cash cost curve*, 2025



Asia styrene plant gate cash cost curve*, 2030



Asia styrene plant gate cash cost curve*, 2035



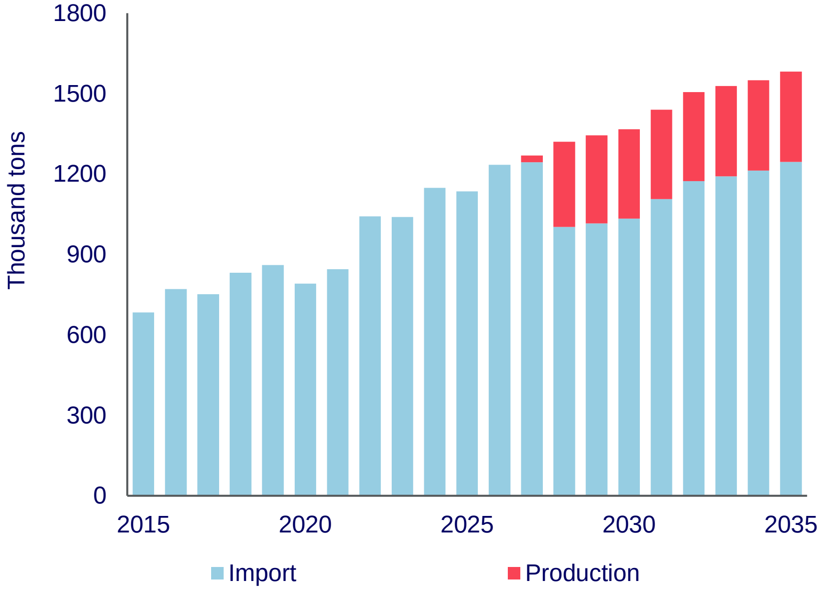
*The cost curves are on a "Fully loaded" basis. Costs are in "dollars per ton of styrene". Integrated ethylene and propylene feedstock sources are considered on a cost basis and co-product credits are factored (e.g. PO is included as a co-product credit in PO/SM cost assessment)

Source: Wood Mackenzie Styrene Asset Benchmarking Tool H2 2024

Export opportunities emerge in other markets as China moves towards self-sufficiency

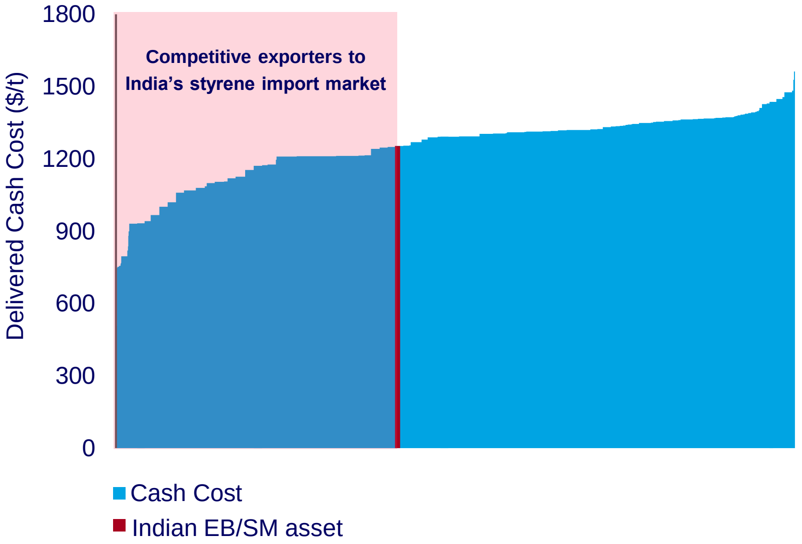
India remains the key target for styrene exporters, despite growth in domestic production

India styrene supply profile



Source: Wood Mackenzie Chemicals

World styrene Indian market delivered cash cost curve*, 2028



Source: Wood Mackenzie Styrene Asset Benchmarking Tool H2 2024

*The cost curve is on a "Fully loaded" basis. Costs are in "dollars per ton of styrene" delivered to the Indian market. Integrated ethylene and propylene feedstock sources are considered on a cost basis, and co-product credits are factored (e.g. PO is included as a co-product credit in POSM cost assessment)

Concluding remarks

- The global benzene industry remains dominated by its by-product nature, leading to mismatches in local supply and demand.
- Asian transalkylation emerges as a crucial supply tier to accommodate necessary benzene supply changes. Notably, Asia has become the global price setter for benzene.
- North America and Europe are key price-taking regions for benzene. We predict price differentials between Asia and these regions to evolve in line with changes in their trade positions.
- China’s styrene capacity will continue to expand with strengthened industry competitiveness. However, some mid-to-small producers will exit the market.
- Propylene oxide profitability, carbon tax costs and trade barriers will significantly impact Asian assets' cost positions, particularly those with high export exposure.
- Ongoing trade and geopolitical tensions pose downside risks to our forecast benzene-naphtha spreads. Styrene consumption will face more immediate impacts, potentially delaying margin recovery and prolonging challenges for marginal styrene producers.

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