

Polymers: Pricing dynamics explained

Bernardo Fallas
Associate Editorial Director – Americas
S&P Global Platts

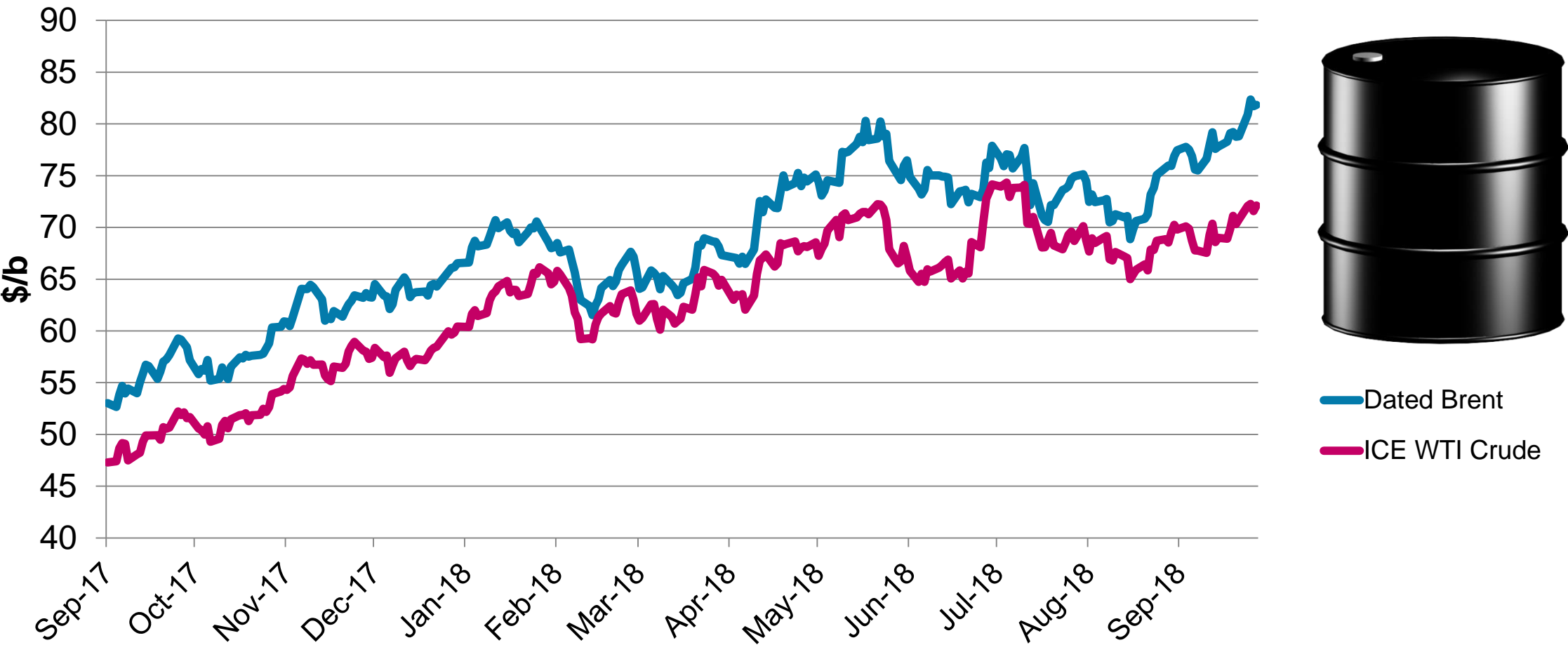


S&P Global
Platts

Key global trends

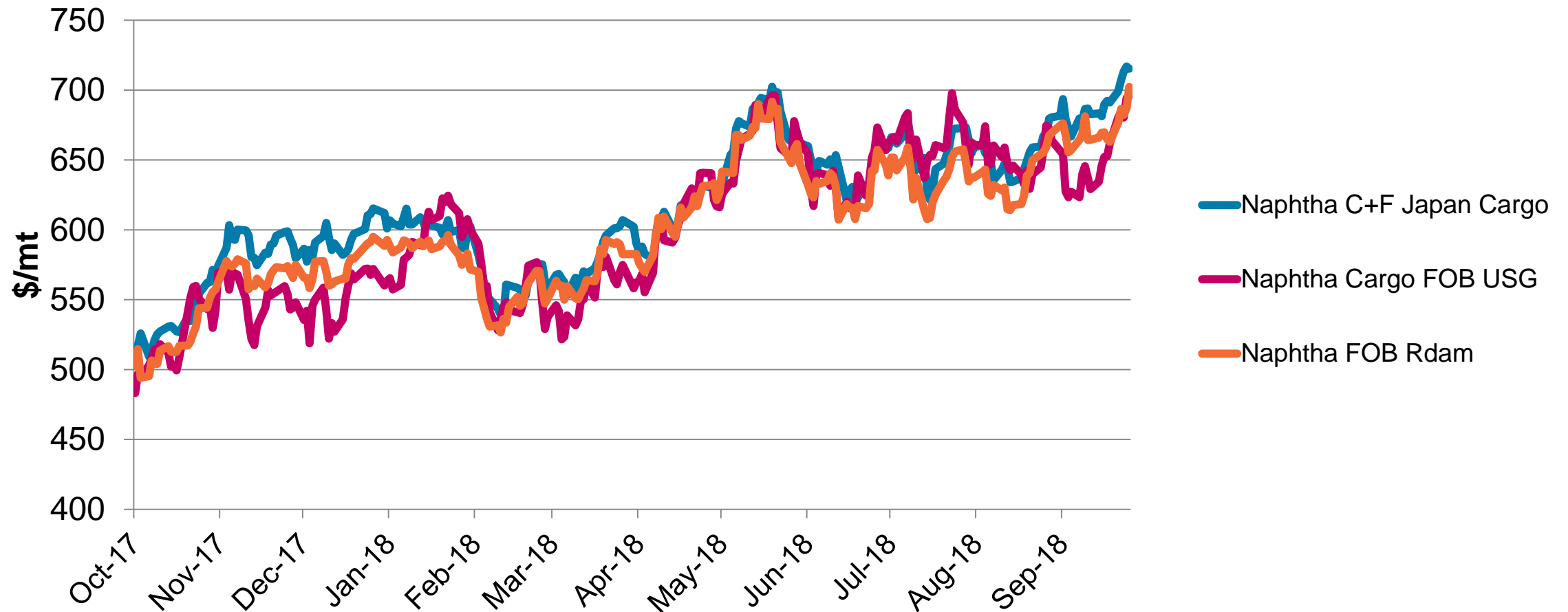
- **Rebounding crude prices impact petrochemical feedstocks**
 - Global crude benchmarks closed H1 2018 at levels not seen since late 2014

Oil pricing on the upswing



Source: S&P Global Platts

...and naphtha follows



Source: S&P Global Platts

H1 2018 highlights

- **Global crude:** Ends H1 2018 at levels not seen since late 2014
- **USG ethane:** At 52-month highs, averaged 34% higher than gas
- **USG propane:** Posts highest average since '14, driven by exports
- **USG benzene:** 298.46 cents/gal (\$892.40/mt), up 13% y-o-y
- **USG ethylene:** 18.39 cents/lb (\$405.43/mt); hits record low on glut
- **USG propylene:** 51.13 cents/lb (\$1,127.21/mt), highest since '14
- **NA export PE:** Firm on Asia pull; softens to end Q2, mainly LLDPE
- **Mercosur:** Most import PE, PP grades average highest since 2014

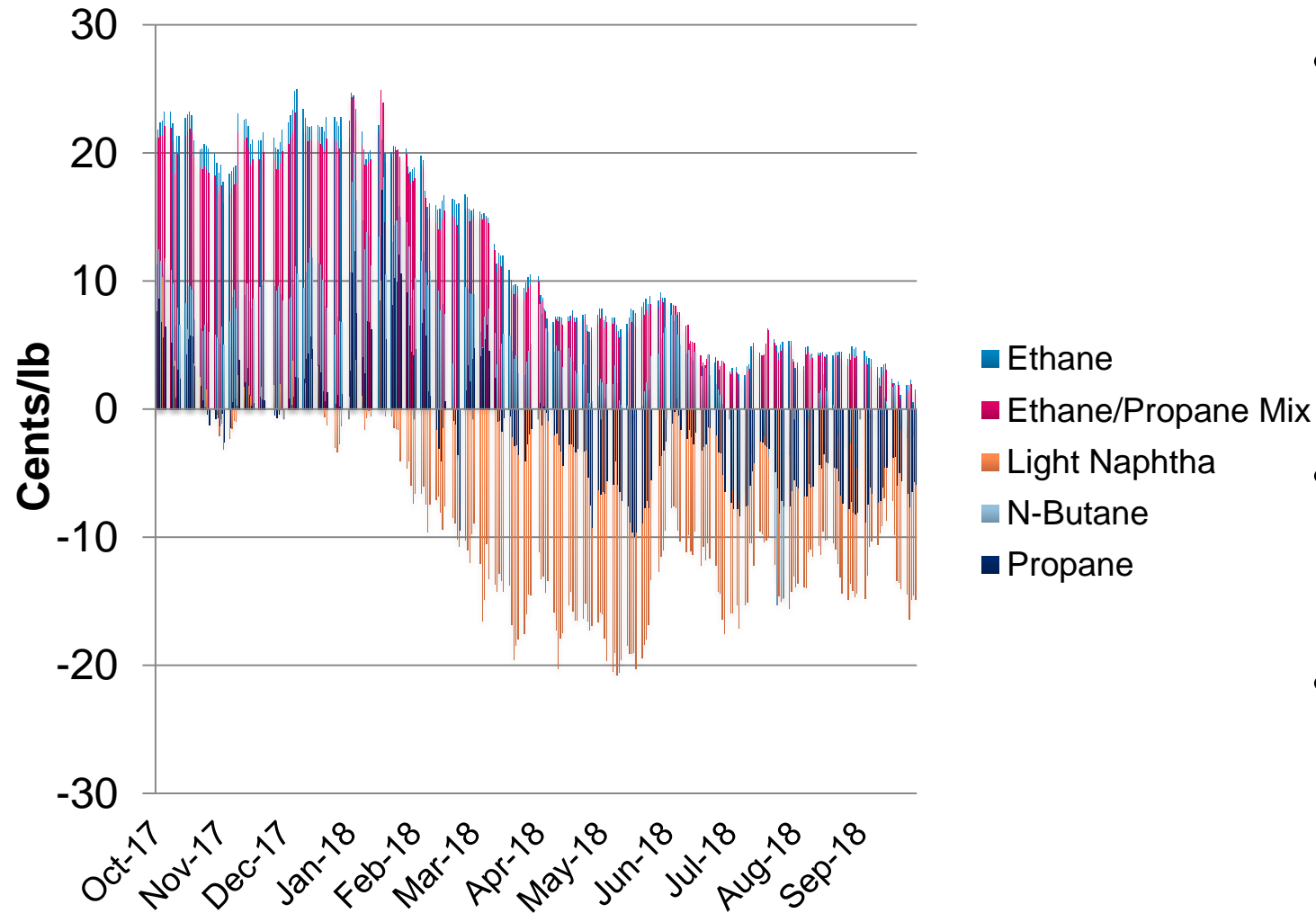
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 - Cracker margins reach record lows, but integrated producers line up more projects

USGC ethylene projects 2017-2020

| Company | Location | Tm/yr | Startup |
|-----------------------|-----------|-----------|---------|
| Occidental/Mexichem | Texas | 550,000 | Q2 2017 |
| Dow Chemical | Texas | 1,500,000 | Q3 2017 |
| CP Chem | Texas | 1,500,000 | Q1 2018 |
| ExxonMobil Chemical | Texas | 1,500,000 | Q3 2018 |
| Indorama | Louisiana | 370,000 | Q4 2018 |
| Shintech | Louisiana | 1,500,000 | Q1 2019 |
| Sasol | Louisiana | 1,500,000 | Q1 2019 |
| Axiall/Westlake-Lotte | Louisiana | 1,200,000 | 2019 |
| Formosa Plastics | Texas | 1,500,000 | 2019 |
| Total Petrochemicals | Texas | 1,000,000 | 2020 |

2018 US cracker margins sink on ethylene glut



- With ethylene sub-20 cents/lb (\$440/mt) but spot PE for export around 50 cents/lb (\$1,102/mt), integrated producers are not sweating it
- ROI, however, remains consideration
- Depressed margins are affecting merchant sellers

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- **Projected deficits have Asia seeking 'bottomless' refinery**
 - Plant integration is the new mantra; turning residuals into higher-value products

Petrochemicals & the bottomless refinery

Post 2020 Refinery Trends

Minimize High Sulphur Fuel Oil

Maximize Transport Fuels

Maximize Middle Distillates

Post 2020 Petrochemicals Focus

High Severity FCC

Hydro-Wax Cracking

Pet-coke & Off Gas Cracking

Crude to Chemicals

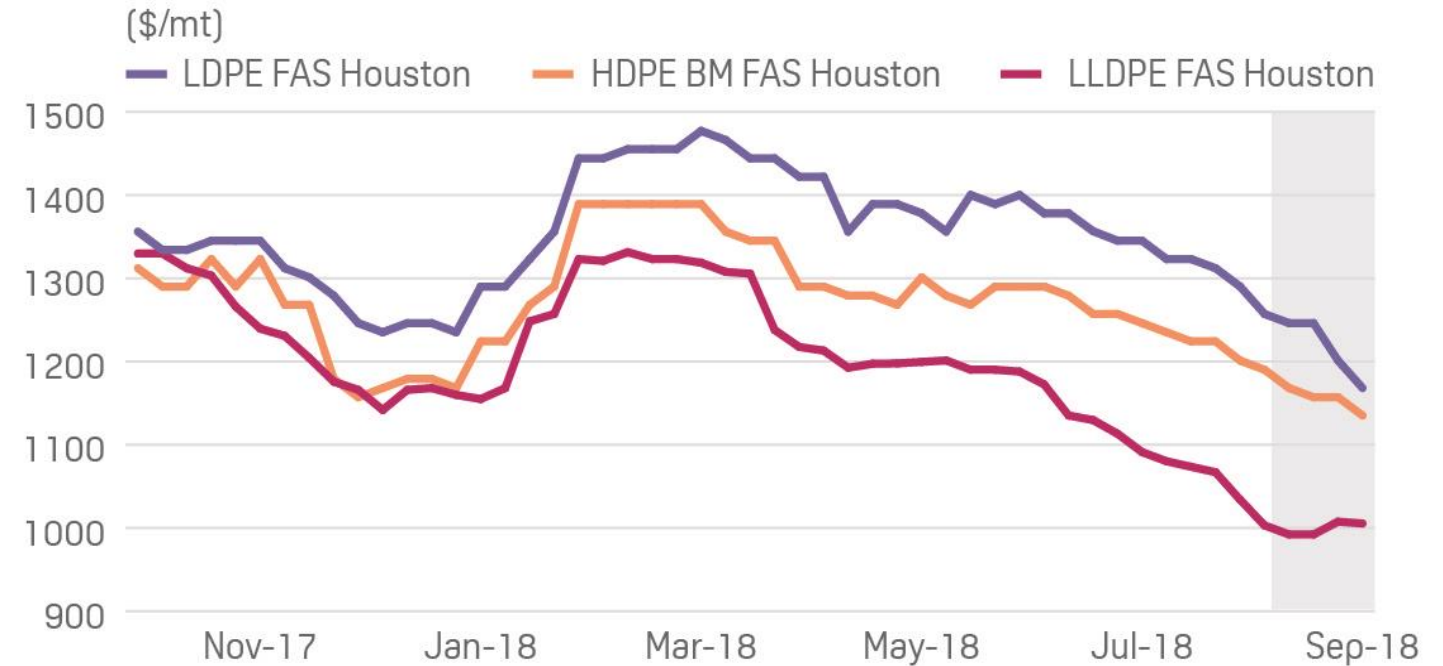
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- **Projected deficits have Asia seeking 'bottomless' refinery**
 - Plant integration is the new mantra; turning residuals into higher-value products
- **Ongoing trade tensions between US, China, others**
 - Possibility of trade war to cause uncertainty in short term; US PE market on alert

US export pricing under pressure from surplus

- US export pricing of key PE grades has fallen 13-17% since early June; domestic pricing range-bound
- Trend has continued since tariff enforcement by China; has affected grades beyond listed
- Some US producers argue drop will be temporary, perhaps 6 months, as trade flows adjust

US PE EXPORT PRICING



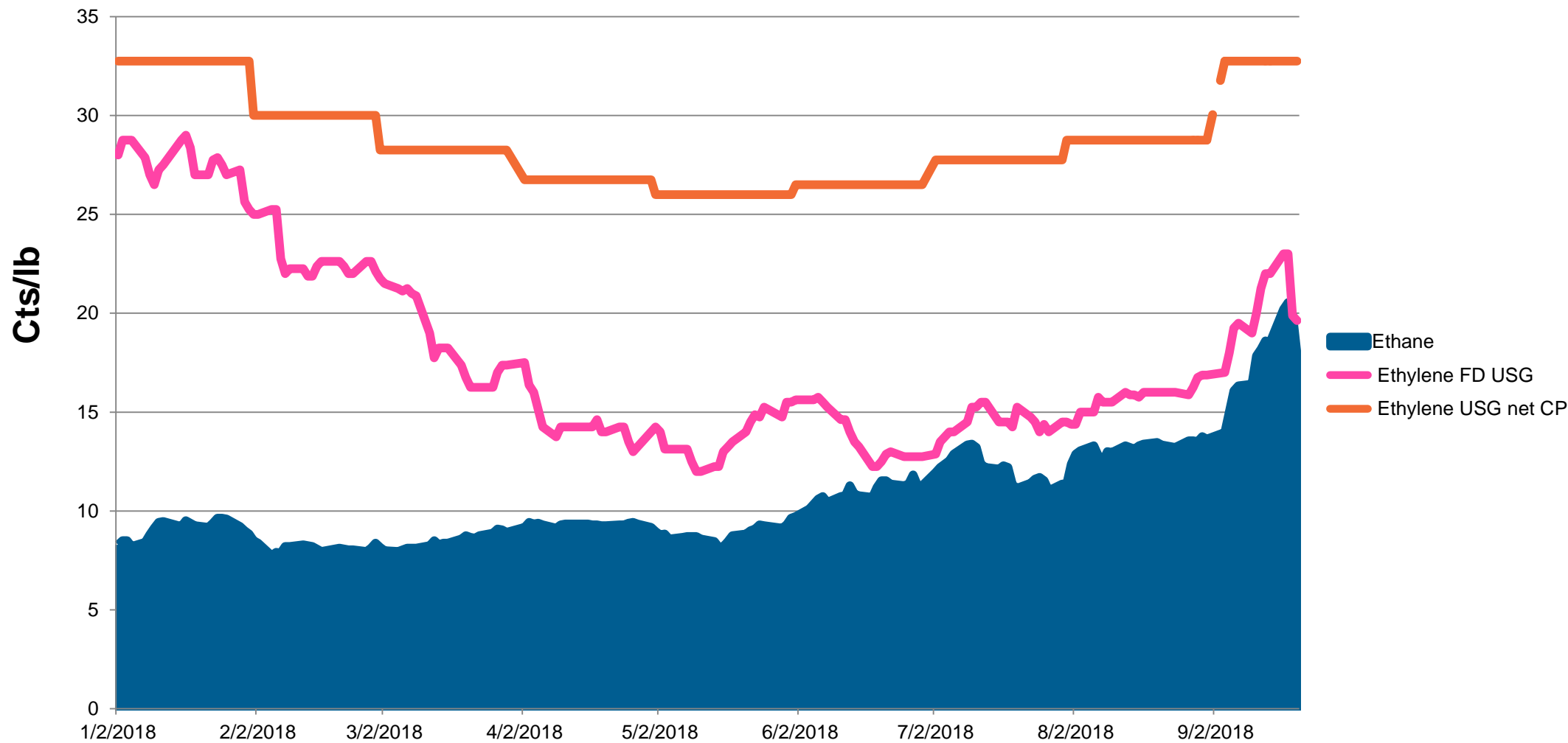
Note: Shaded area refers to China's implementation of tariffs on select US PE grades

Source: S&P Global Platts

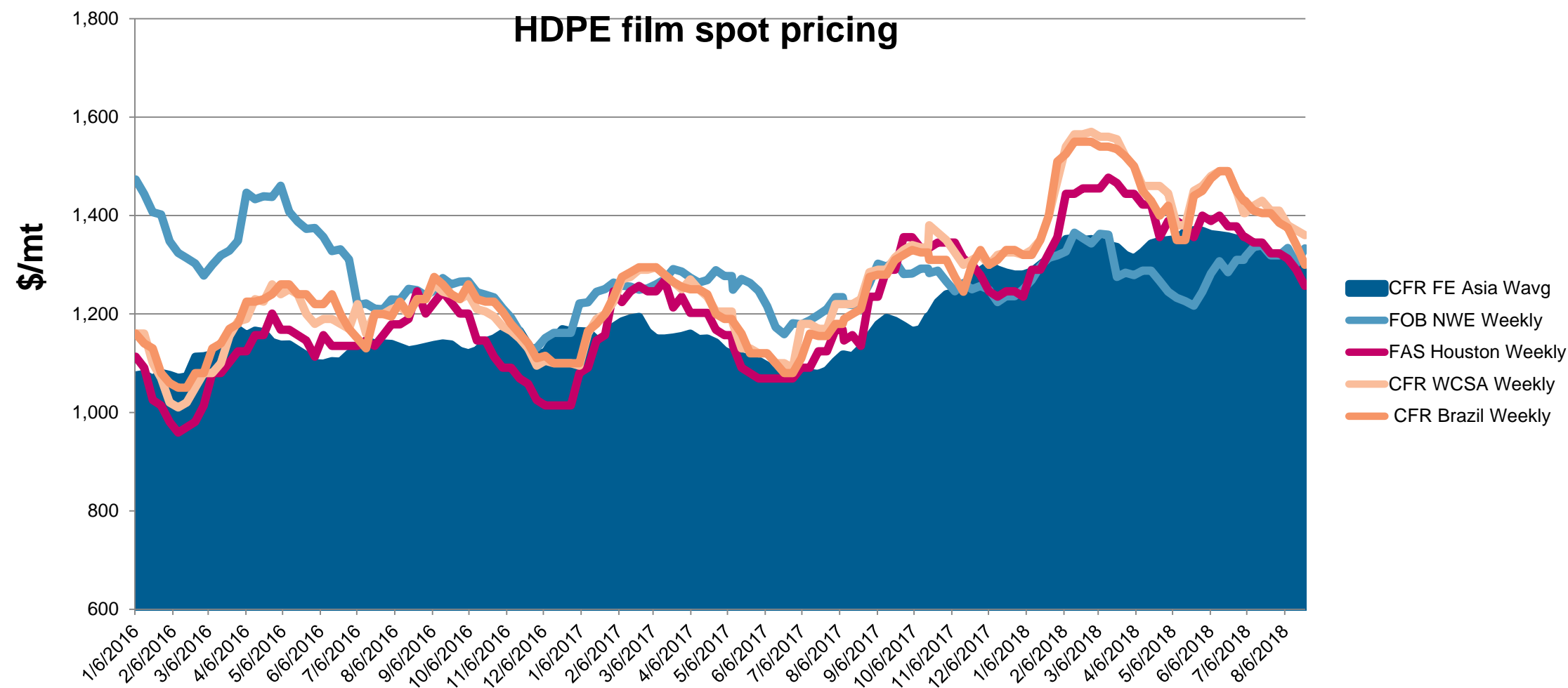
H2 2018 highlights & expectations

- **USG ethane:** Surges to near 7-year highs on fractionation constraints
- **USG propane:** Remains at 4-year highs ahead of winter months
- **USG benzene:** Weak but could rebound in Nov. on limited imports
- **USG ethylene:** Sept CP rises 5 cents despite length; Q4 likely weaker
- **USG propylene:** Stable to lower on derivative demand, C3, exports
- **NA export PE:** Length pressures market down for next six months
- **NA export PP:** Uncompetitive; South Asia, ME exert more influence
- **Mercosur:** Import pricing softens; LLDPE at record lows, LDPE suffers

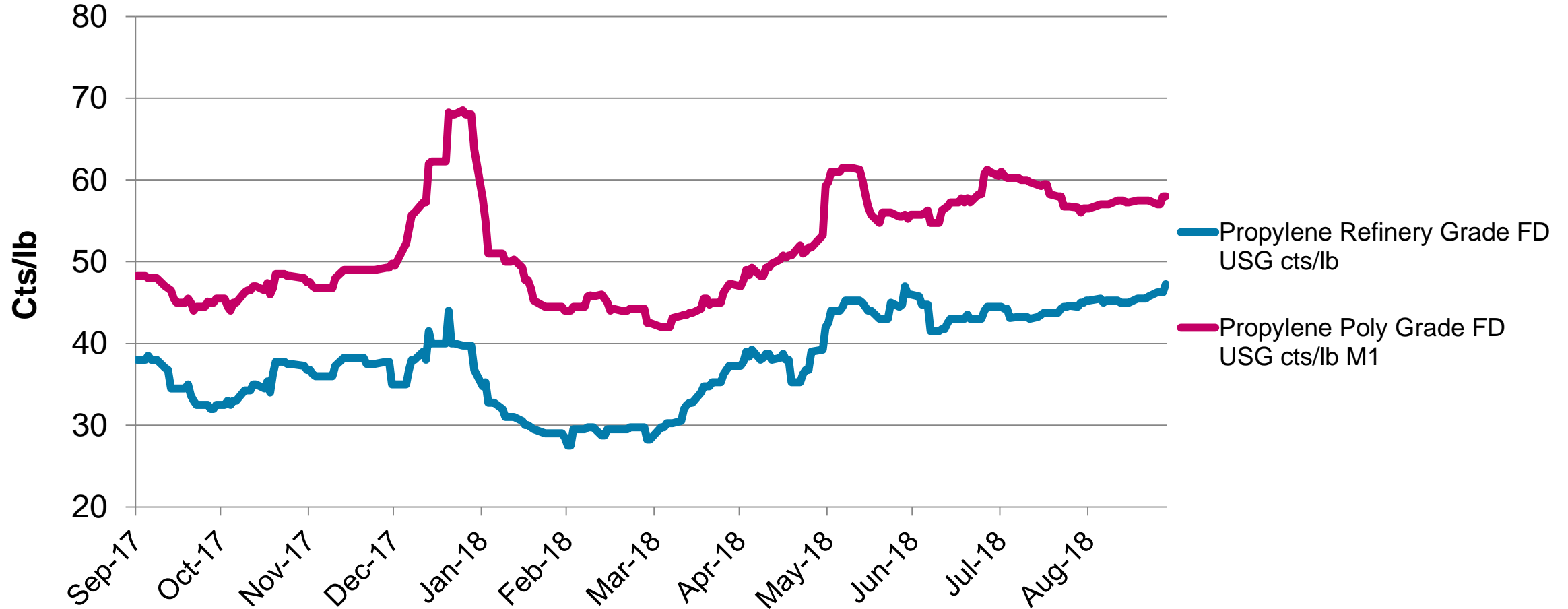
US ethylene: long with more capacities coming



Naphtha-based regions set global PE price

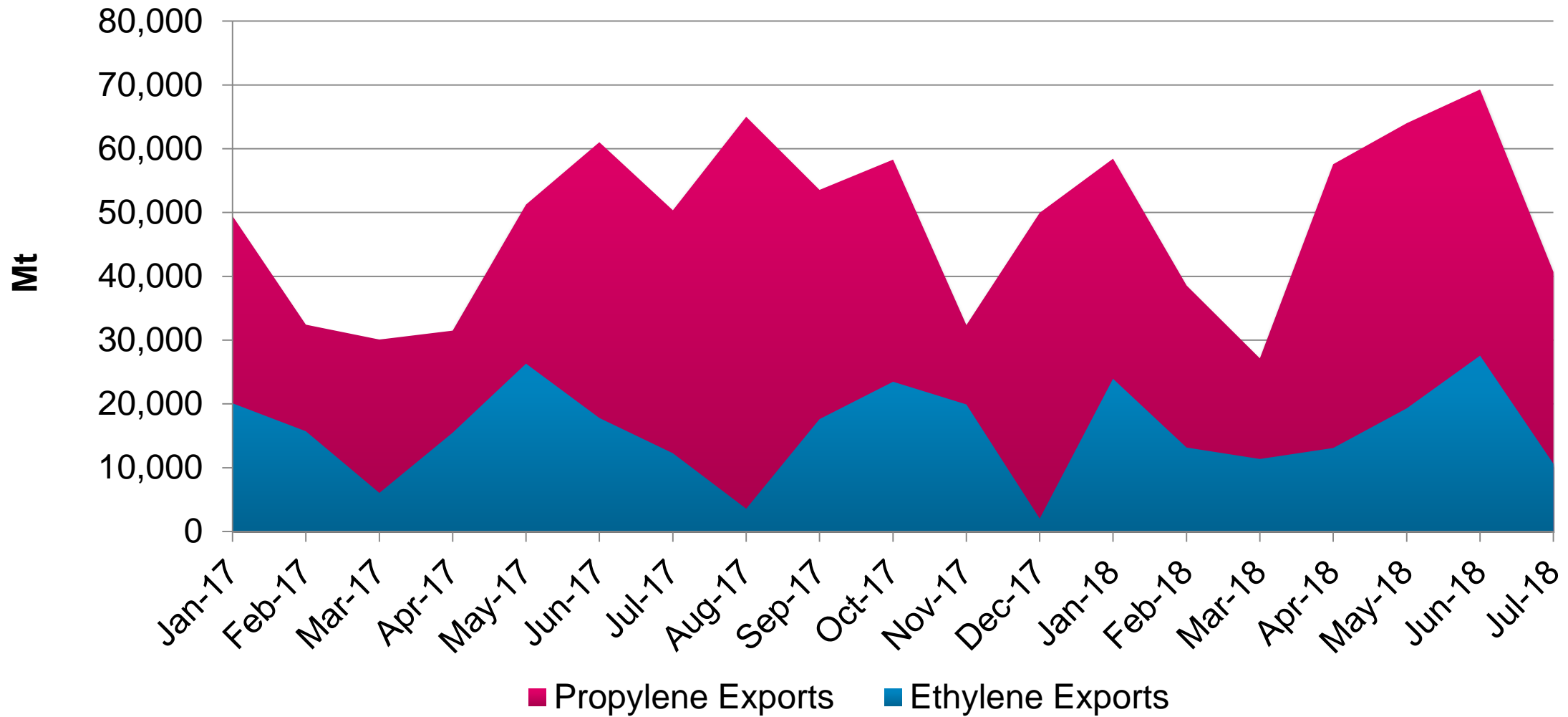


US propylene: Balanced to tight



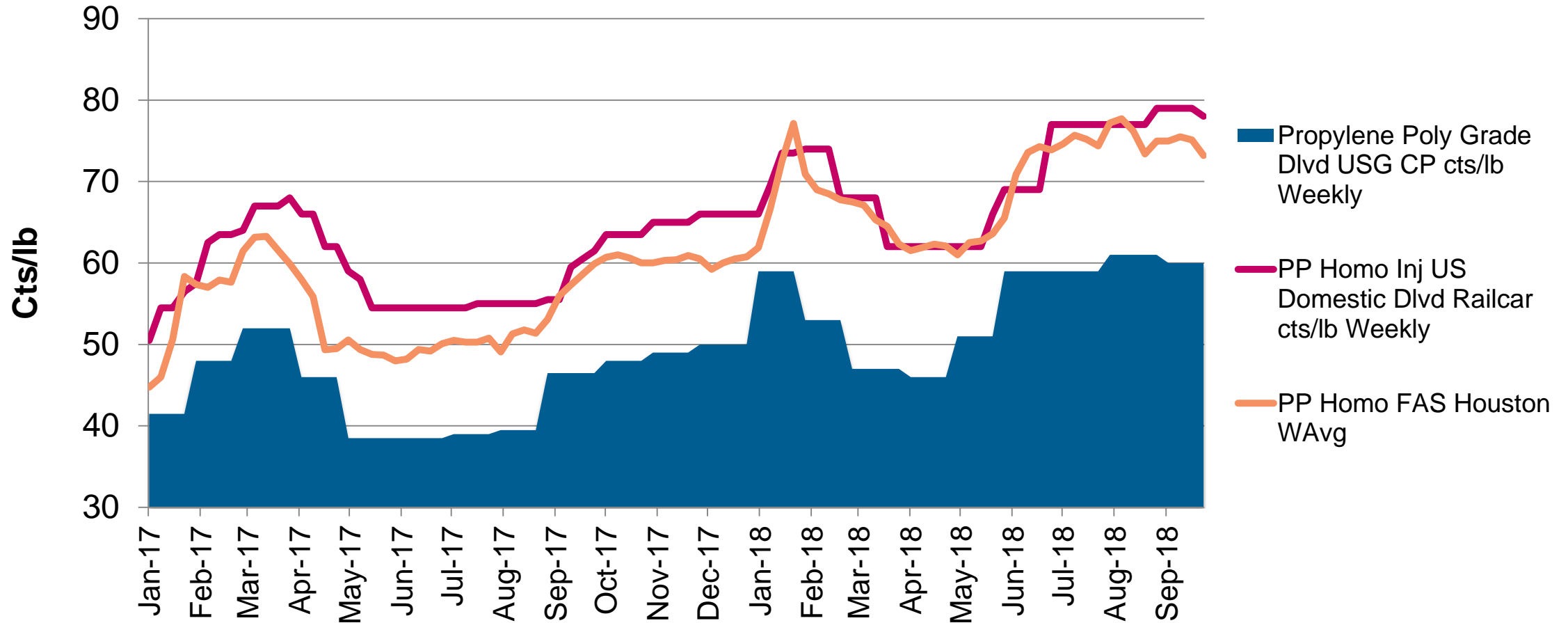
Source: S&P Global Platts

Propylene exports outpace ethylene by far



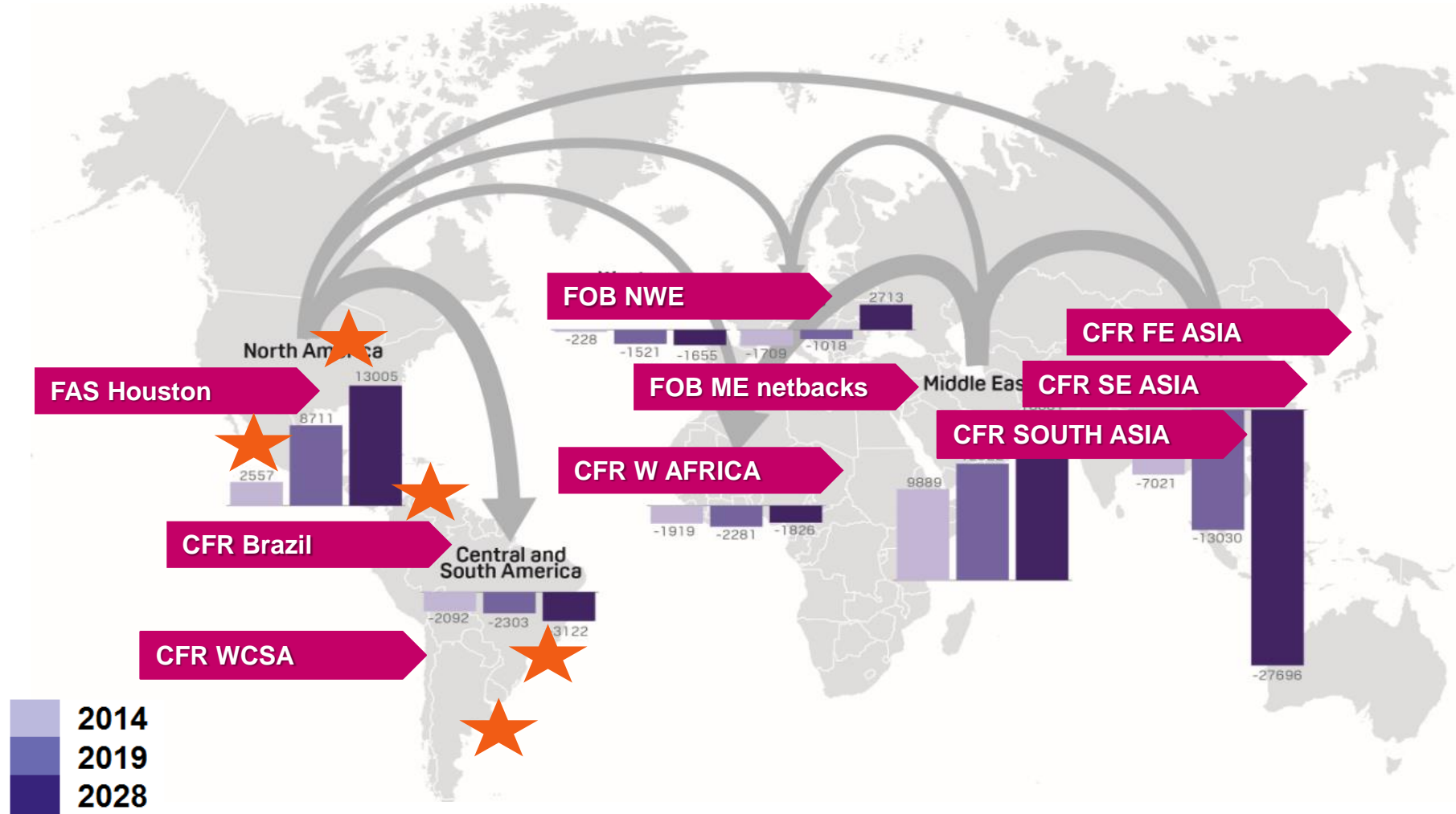
Source: S&P Global Platts

Propylene drives PP pricing



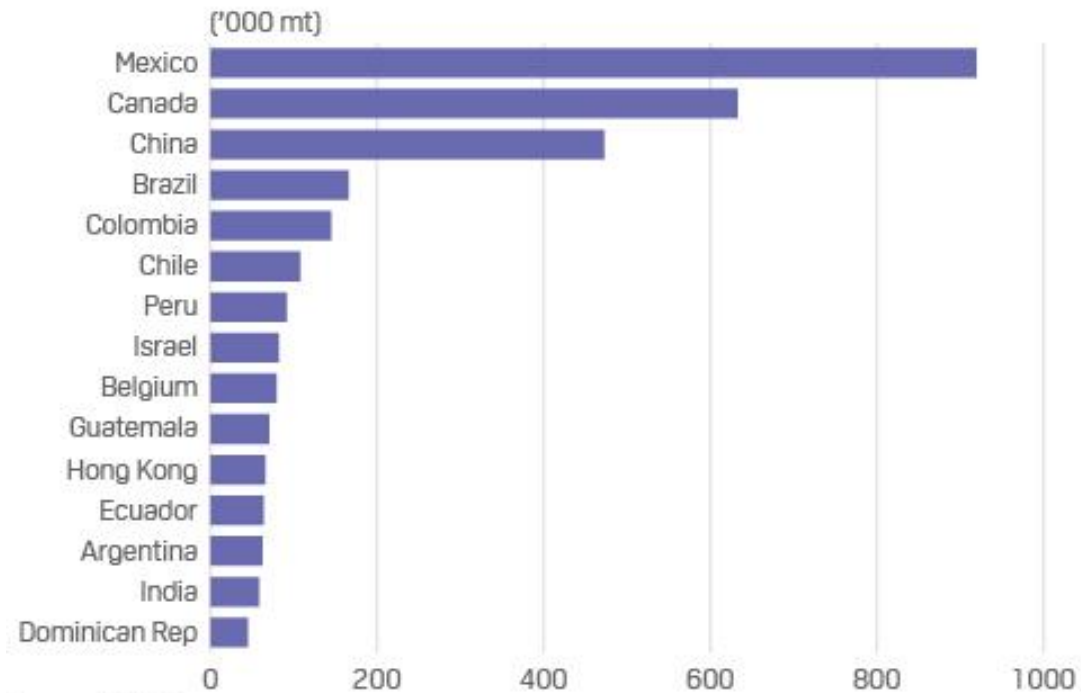
Source: S&P Global Platts

Understanding global PE pricing, trade flows key

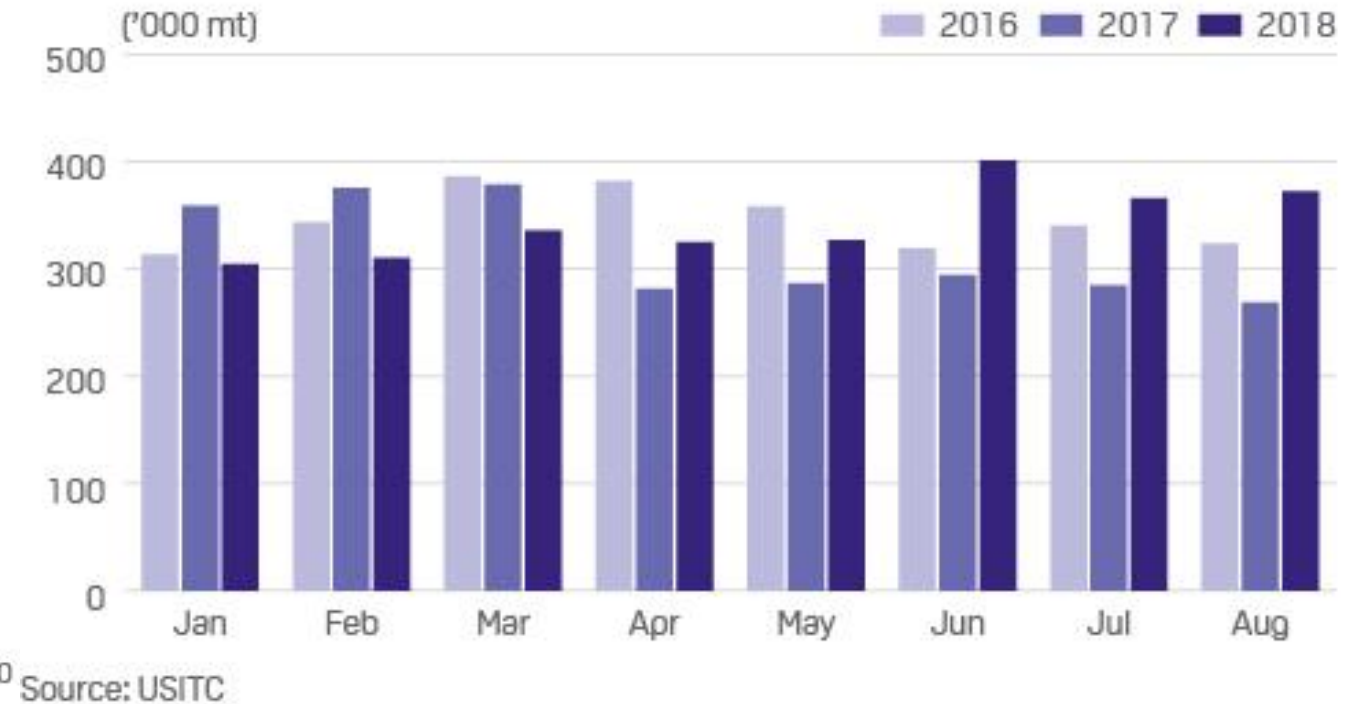


Why Latin America matters

TOP DESTINATIONS FOR US PE IN 2017



TOTAL US PE EXPORTS



Mexico: PE/PP markets at a glance

Polyethylene

Demand: 2+ million mt/yr

Installed capacity: 1.87 million mt/yr

US imports (2017): 900,000+ mt/yr

Producers: Pemex, Braskem Idesa

Polypropylene

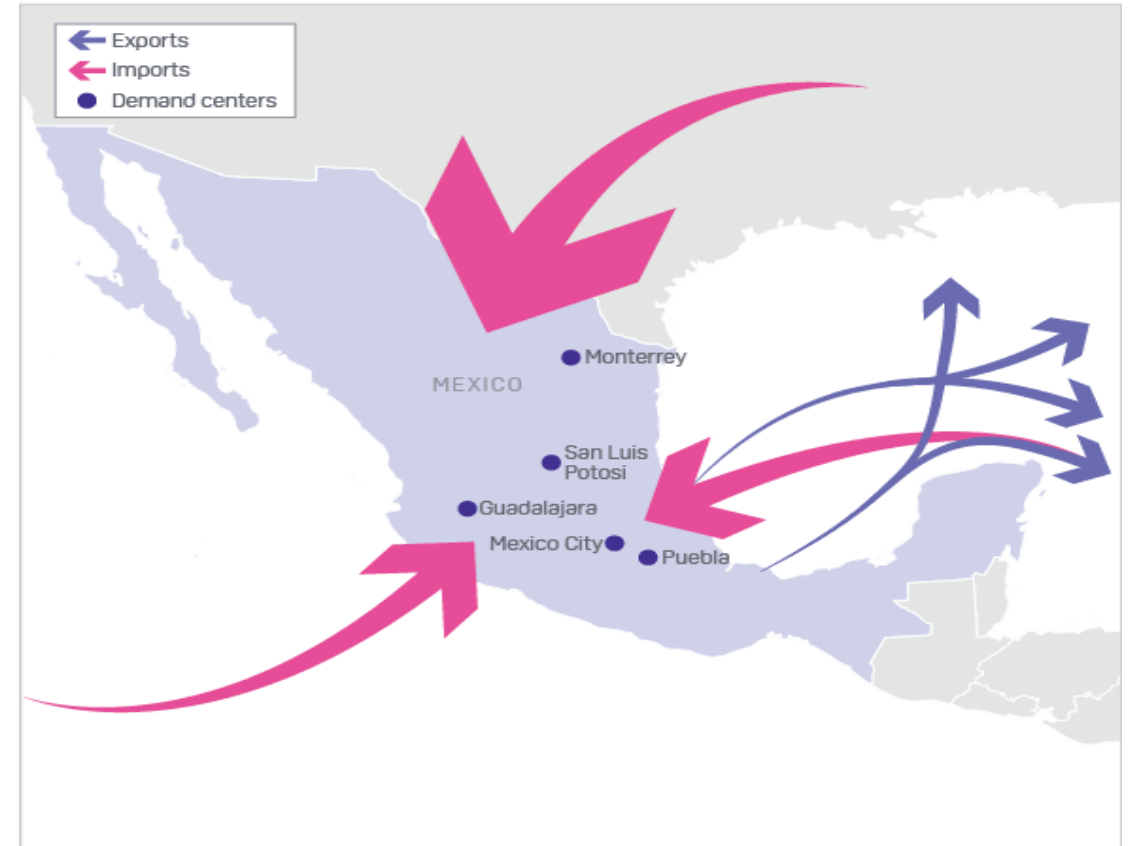
Demand: 1.4 million mt/yr

Installed capacity: 600,000 mt/yr

US imports (2017): 550,000+ mt/yr

Producer: Indelpro (Altamira)

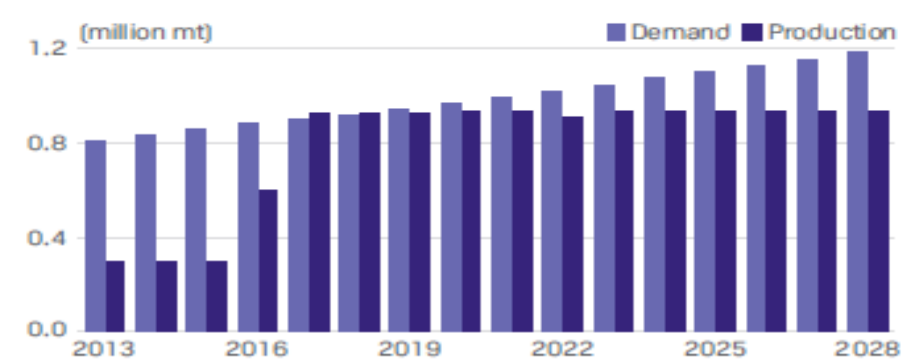
MEXICO'S PE/PP TRADE FLOWS



Source: Platts

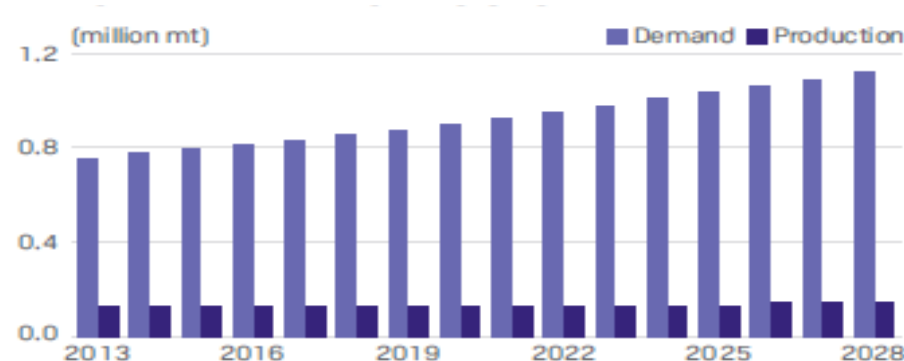
Mexico balances at a glance

HDPE: BRASKEM IDESA IMPROVES SUPPLY



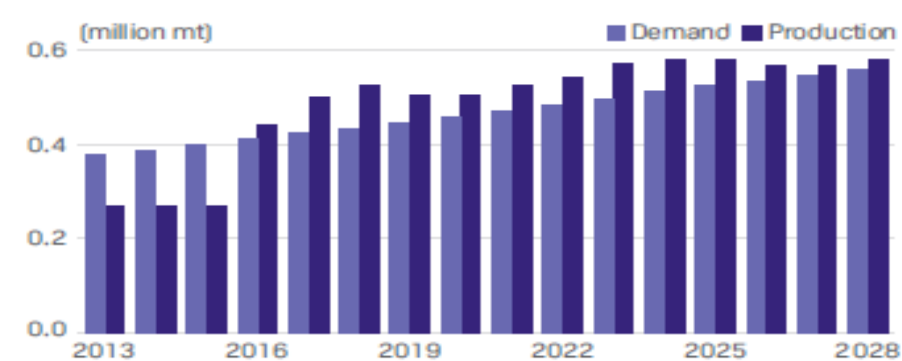
Source: S&P Global Platts Analytics

LLDPE: DEFICIT TO GROW



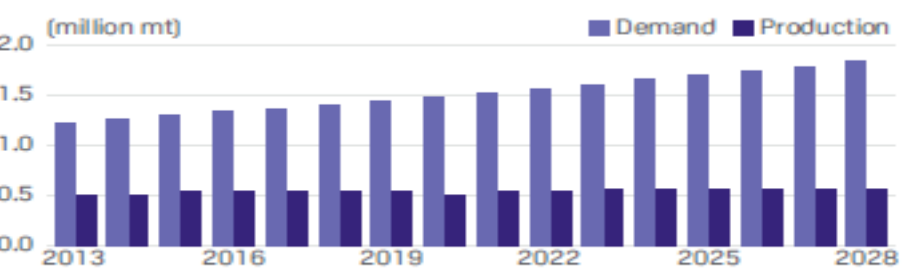
Source: S&P Global Platts Analytics

LDPE: MARKET SEES SURPLUS



Source: S&P Global Platts Analytics

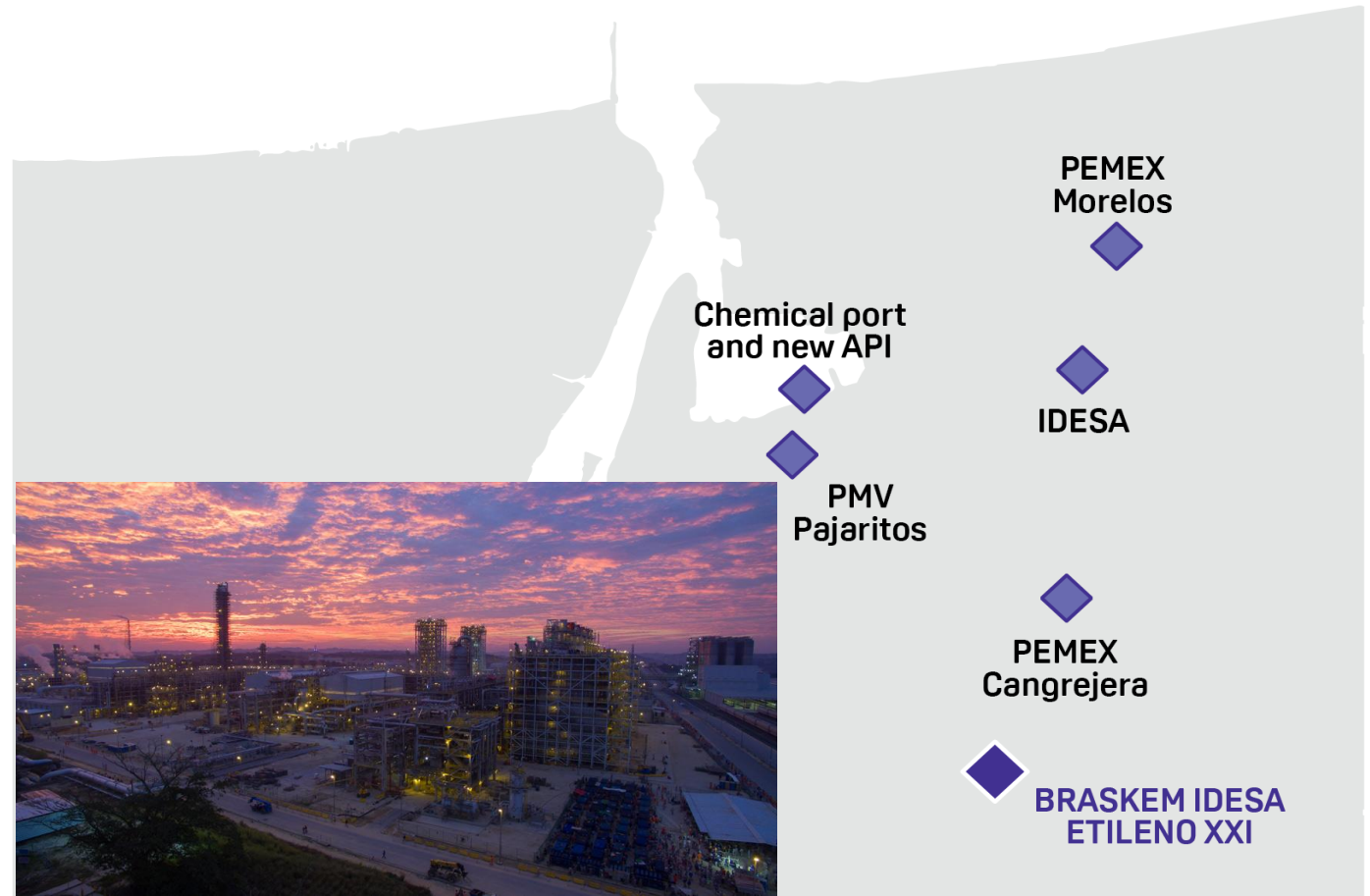
PP: REMAINS IN NET IMPORT POSITION



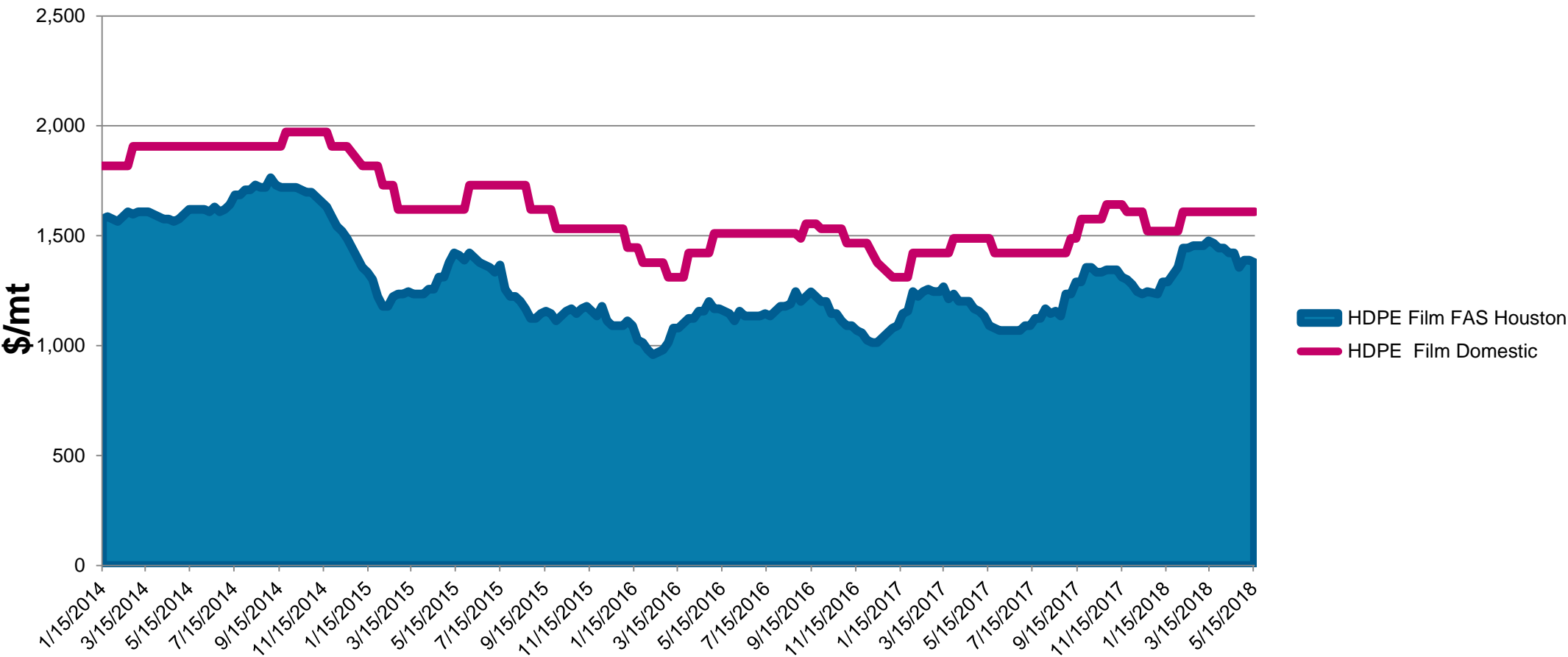
Source: S&P Global Platts Analytics

Mexico's feedstock challenge

- Ethane production in Mexico in decline
- Braskem Idesa able to consume up to 66 Mb/d
- Pemex under 20-year contract to supply Braskem Idesa
- Pemex consumption prior to PMV accident 79 Mb/d
- Limited availability results in lower utilization rates
- Ethane imports by Pemex improve supply, short-term fix



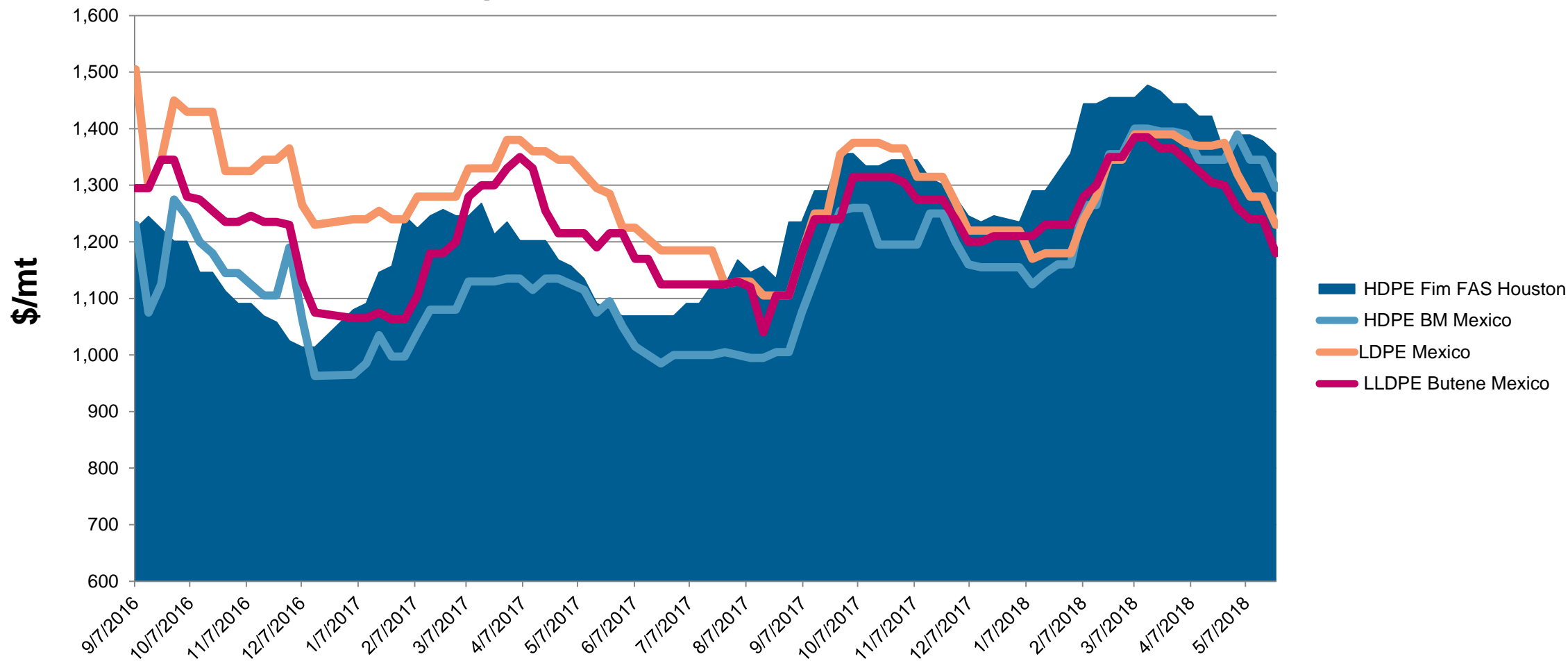
PE: US export versus domestic pricing



S&P Global Platts Analytics

Mexico PE market developing autonomy

US export vs. Mexico domestic



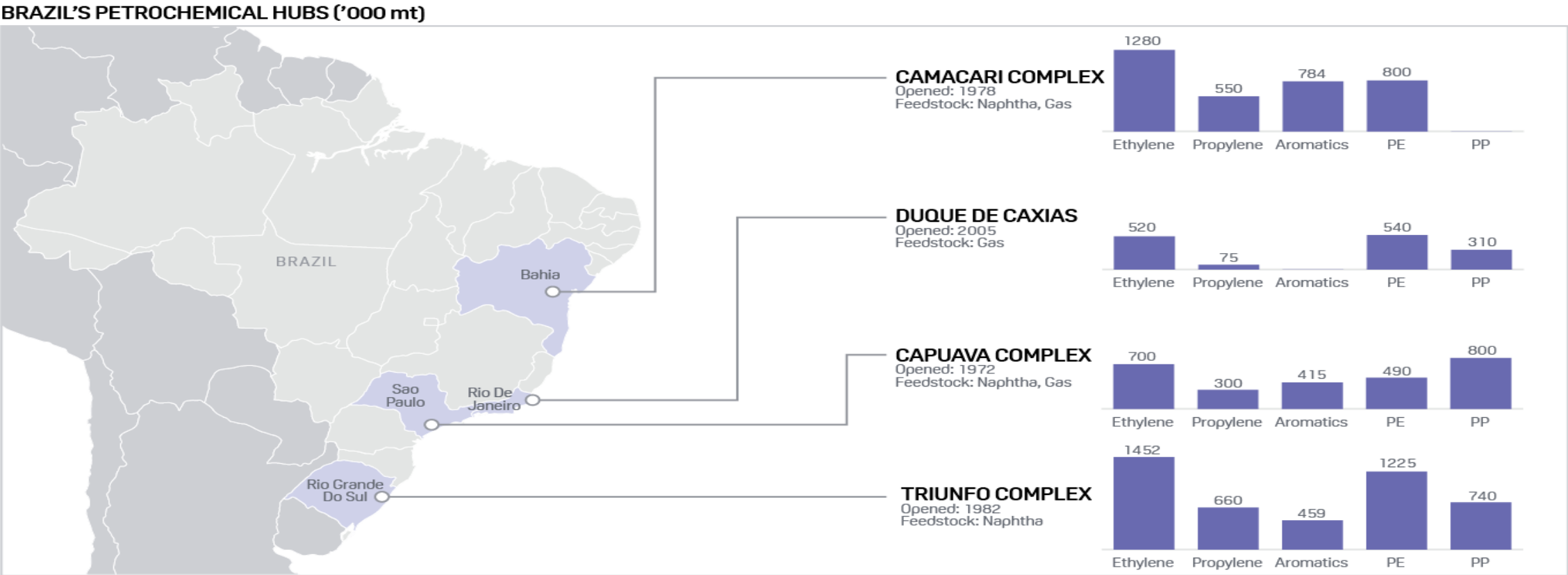
Brazil: A major chemical market (and growing)

| Country | Net sales (US\$B) |
|----------------|-------------------|
| China | 1,900 |
| USA | 768 |
| Japan | 262 |
| Germany | 236 |
| South Korea | 166 |
| India | 133 |
| France | 133 |
| Brazil | 109 |
| Ireland | 102 |
| United Kingdom | 99 |

Source: ABIQUIM, American Chemistry Council, CEFIC

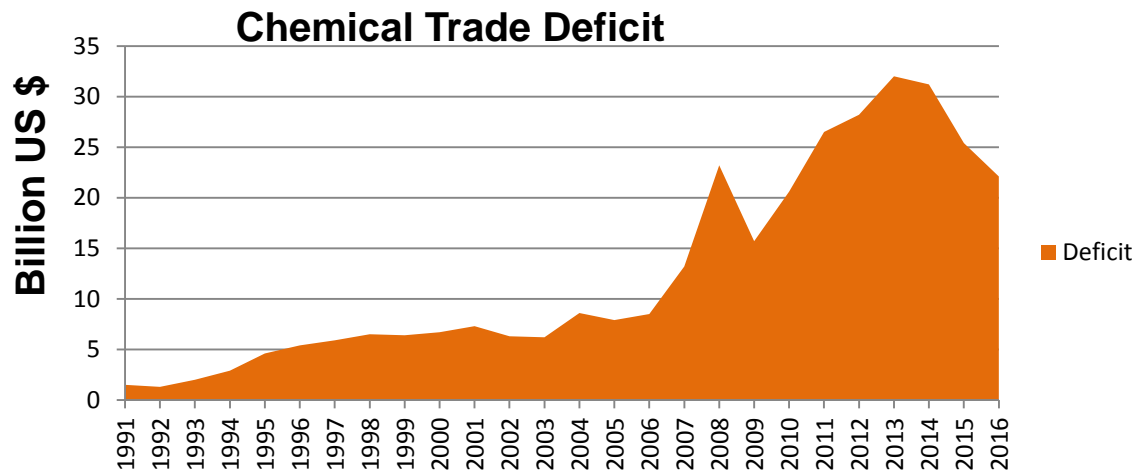
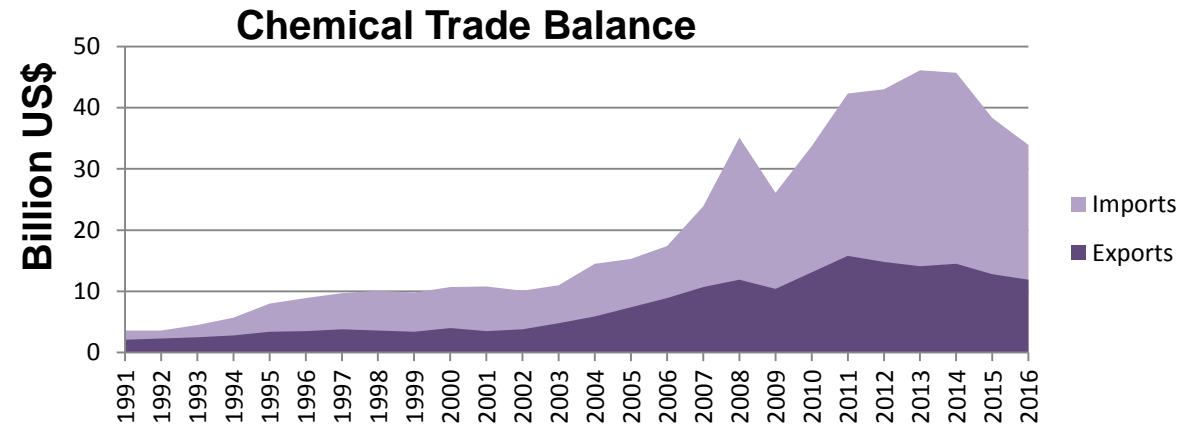
- Brazil's chemical market ranked 8 in 2016 in global industry worth \$5.2 billion
- Chemicals amounted for 10.4% of industrial GDP in 2015 (2.5% overall GDP)
- BRICS accounted for 45.2% of all chemical sales globally in 2016

Largest chems producer in S. America, but...

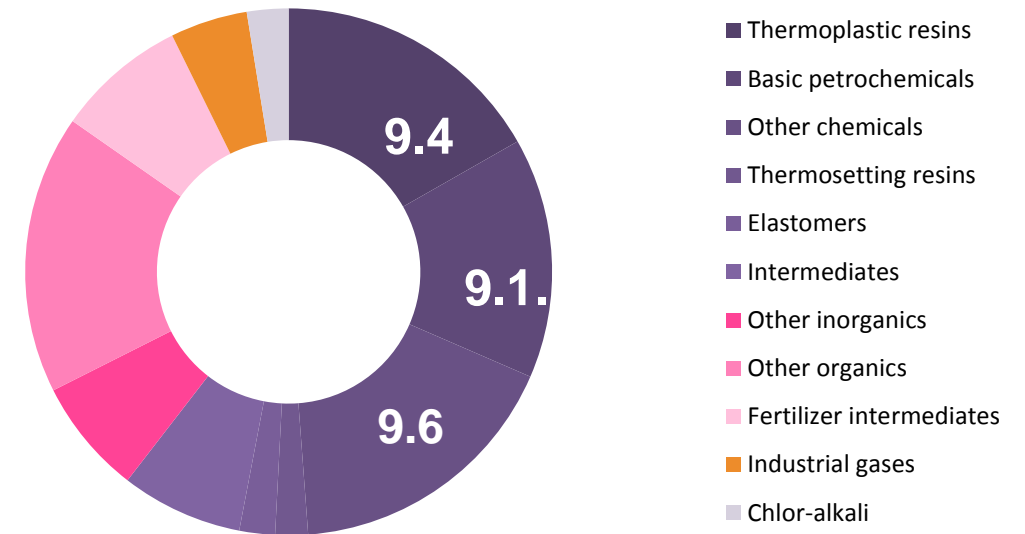


Source: Platts

...heavily dependent on imports



Industrial-Use Chemicals revenues (US\$ 58 Billion)



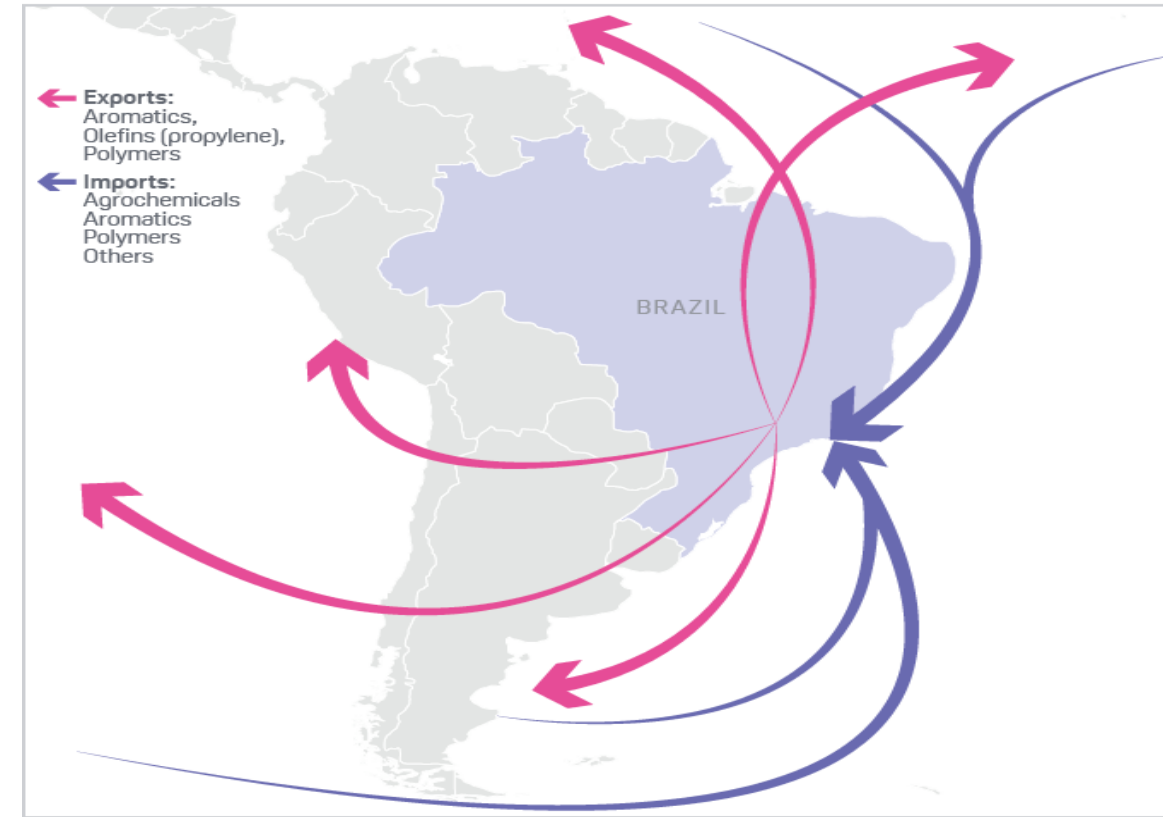
Source: ABIQUIM

- 2017 deficit = **US\$23.2 billion**
- 2017 imports = US\$36.8 billion
- 1991 deficit = US\$1.5 billion

Major supplier of polymers to region

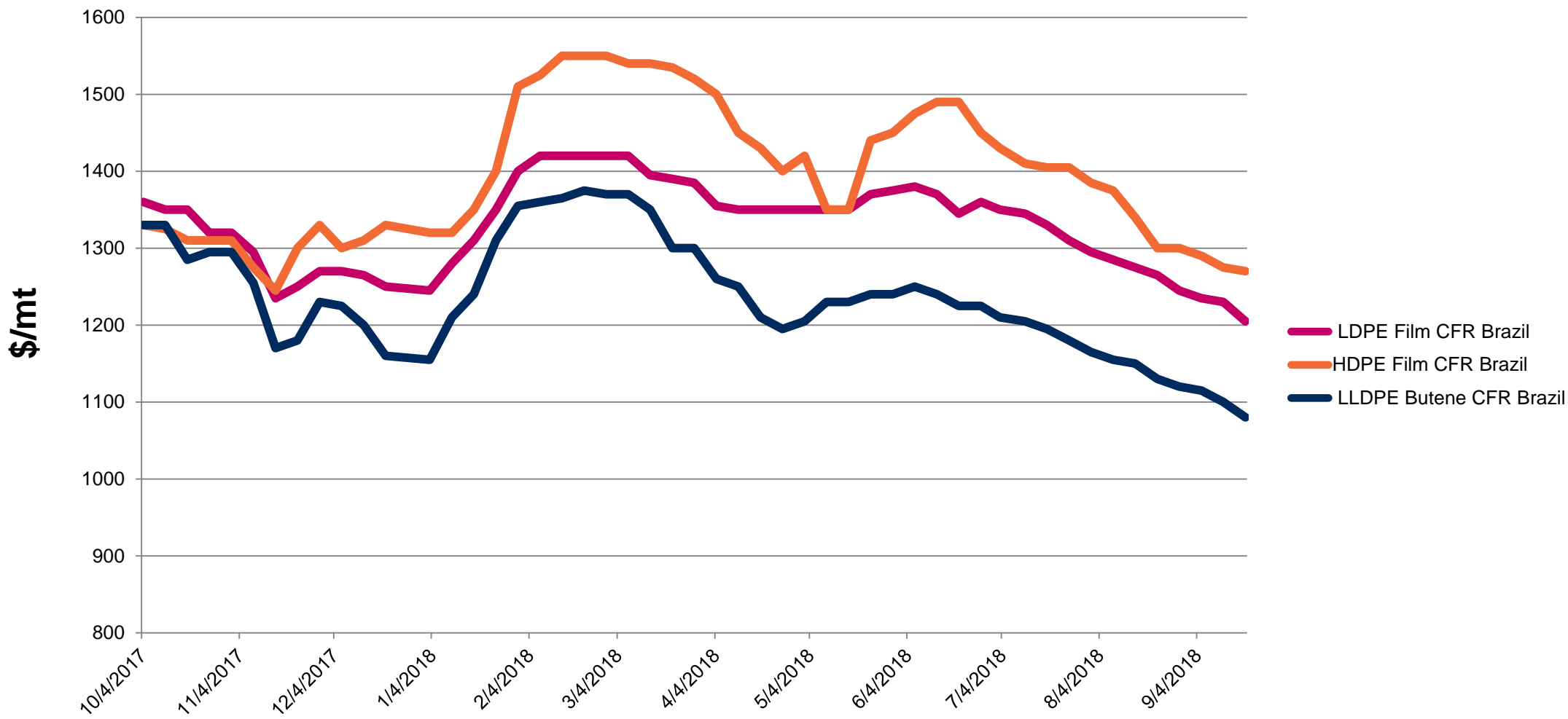
- Braskem is a major supplier of PE, PP to region; also an exporter of propylene
- Main exporter of aromatics in the region, mainly to US & Europe; imports PX
- PE imports mainly from Argentina, Asia, Middle East & US (CFR Brazil)
- Imports much of the naphtha needed for petrochemical production & also ethane
- Major importer of agrochemicals

BRAZIL'S PETROCHEMICAL TRADE FLOWS



Source: Platts

Brazil import pricing slides on demand, length



Innovative market **insights**

Driven by analytics, powered by fundamentals