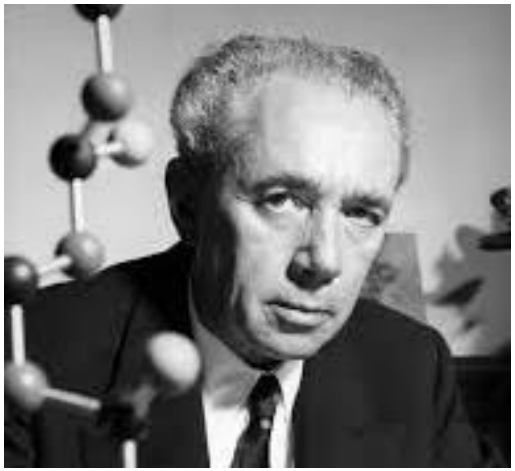
GCC Petrochemicals Industry

11-12 February 2019
Singapore

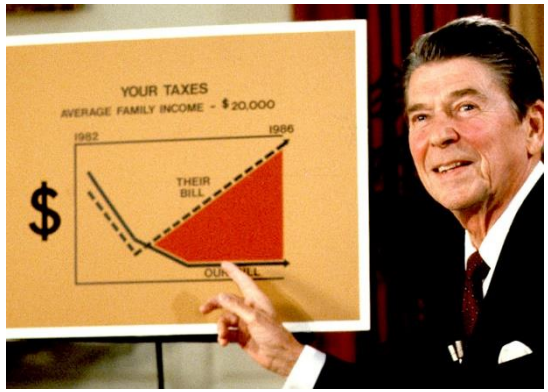
The chemical industry was created by German scientists and grew in the US and Saudi Arabia, enabled by feedstock, regulation and megaprojects

Germany



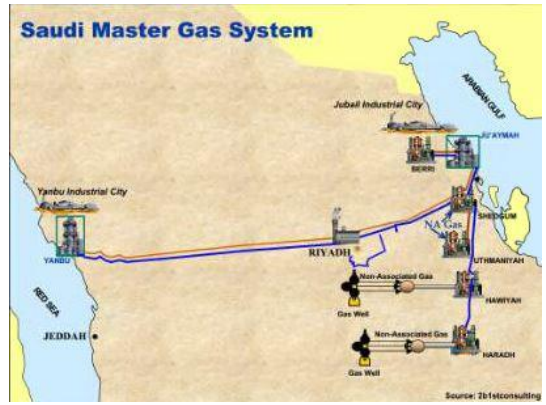
- In 1909, Haber-Bosch process for ammonia production invented (1918 and 1931 Nobel Prizes)
  - World War I munitions
  - Fertilizers
- In 1925, Franz Fischer and Hans Tropsch invented a process to liquify coal / gas
- In 1950s, Ziegler and Natta invented polymerization catalysts (1963 Nobel Prize)

US



- Ronald Reagan deregulated the US oil and gas industry in the early 1980s
  - Led to massive growth in supply and infrastructure
  - Enabled petrochemical investments

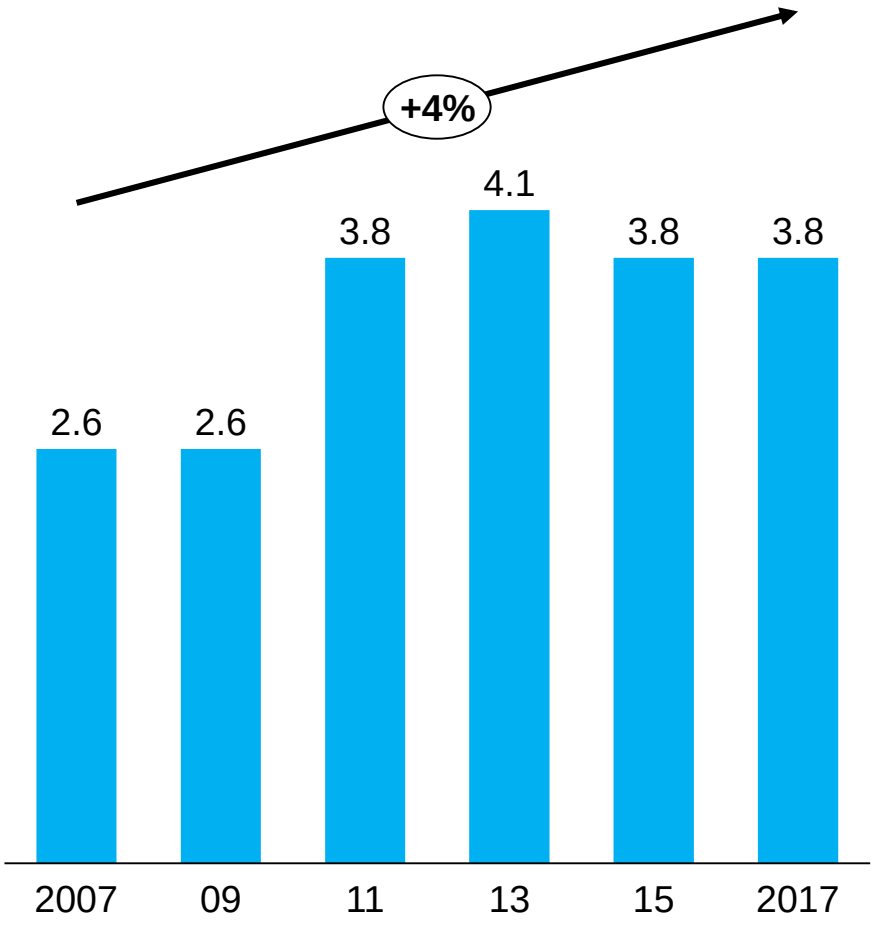
Saudi Arabia



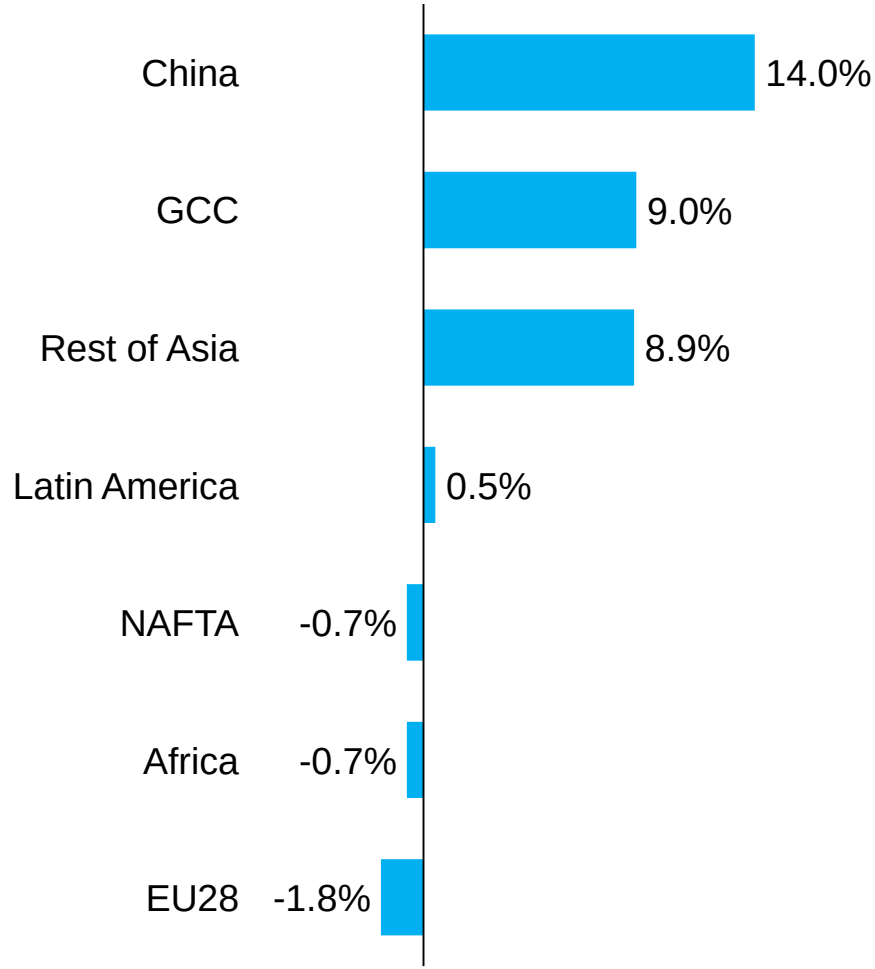
- Master gas pipeline project proved to be key enabler
  - Allowed country to put its ethane to good use, as opposed to flaring it
  - Attracted significant local and foreign investment to exploit gas resources

Today, the size of the chemicals industry is USD ~4 trillion, with Asia and GCC driving growth over the past decade

Global chemicals revenue
USD trillion



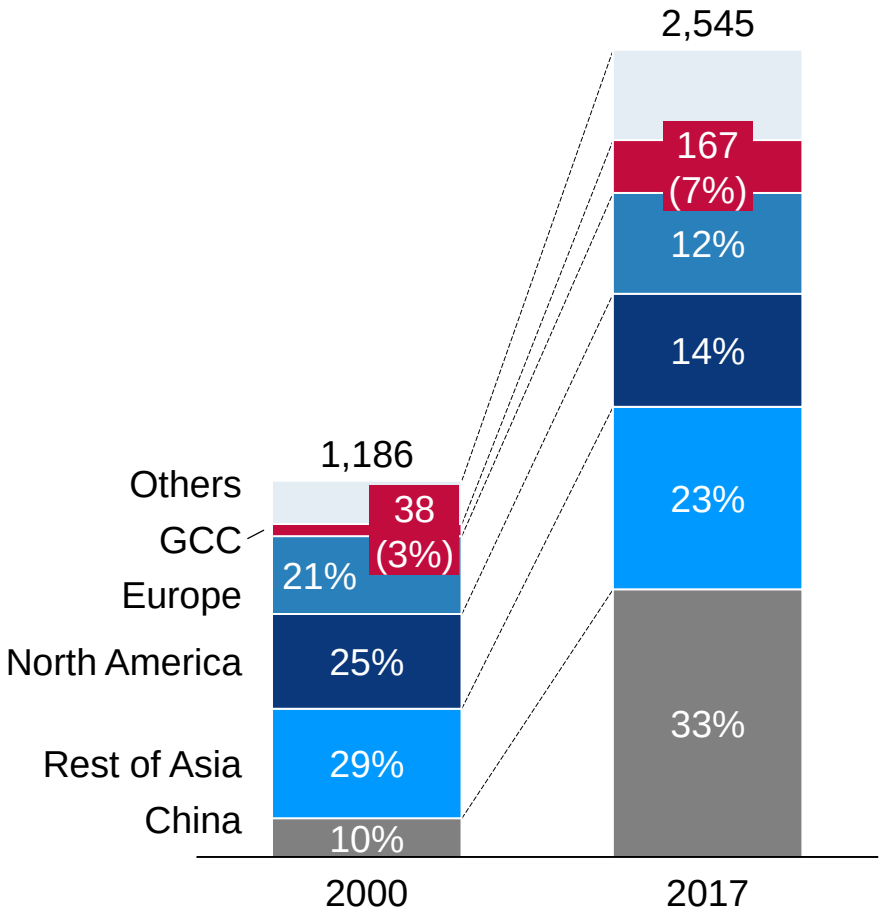
Chemicals revenue growth by region
% CAGR 2007-2017



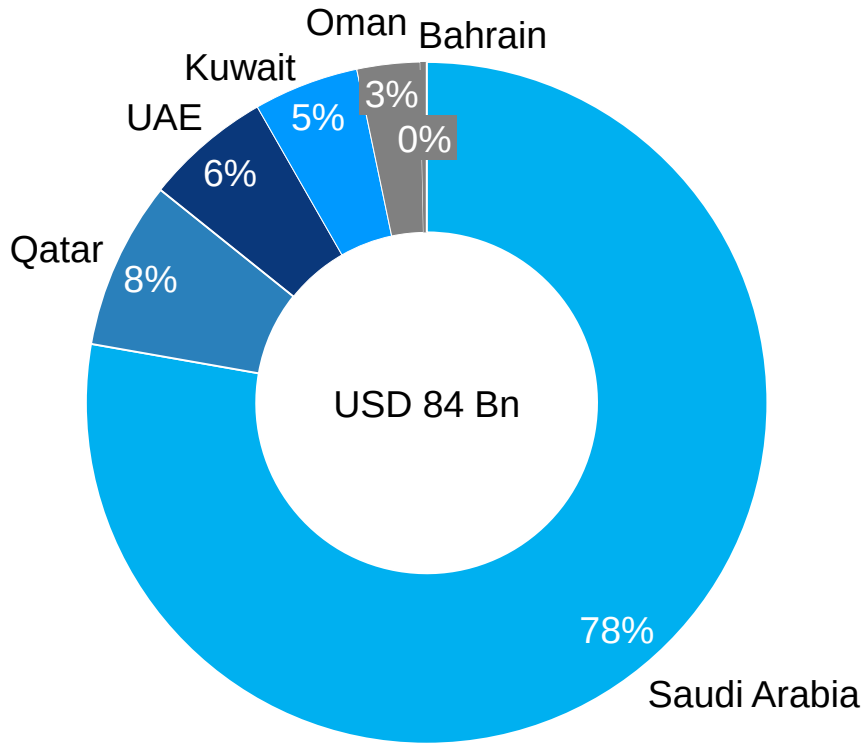
Source: European Chemical Industry Council, Chemdata International, American Chemistry Council, GPCA

GCC's share in global petrochemical capacity has more than doubled over the past decade, and Saudi Arabia is by far the biggest player in the GCC

Global petrochemical capacity
Million tons per annum (% of total)



GCC chemicals revenue by country
2017, % of total

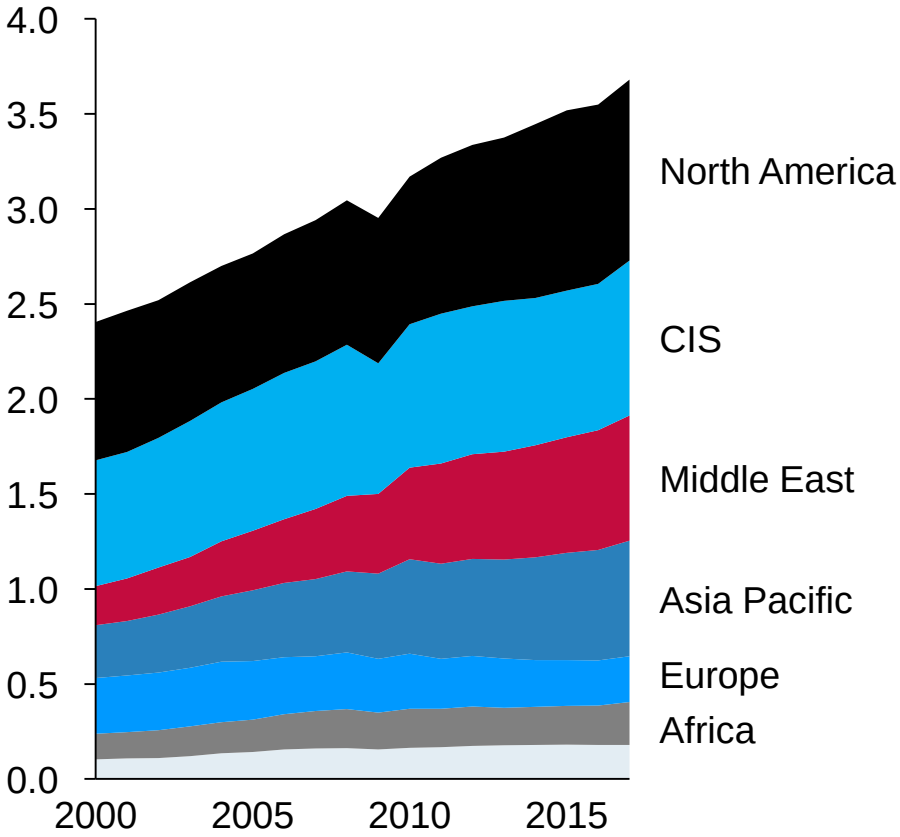


Source: ICIS, GPCA

Middle East is the third largest gas producer globally, and is expected to be the second largest driver of growth until 2035, after US shale gas

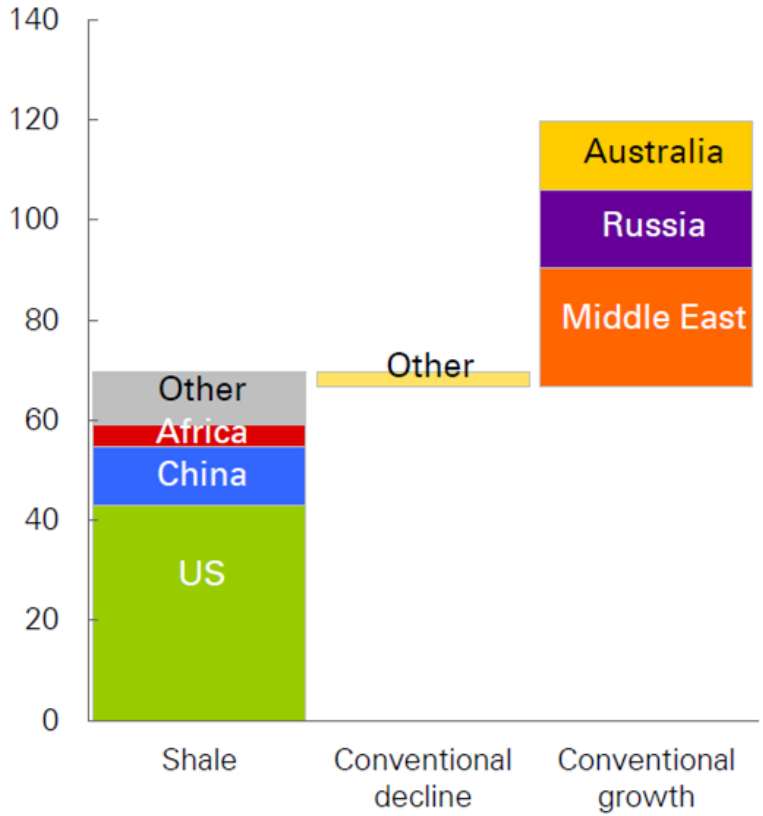
Total natural gas production

Trillion cubic meters per year



Forecasted gas supply growth

Billion cubic feet per day

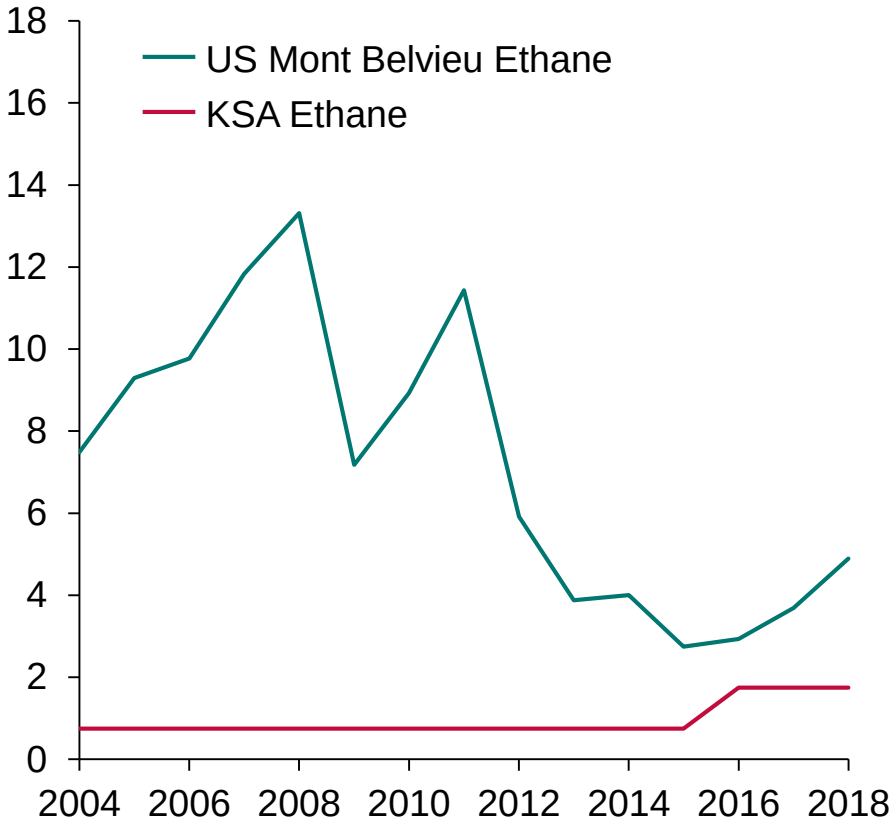


Source: BP Statistical Review 2018, BP Energy Outlook 2017

Price of gas feedstock in Saudi Arabia has been significantly lower than the rest of the world e.g., the US, although the gap has been closing

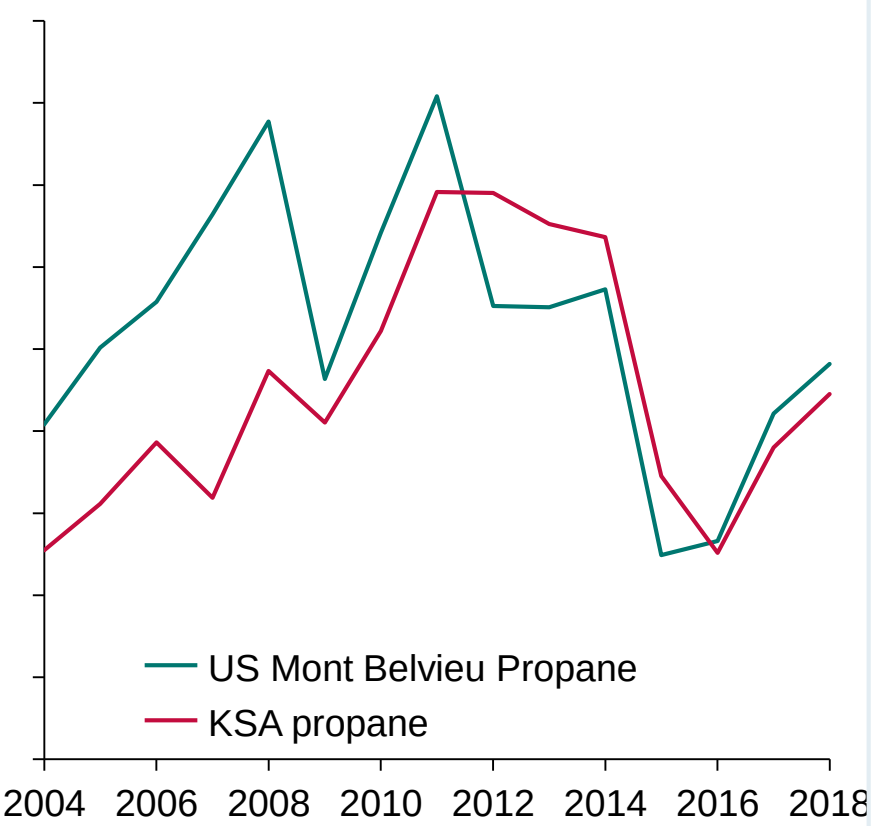
Ethane price advantage in Saudi Arabia

USD per mmBtu



Propane price advantage in Saudi Arabia

USD per mmBtu



Source: Wood Mackenzie

Feedstock advantage accounts for ~60% of global annual EBITDA pool; GCC players have historically focused on the upstream part of the value chain

Petrochemical value pools[1,2]

EBITDA USD Bn, 2013-2015 weighted average

Feed-stock	Building blocks		First level		Intermediates		Final products		
Coal	C1	30	Ammonia Methanol	5	Urea, VAM, Acetic Acid	1.2	POM	0	36
Natural Gas	C2	42	Ethylene	19	EO, MEG, LAO	2.4	PE, PVC	5.5	69
NGL[4] LPG	C3	2.6	Propylene	2.6	PO, Acrylics, MMA , ACN, ECH	8.0	PP, ABS	4.4	18
Naphtha	C4	0	Butadiene, Butene	1	MMA	0.1	PBR, SBR	0	1
Gasoil	Aro-matics	0	BTX[5]	3.6	PX, PTA, SM, TDI, MDI, Phenol	0.2	PS, ABS, PET, PC	0.2	4
		74		31		12		10	127
		Feedstock advantage[3]			Stand-alone value contribution				Total

1 Returns = EBITDA per ton/capital replacement cost per ton
2 Transfer between stages at market price
3 Value pool associated with advantaged feedstock
4 Natural Gas Liquids, both from conventional and shale
5 Benzene, Toluene, Xylene

Source: McKinsey & Company

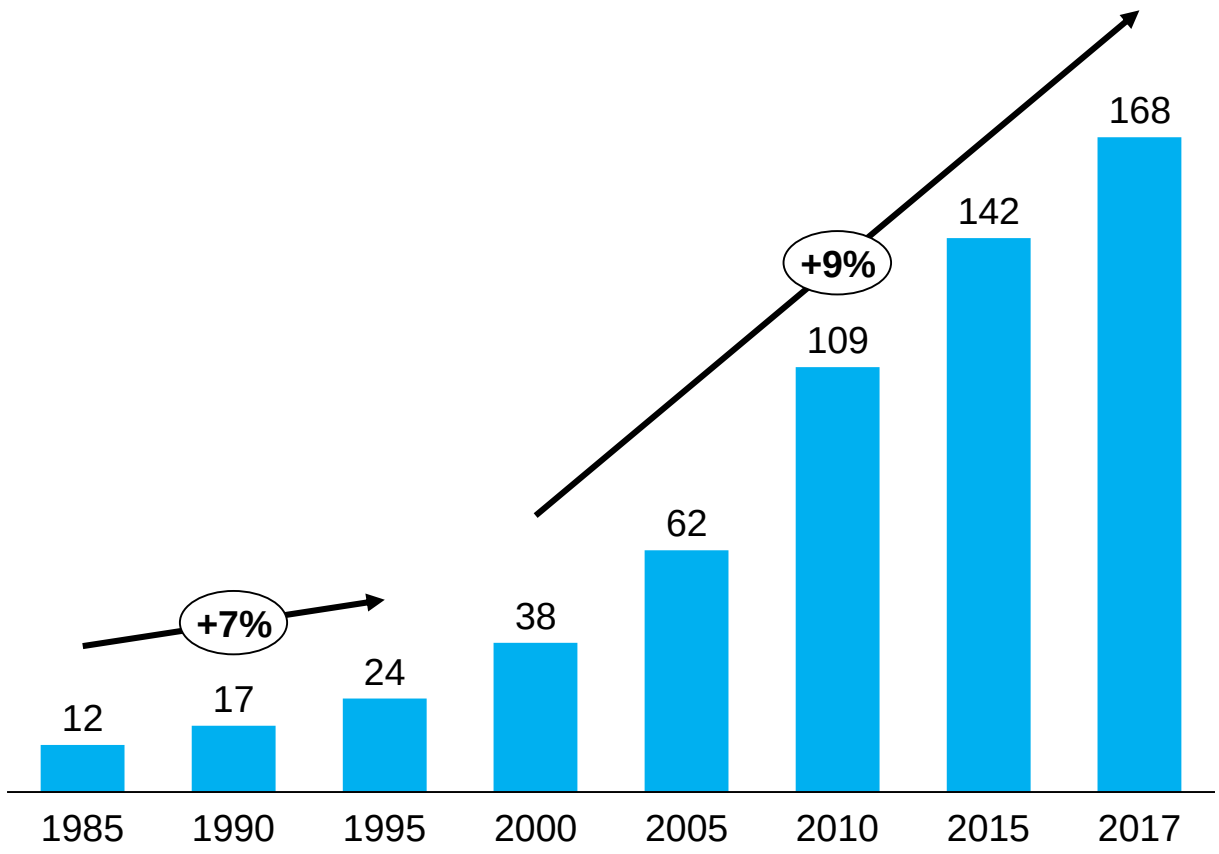
In the late 90's, GCC regulators put in place a number of key enablers that unlocked the growth potential of the region in the period 2000-2017

Enablers put in place in GCC

- **Master gas project** in the late 1970s, enabling access to feedstock
- Clear regulatory framework and process for **feedstock allocation**
- Development of dedicated **industrial cities** with their own authorities, industry-friendly processes, **infrastructure** etc
- Access to **competitive project financing** through government funding agencies

GCC petrochemical industry production capacity

Million tons per annum

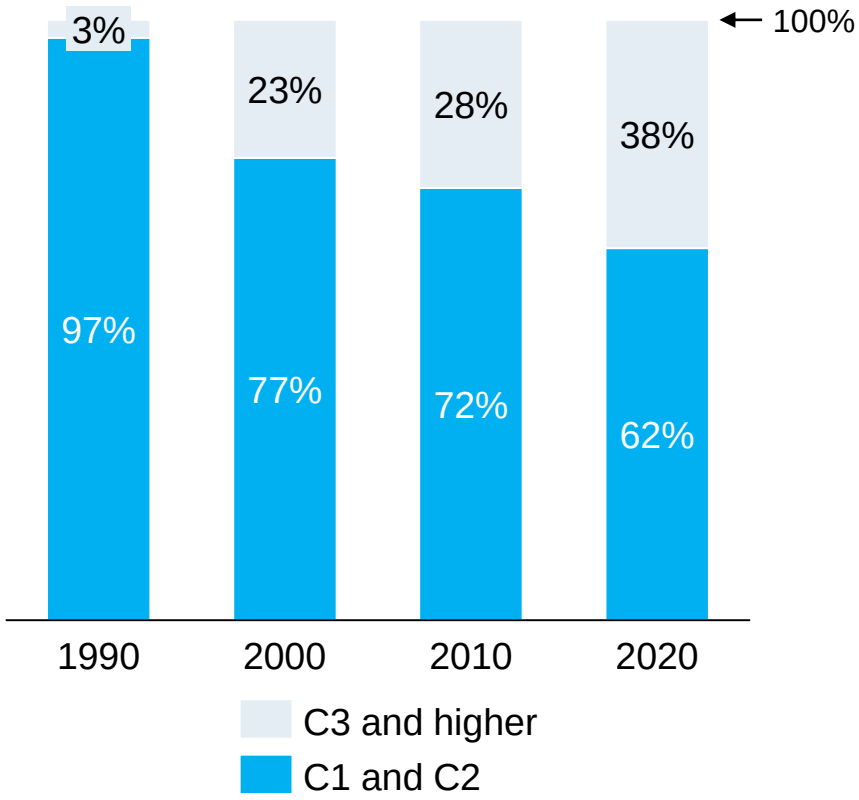


Source: ICIS, GPCA

Regulators pushing GCC players to produce more complicated molecules and integrate downstream to create more jobs

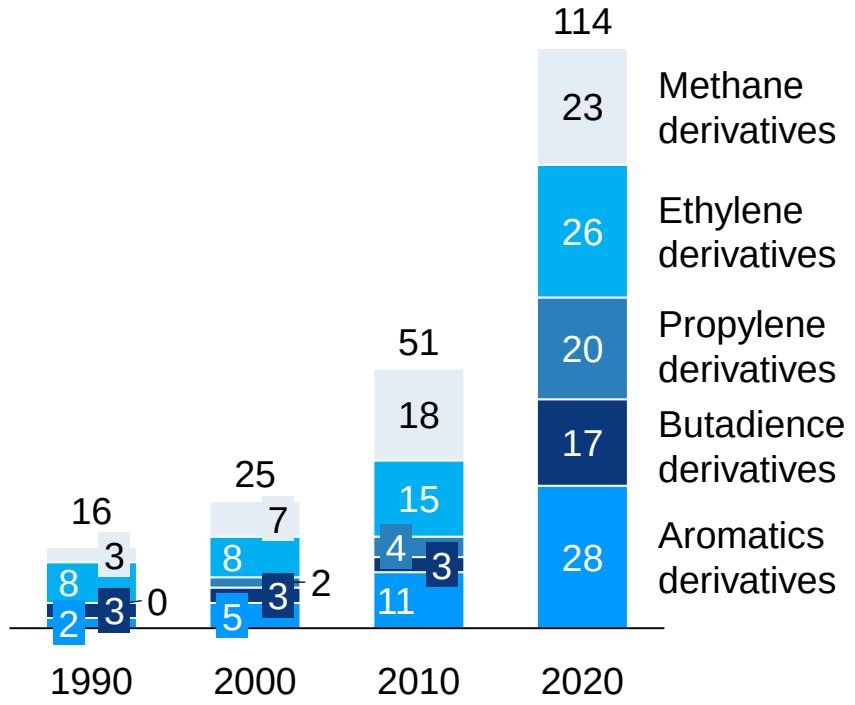
Regulators pushing for more complicated molecules…

% base chemical



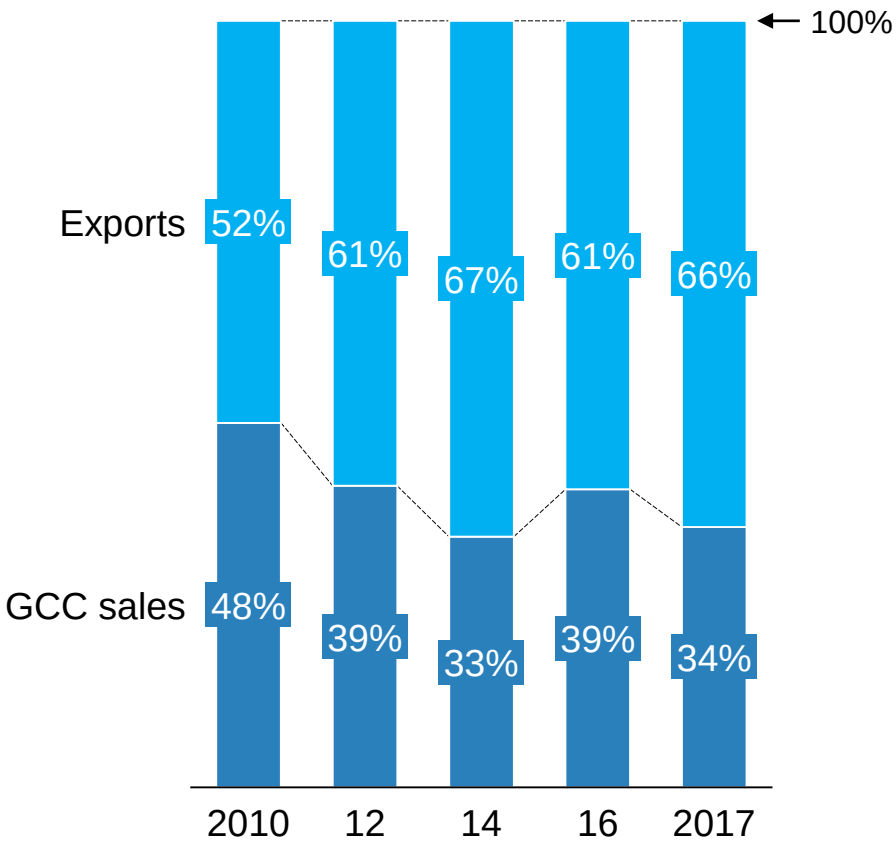
…and the result is more complicated chemistries taking place in the GCC

Number of different products

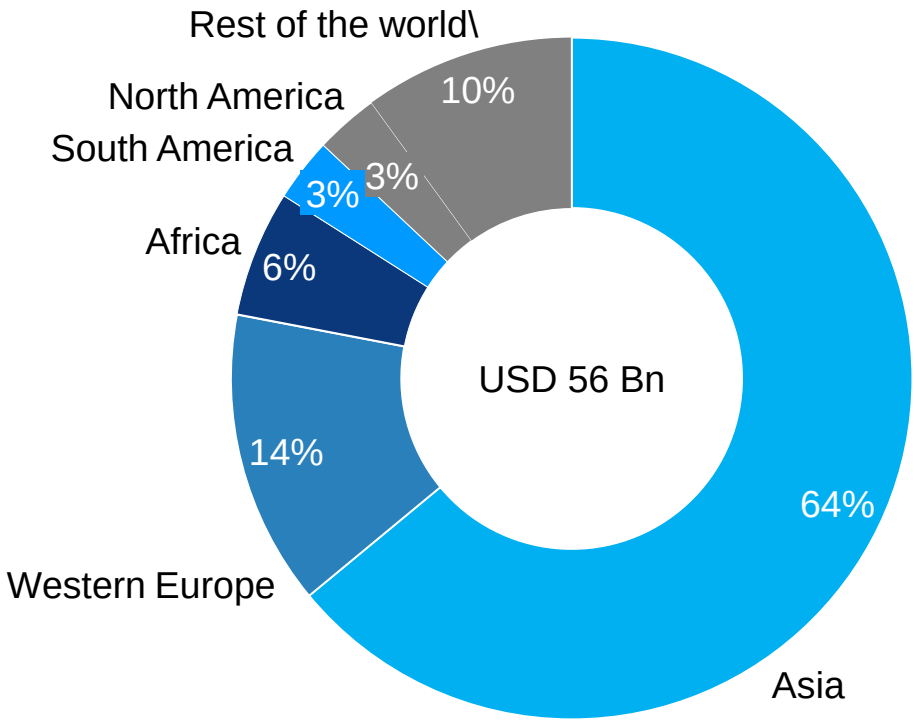


Success in specialty / downstream products requires customer proximity, while GCC players rely heavily on long-distance exports

GCC chemicals industry sales
% exports



GCC chemicals exports
% by destination based on value of exports, 2017



Source: UN Trade Statistics, GPCA

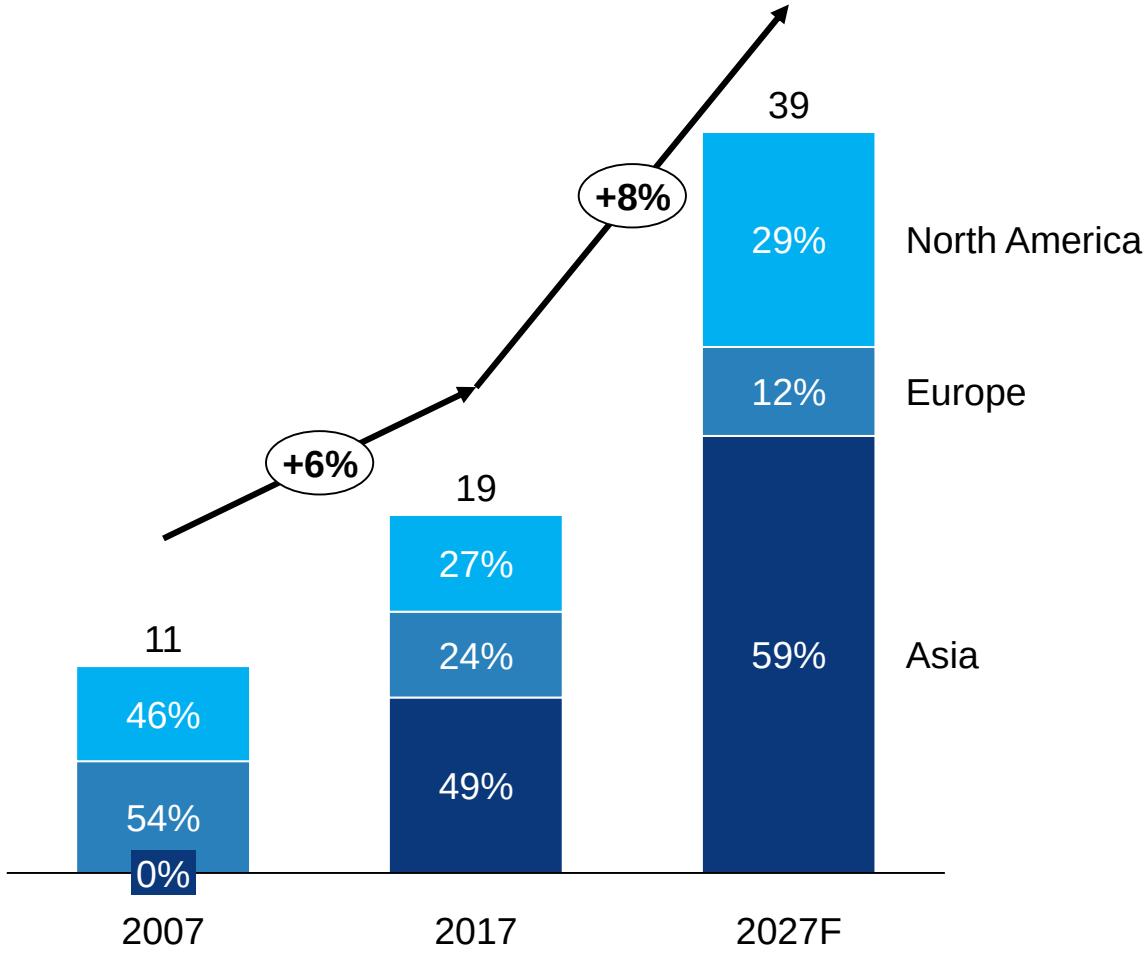
GCC players have been steadily increasing their overseas investments to get closer to customers, as feedstock advantage at home erodes slowly

Drivers of overseas investment by GCC players

- New sources of advantaged feedstock in North America
  - Limited availability of (new) gas feedstock in GCC
  - Increasing feedstock, energy, utility and labor costs in GCC
- Desire to move closer to customers
  - Better pricing decisions
  - Greater ability to gain and defend market share
  - Fear of trade barriers / trade wars
- Access to talent

Overseas capacity of GCC players

Million tons per annum

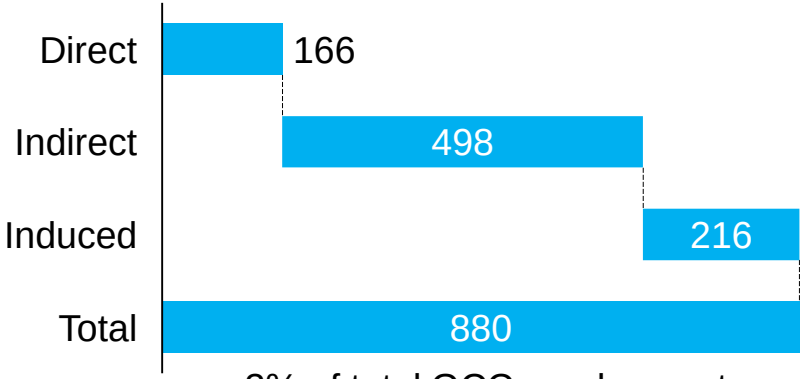


Source: GPCA

Chemical industry accounts for ~3% of jobs and ~6% of GDP in the GCC; in coming years, regulators will be trying to strike balance in their stance

Employment impact of GCC chemical industry

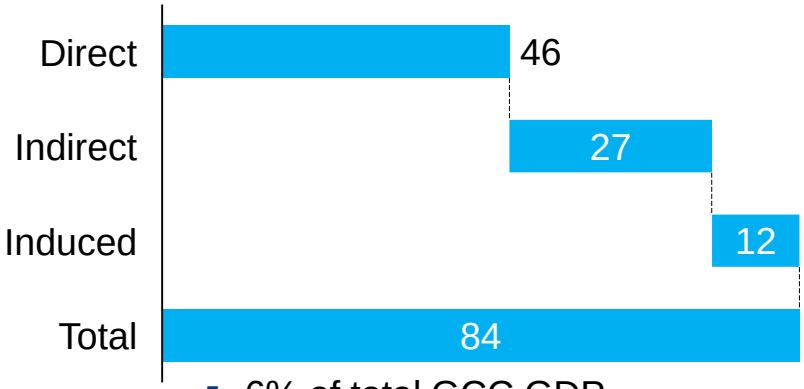
Thousand jobs in 2017



- 3% of total GCC employment

GDP impact of GCC chemical industry

USD Bn GDP contribution in 2017



- 6% of total GCC GDP

Key factors for regulatory decision-making

- Historical objective in supporting industry was to monetize stranded gas resources
  - Convert gas to plastics and export, as opposed to flaring
- Over time, industry became important employer, GDP contributor and talent pool
- Preparing for non-oil economy, regulators need to balance:
  - Challenge of supplying competitive feedstock
  - Risk of losing industry growth and investment
  - Ensuring long-term sustainability and competitiveness of local industry

Source: GCC Statistics, GPCA

In summary, GCC petrochemical players are facing a number of challenges today

Key challenges for GCC petrochemical players

1. Diminishing price advantage for ethane and propane due to e.g.,
   - Competition from US shale gas
   - Competition from coal to olefins in China
     - Slower than before, due to environmental concerns
2. Limited availability (i.e., volumes) of gas feedstock for petrochemical conversion
3. No clear pricing framework for liquid feedstocks

THANK YOU