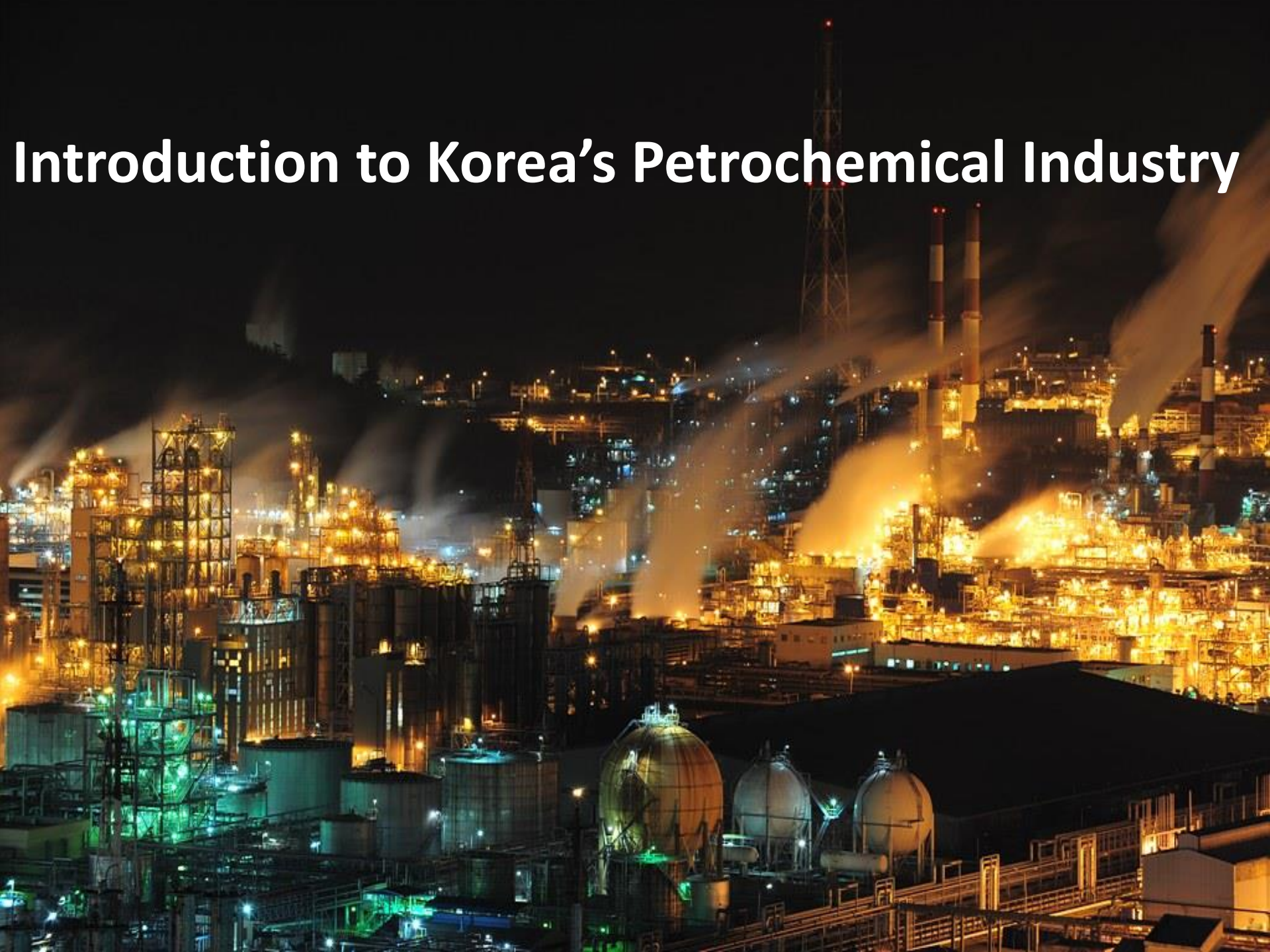


# Introduction to Korea's Petrochemical Industry



Korea,  
Where Success Knows No Limits

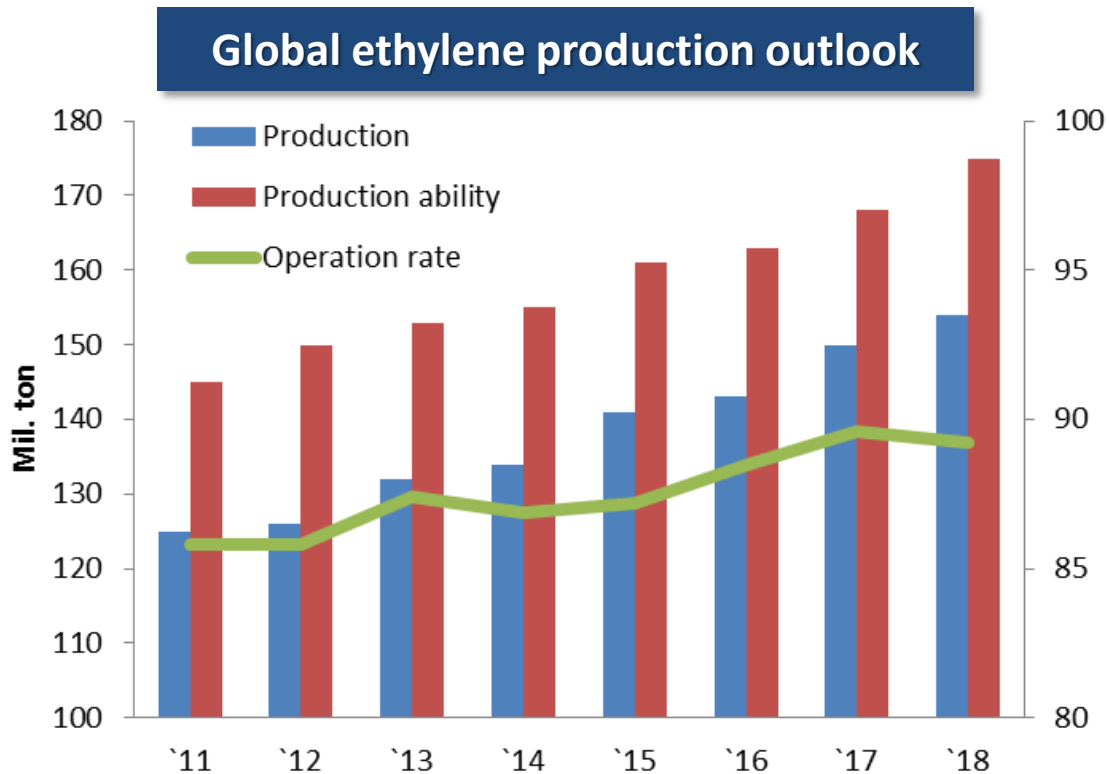
## Petrochemicals

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# Global Market Keeps Growing

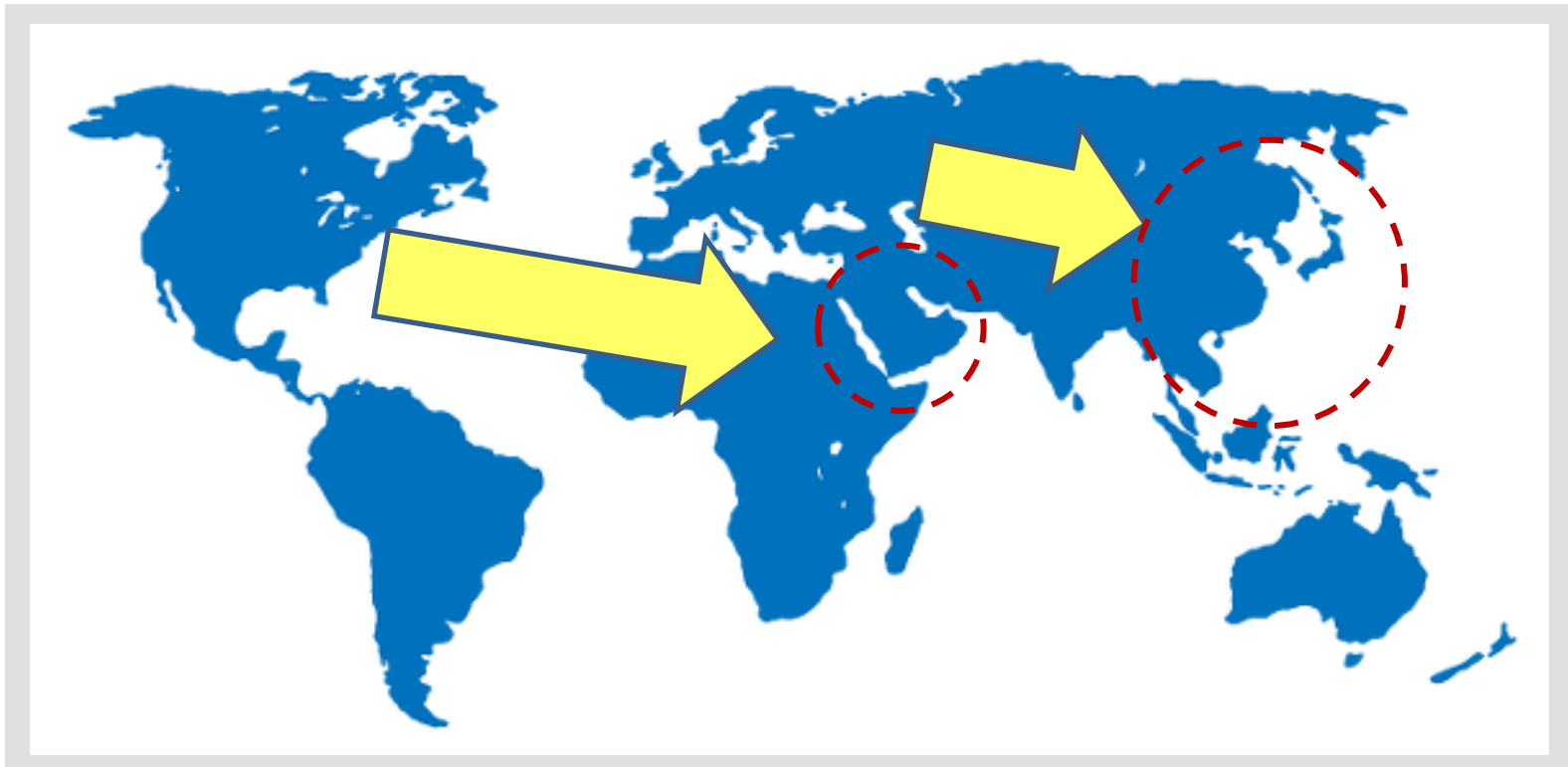
- The global petrochemical industry keeps growing until 2018 (ICIS, 2015)
  - CAGR: 3.0% (Production); 2.7% (Production ability)
  - Operation rate will increase except oil shock ('14~'15)



Source: ICIS, KPIA (2015)

# Core Moving

- Since 2000s, core production areas have been moved from Europe and U.S. to North East Asia and Middle East.
  - Asia: China, Japan, South Korea, (ASEAN)



# NEA and ME Rising

- NEA is becoming the biggest supplier in the global market
  - They have the largest market nearby; China
  - ME is the fastest follower; vertical integration

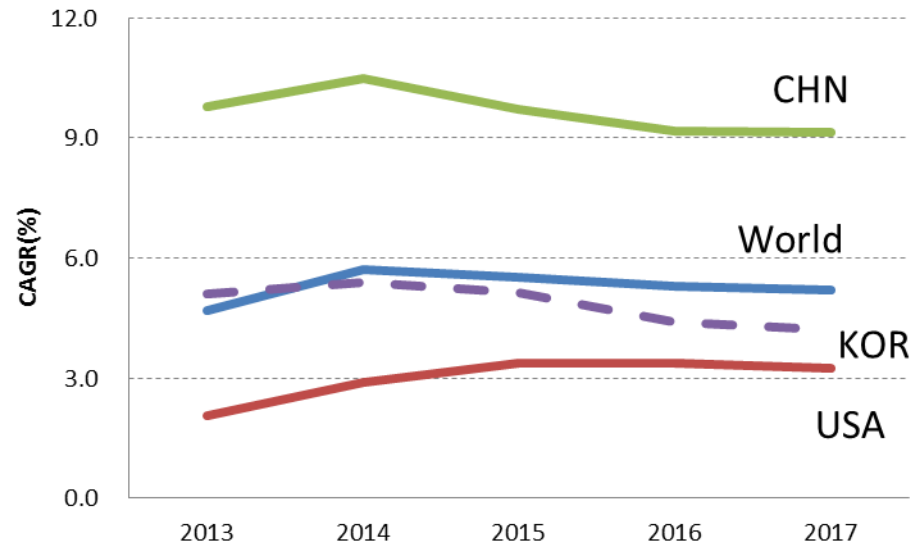
## Production ability ranking by products

	Ethylene	PE	PP	PS	ABS	SM	PTA
1 <sup>st</sup>	U.S.	U.S.	CHN	CHN	CHN	CHN	CHN
2 <sup>nd</sup>	CHN	CHN	U.S.	U.S.	KOR	U.S.	KOR
3 <sup>rd</sup>	SAU	SAU	SAU	KOR	JPN	KOR	U.S.
4 <sup>th</sup>	KOR	KOR	KOR	JPN	U.S.	JPN	JPN
5 <sup>th</sup>	JPN	JPN	JPN	DEU	DEU	SAU	SAU

Source: KIET (2015)

# China ; The Biggest Petrochemical Market (1)

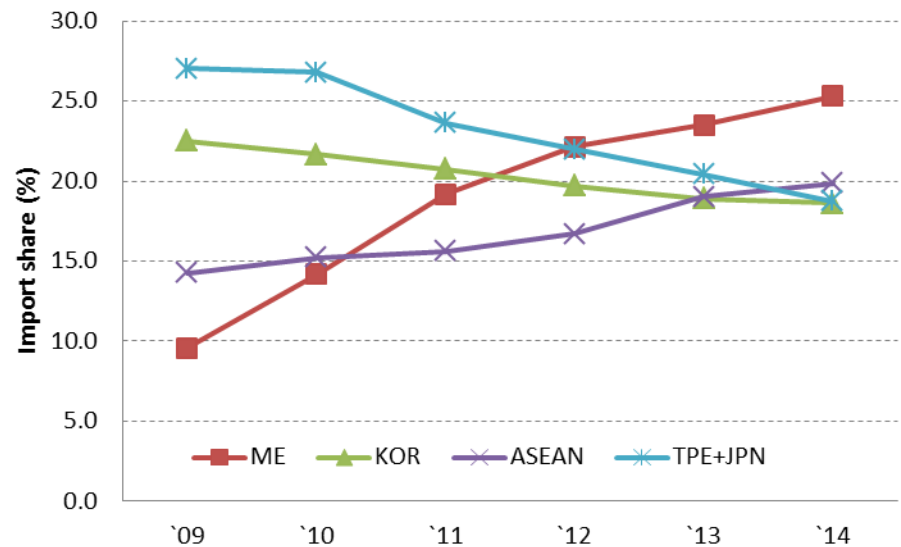
- China is the biggest importer in the global petrochemical market
  - The factory of the world



Source: KIET (2015)

# China ; The Biggest Petrochemical Market (2)

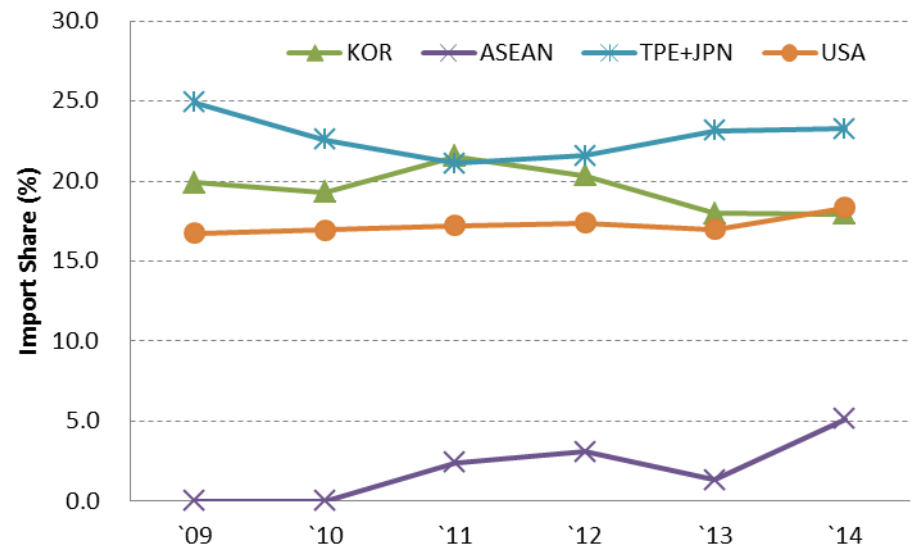
- Chinese Synthetic resins market share;
  - ME and ASEAN rising
  - Technical barrier to entry is relatively low



Source: KIET (2015)

# China ; The Biggest Petrochemical Market (3)

- Chinese Synthetic fiber raw materials market share;
  - JPN, USA and KOR share the market

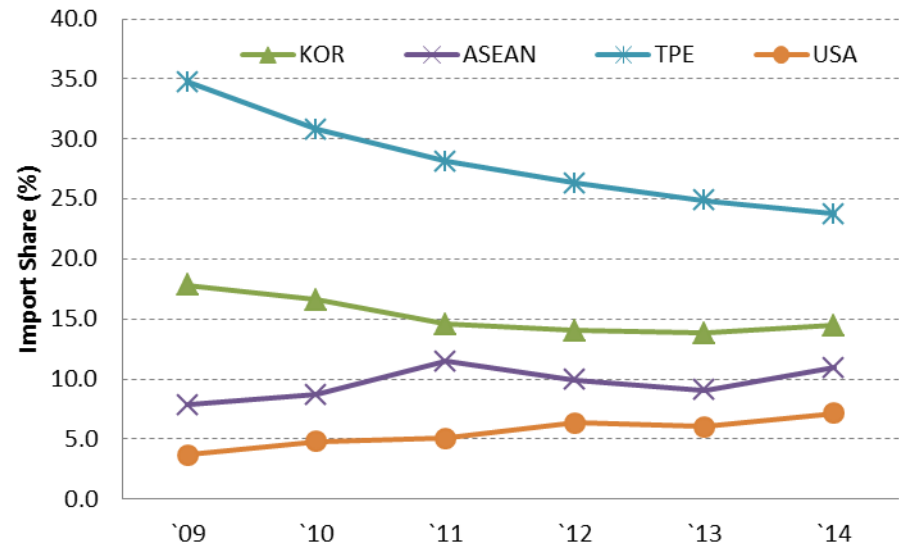


Source: KIET (2015)



# China ; The Biggest Petrochemical Market (4)

- Chinese synthetic rubbers market share;
  - TPE leads the market, market share declining
  - KOR, ASEAN, and USA chasing TPE



Source: KIET (2015)

# Industry Overview

Korea's petrochemical industry is the world's **4<sup>th</sup> largest**



## The world's top 50 chemical companies in 2014

  
**LG Chem**  
**13<sup>th</sup>**

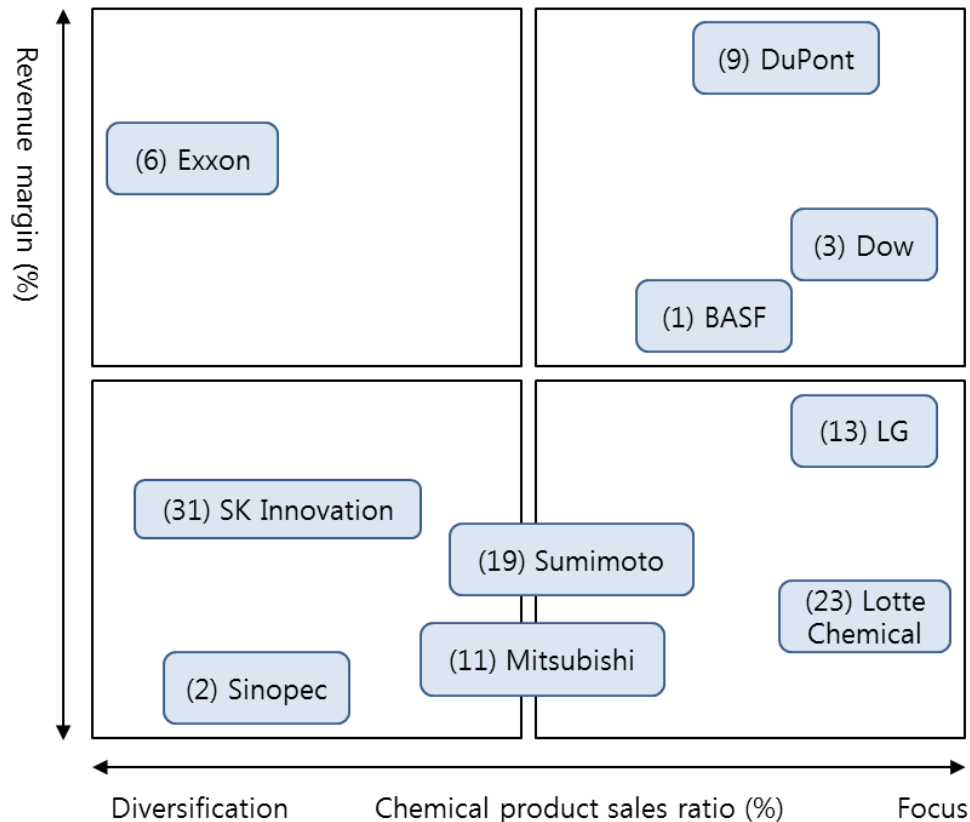
**LOTTE CHEMICAL**  
**23<sup>rd</sup>**

  
**SK innovation**  
**31<sup>st</sup>**

Source: Chemical & Engineering News (July 28, 2014), "Cover Story: Global Top 50".

# Global Leaders' Strategy

- Korean leading companies focus on petrochemical market;
  - Low revenue margin: general products
  - SK Innovation (31): petroleum, resource development



# Petrochemicals Complexes

## Daesan Complex

- Ethylene production ability: 3,110 KTA
- # of firms: 6
- Main product: Polymers
- The newest complex

## Yeosu Complex

- Ethylene production ability: 4,060 KTA
- # of firms: 19
- Vertically integrated
- Economies of scale
- The biggest complex



## Ulsan Complex

- Ethylene production ability: 1,330 KTA
- # of firms: 26
- Vertically integrated
- SME
- The oldest complex

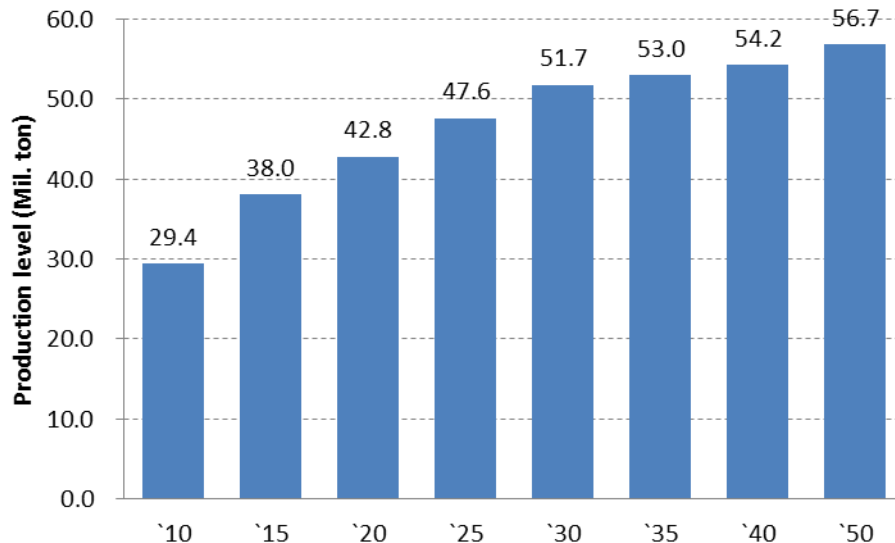
# Industry Characteristics

- **Universal/general products : world price taker**
  - ✓ **Global leading production capacity**
  - ✓ **Mid-stage in GVC→ Low VA**
- **Heavily relying on Chinese Market: 50% of export**
- **Momentum changing point: diversification**
  - ✓ **General →fine chemical, specialty products**

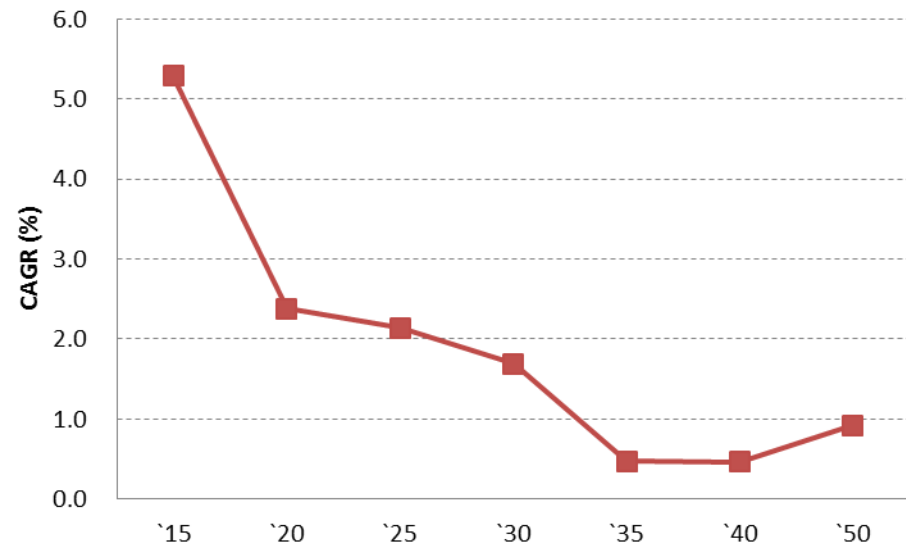
# Global Leading Supplier

- Korean leading companies keep investing to production capacity
  - Economies of scale → price competitiveness in the general product market
  - CAGR from '10 to '14 : Ethylene (9.7%), Propylene (20.3%), PX (51.8%)
- Key technology gap: 80% of the global leading companies
  - Mid-stage in GVC smiling curve → low VA

### Basic petrochemical production level



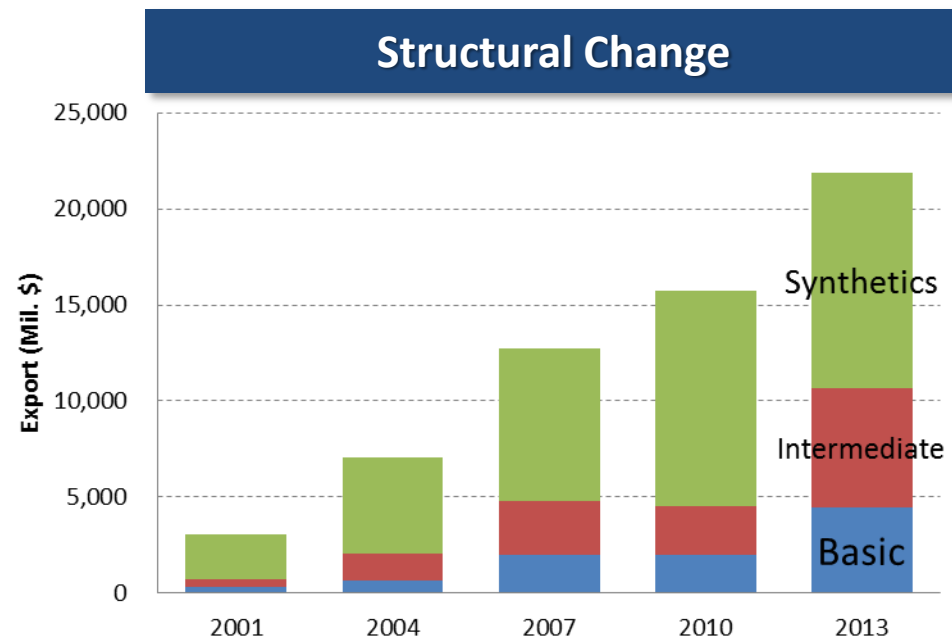
### Basic petrochemical production CAGR



Source: KIET (2015)

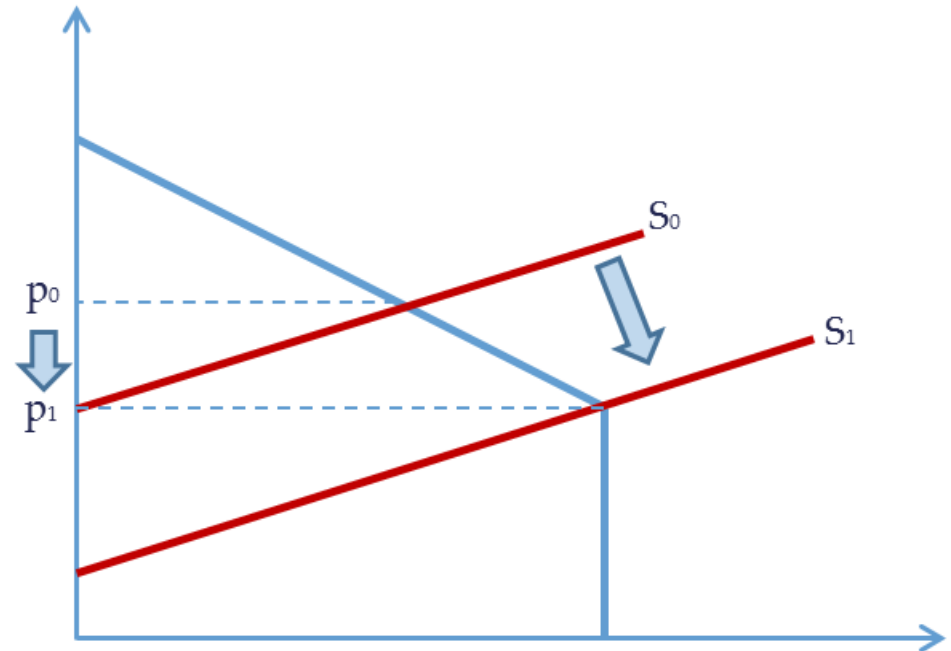
# Heavily Relying on the Chinese Market

- 50% of total export of petrochemical products head to the Chinese market
  - One of the nearest countries around the Chinese market
    - Low transaction costs; supply just-in-time
  - Large production capacity
- Export structure change
  - Synthetic products(resins, fibers, and rubbers) → basic petrochemical products and intermediate products



# Momentum Changing Point

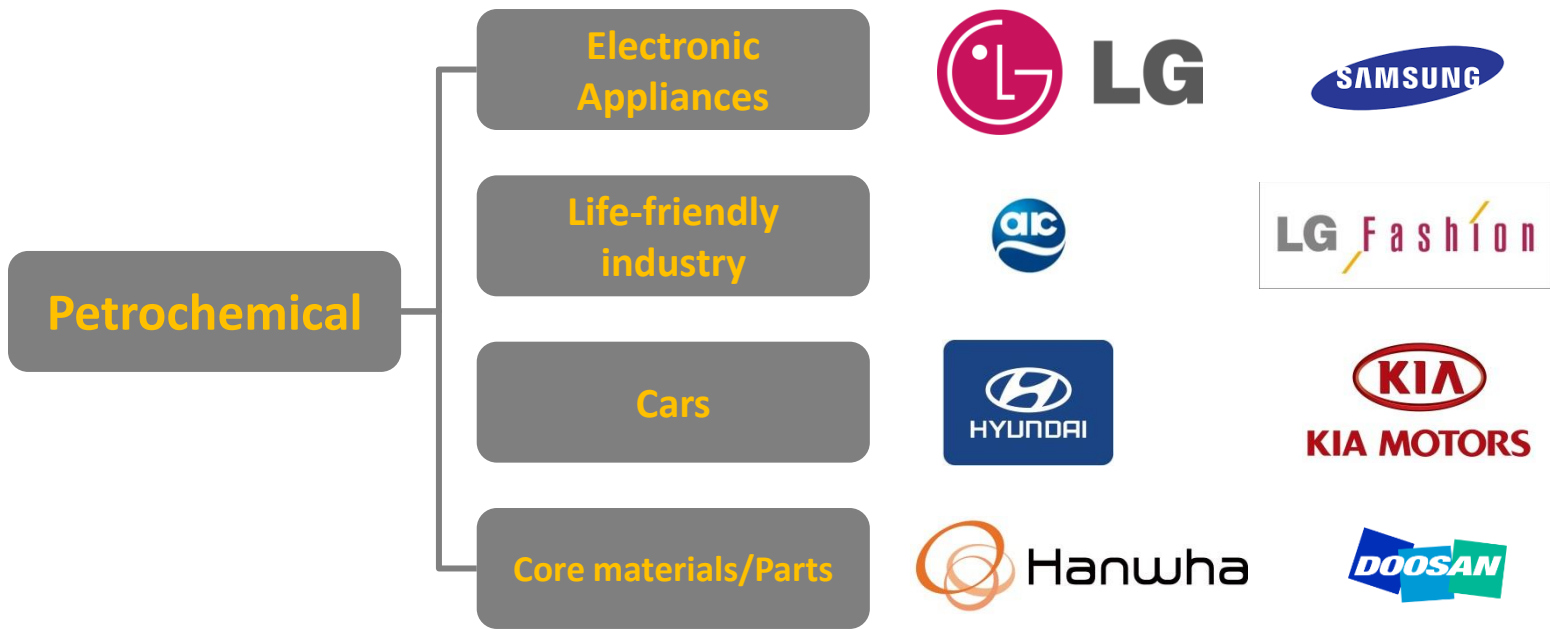
- Nutcracker between global leaders and fast followers (CHN, ME)
  - Price competitiveness weaken in the Chinese market
- Portfolio diversification
  - General petrochemical products → fine, specialty chemical products





# We are not alone

**Korean petrochemical industry has strong value chains**



## What we have

### Strong

- Competitive human resources
- The highest level of operating/managing skills
- Well-established production complexes
- Global leading production capacity in the general petrochemical products

### Opportunity

- Geological distance to the emerging markets
  - ✓ China, ASEAN
- Domestic value chains
  - ✓ Large size of downstream industries
- KOR-CHN FTA

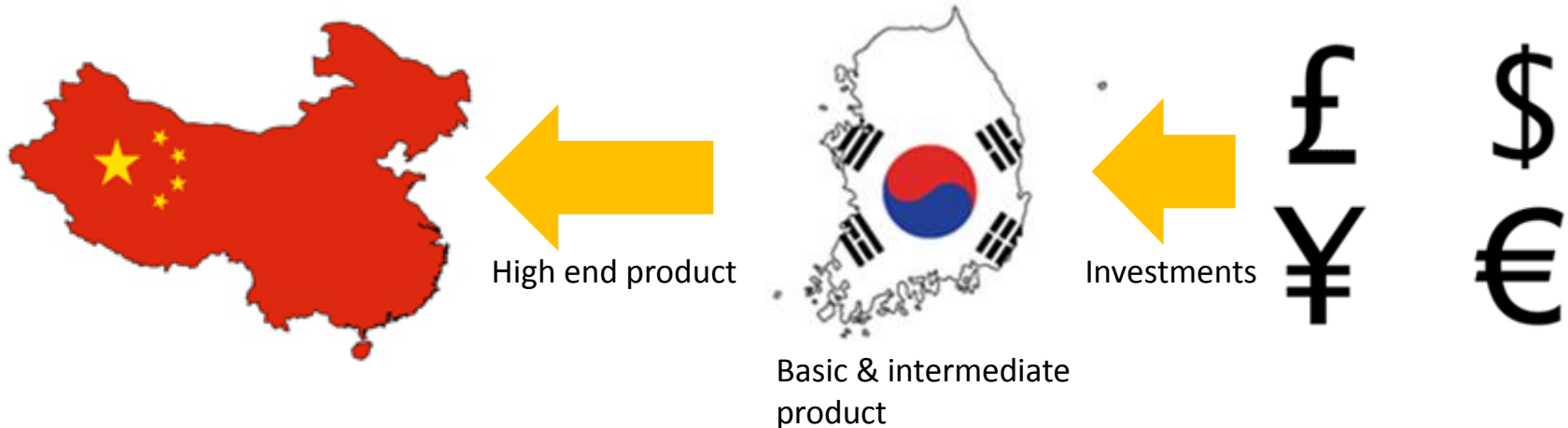
## KOR-CHN FTA

- China increase domestic petrochemical production
  - They need more basic, intermediate products from outside
  - Korea can have price competitiveness in those products (No tariffs!)
  - Korean government negotiate provisional tariff rates to the Chinese government
    - PX, ABS, SM, EG, EPDM
  - Korean JV can establish an affiliated petrochemical company in China



## KOR-CHN FTA

- Chinese high VA market opened
  - Korea can be the first mover in the Chinese high VA market
  - Ion exchange resin → battery for electronic appliances, displays
  - SAP → diapers (not only for baby)
  - PPS → core materials for cars
  - Polyurethane → functional clothes, sports wears



# Foreign Direct Investment

- Foreign investment in Korea's chemicals product industry, including fine chemicals, experienced significant fluctuations from 2009 to 2014, and chemicals products accounted for the largest part of the chemical engineering segment until 2013.

## FDI trends

(USD mil., %)

	2009	2010	2011	2012	2013	2014
Chemical engineering	204	927	1,831	1,286	867	3,178
Chemicals	152	847	1,769	1,087	597	743

Source: Ministry of Trade, Industry & Energy (2014.4.24)

Note: Figures on a notification basis

# Foreign Investment by Region



## Japan

---

Sumitomo Chemical

Asahi KASEI

Mitsubishi; Mitsui

Dainippon; Itochu

---



## Other Countries

---

Shell (NED)

Odfjell SE (NOR)

bp (GBR)

Total (FRA)

Caltex (USA)

BASF (DEU)

---

## BASF - Electronic Materials Research and Development Center Asia Pacific

- BASF operates about 280 production sites and six integrated production facilities in about 200 locations around the world. BASF manufactures fine chemicals, functional chemicals, agricultural chemicals, plastic and much more.

### Investments



▲ BASF researchers at the Electronic Materials R&D Center Asia Pacific

2013

BASF and MOTIE signed a letter of intent on the establishment of its new Electronic Materials R&D Center Asia Pacific.

Sept.  
2014

#### R&D Center at Sungkyunkwan University

- The 2,400m<sup>2</sup> facility is expected to generate production worth KRW 220 billion and many high-skill jobs and employ 42 researchers at the master's or doctoral level.
- The R&D Center will focus on researching inorganic materials and formulations for high-performance applications for LEDs and photovoltaics.

# Investment Incentives

## Fine, specialty market

- Relatively low barrier to entry
- The government sets up policies to induce product diversification

## R&D centers

Income tax cuts for foreign technicians working at foreign-invested R&D centers will be extended to 2018.

## Base camp for the Chinese market

- Can be the first mover of the Chinese high VA market





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