



# Fab Investment Outlook and The Surge of China

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# Outline

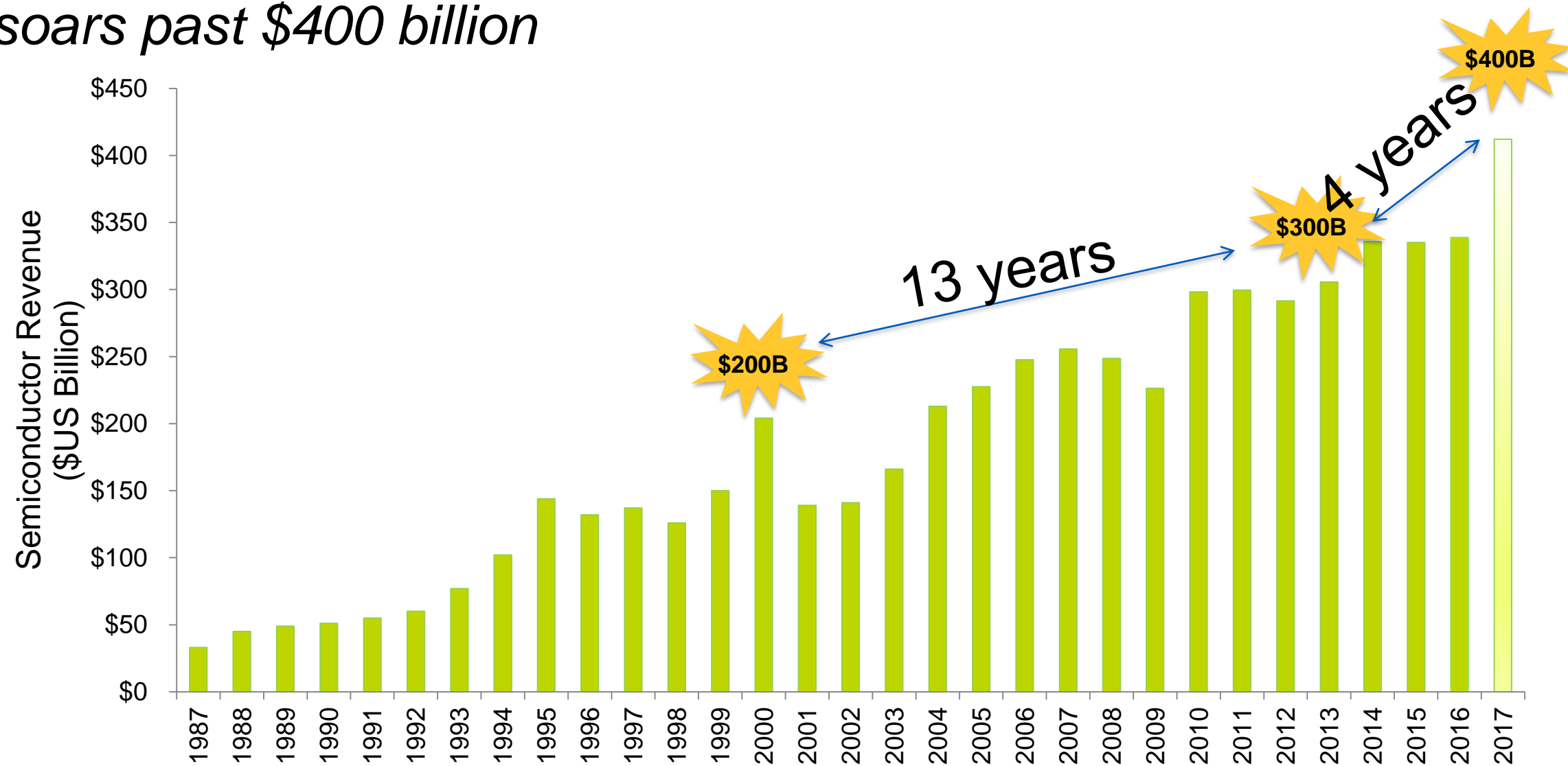
- 2018 Outlook and Drivers
- Fab Investment Outlook
  - Record spending
- The Surge of China
  - New fab projects
  - Capacity projection
  - Memory and Foundry
- Summary

# 2018 Outlook and Drivers



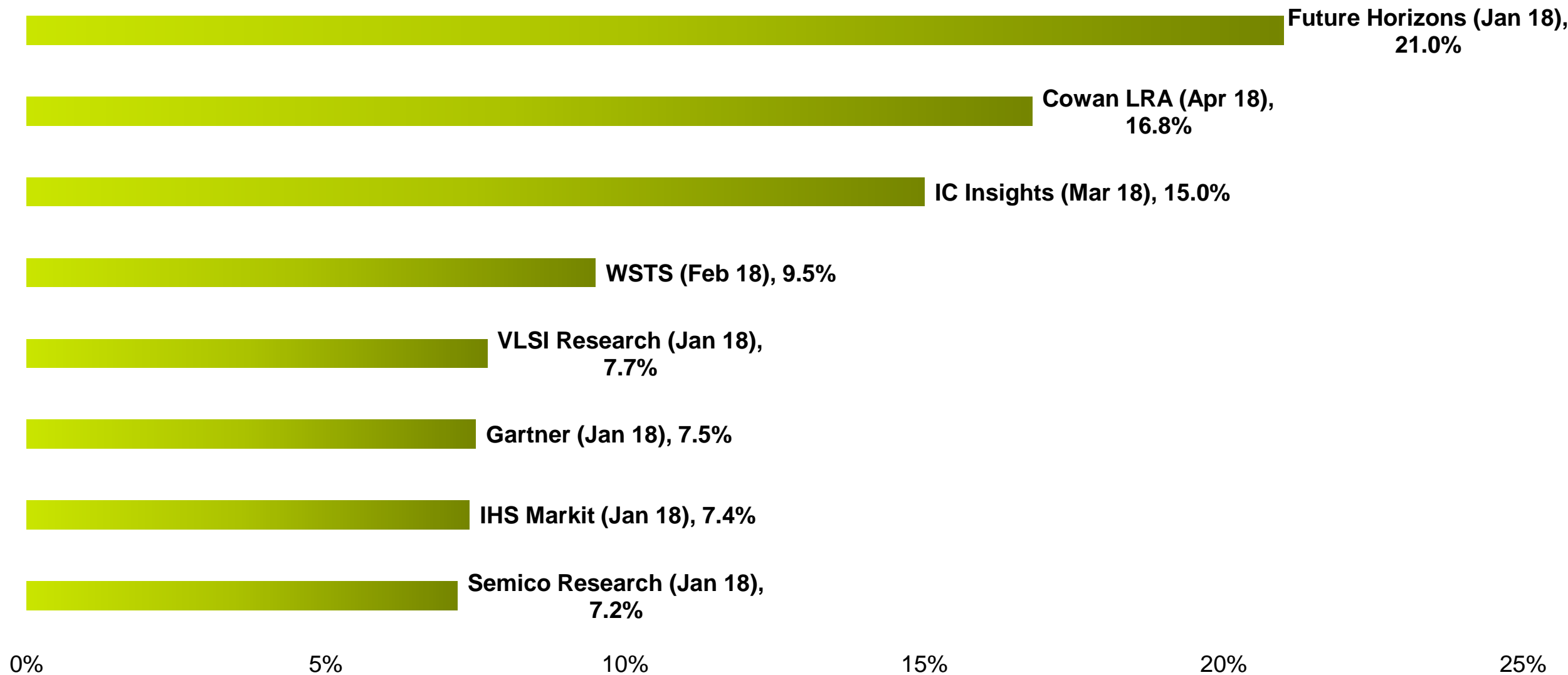
# Semiconductor Industry Outlook

*2017 soars past \$400 billion*



Source: SIA/WSTS historical year end reports, WSTS 2018 Forecast

# 2018 Semiconductor Forecasts



Source: SEMI April 2018

# Industry Trends and Growth Drivers

- Numerous Applications Driving Growth Through 2025

## Applications

Storage

Industrial

Wireless

Automotive

Consumer

## Largest Growth Products in 2017

Memory  
(DRAM due to strong pricing)

Sensors

Opto Electronics

Analog Devices

Discretes

## Long Term Forecast to 2025

IoT \* \$16B -> \$62B

Automotive\* \$32B -> \$51B

5G \*\* \$0B -> \$20B

AR/VR\*\*\* \$4B -> \$131B

AI\*\*\* \$5B -> \$50B

- Robust volume shipments and higher ASPs for Memory are driving strong 2017 revenue growth.
- Storage, industrial, wireless, and automotive applications also contributing to strong 2017 growth.
- Connectivity, data centers, communications, automotive, and advanced software spurs strong demand through 2025.

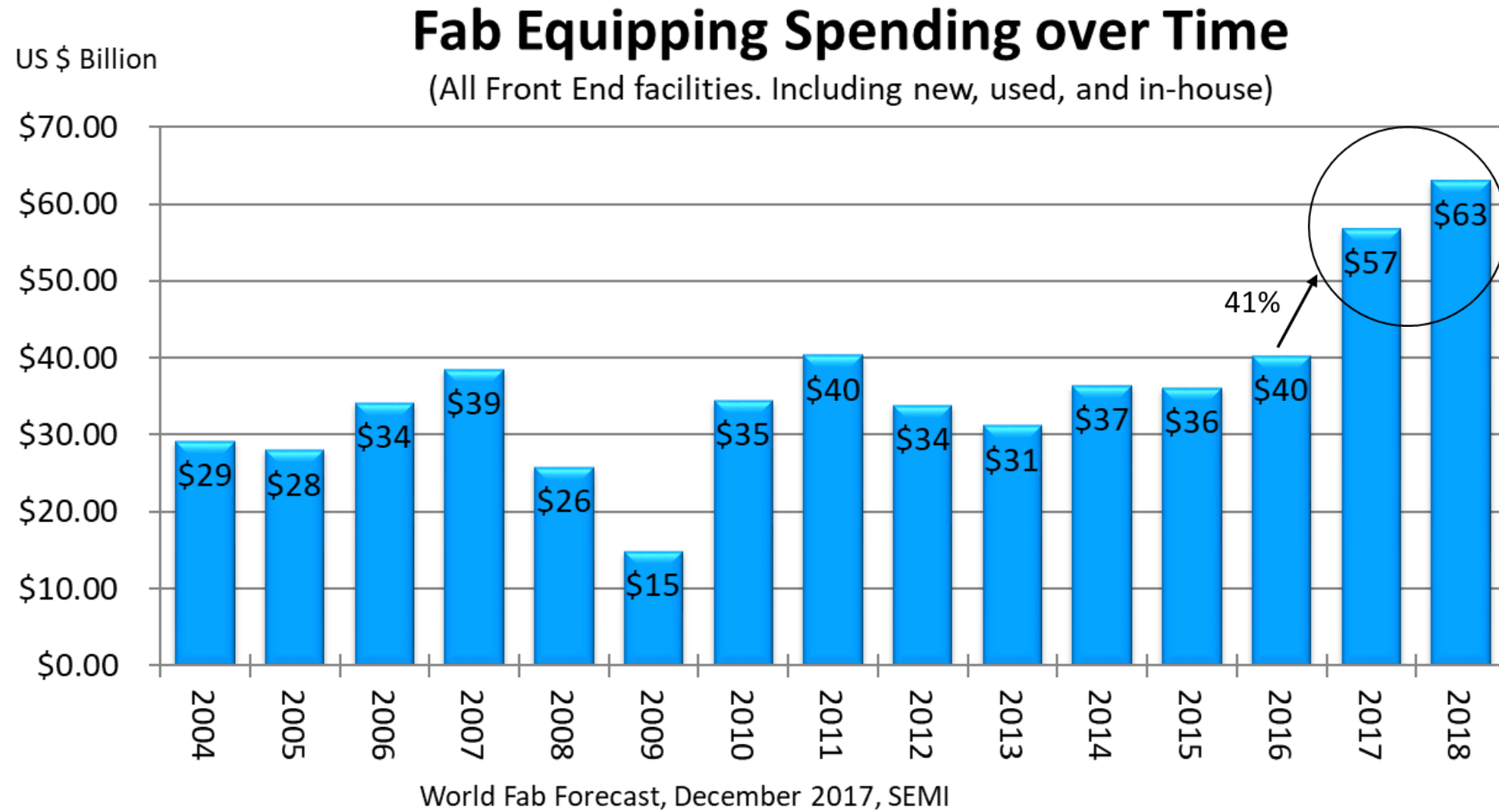
Source: SEMI Industry Strategy Symposium, 2017

\* Semiconductor value  
\*\* Network/Devices  
\*\*\* Market Size

Virtual Reality (VR)  
Augmented Reality (AR)  
AI Artificial Intelligence (AI)

# Global Fab Investment Outlook

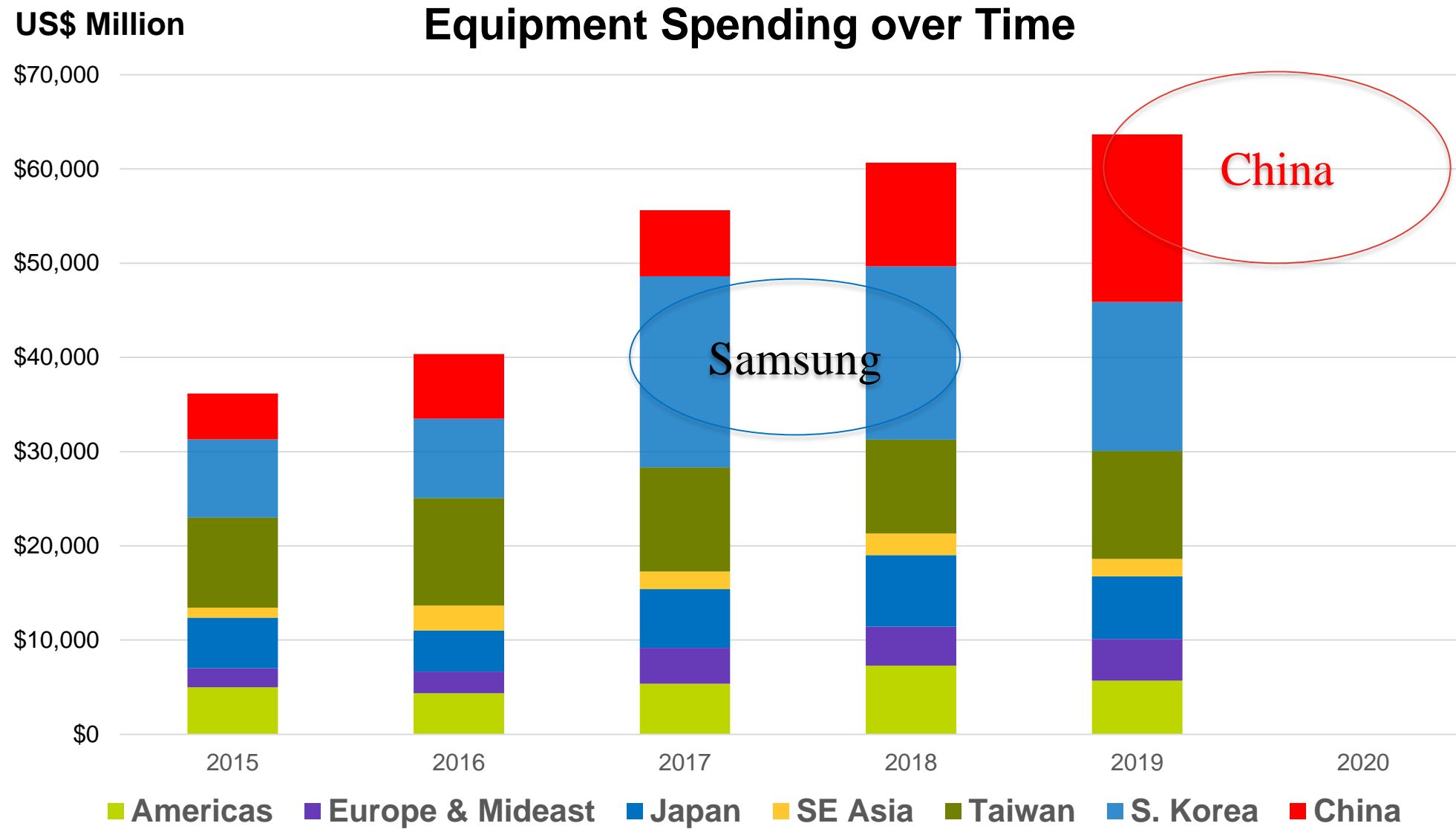
# 40% Increase in 2017





# Fab Investments

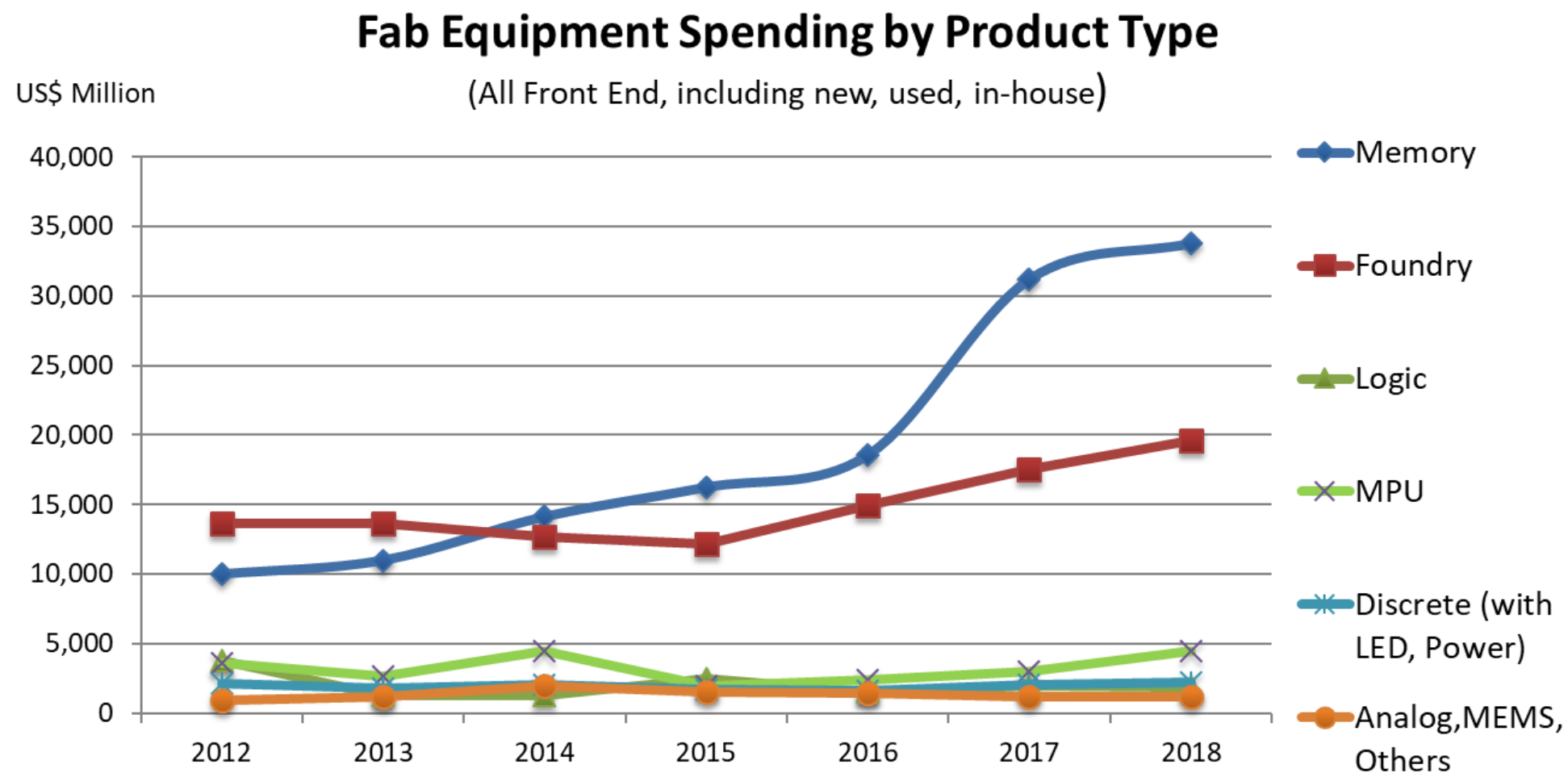
*Growth is likely to continue beyond this year*



Source: SEMI World Fab Forecast, March 2018

# Fab Spending by Product Types

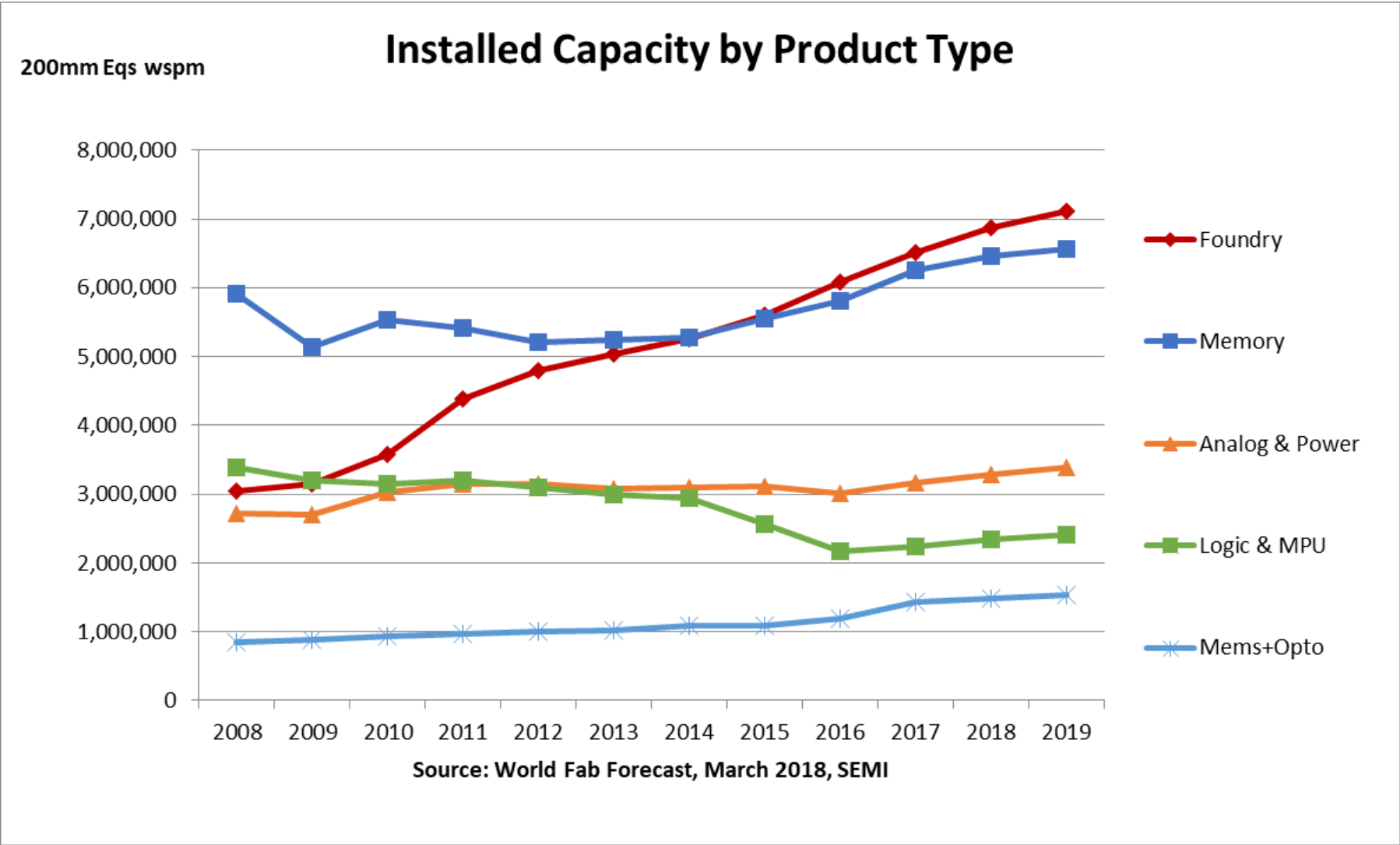
## *Led by Memory and Foundry*



Source: World Fab Forecast reports, December 2017, SEMI

# Capacity Trend by Product Types

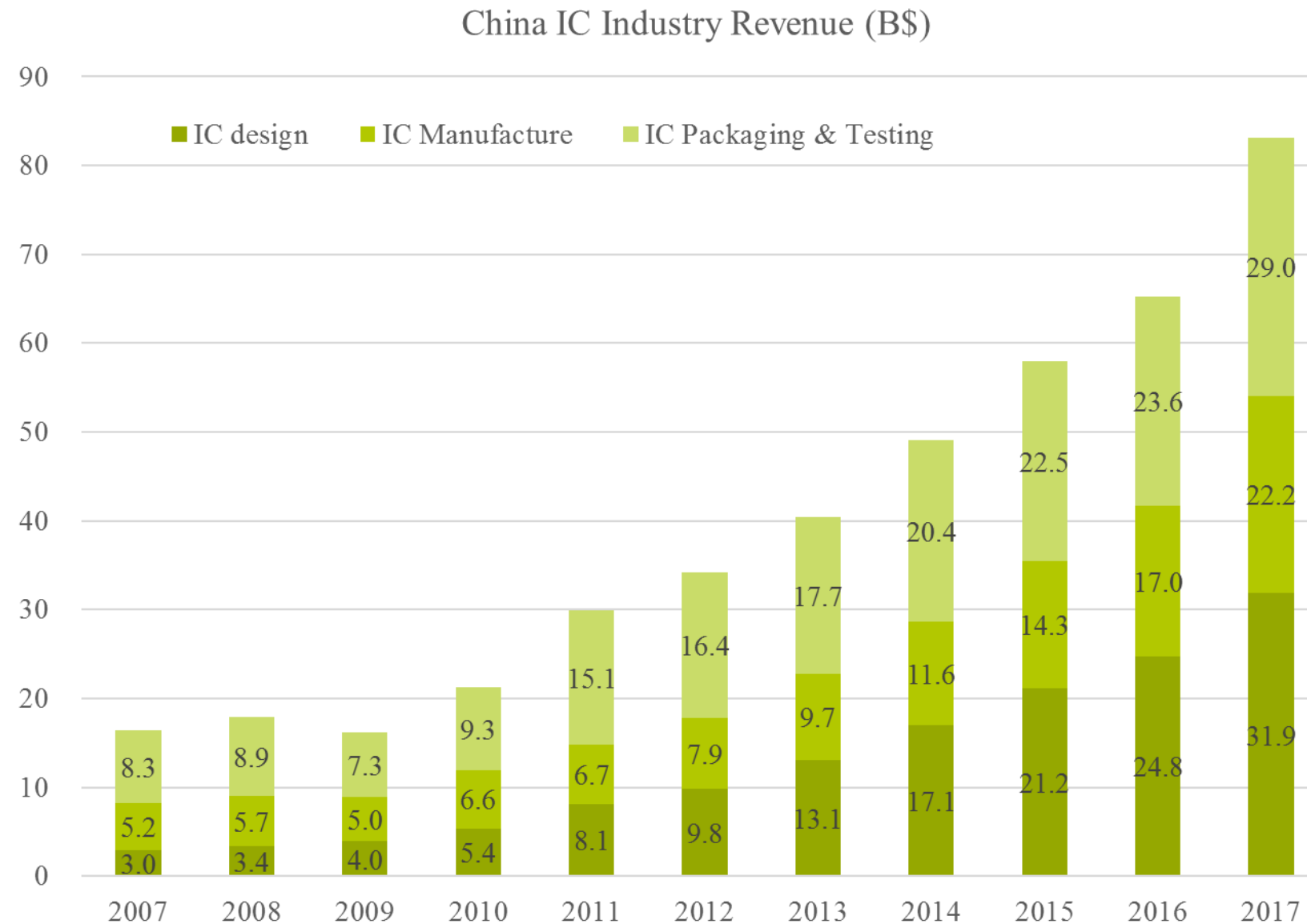
3D NAND, DRAM, Foundry and MEMS add more new capacity



Type	2018	2019
3D NAND	46%	20%
DRAM	5.5%	5.7%
MEMS	7.8%	3.8%
Foundry	5.4%	3.5%
Analog & Power	4.1%	3%
Logic & MPU	4.5%	3%

# China Investment

# China's Domestic IC Industry *Undergoing Dramatic Growth*



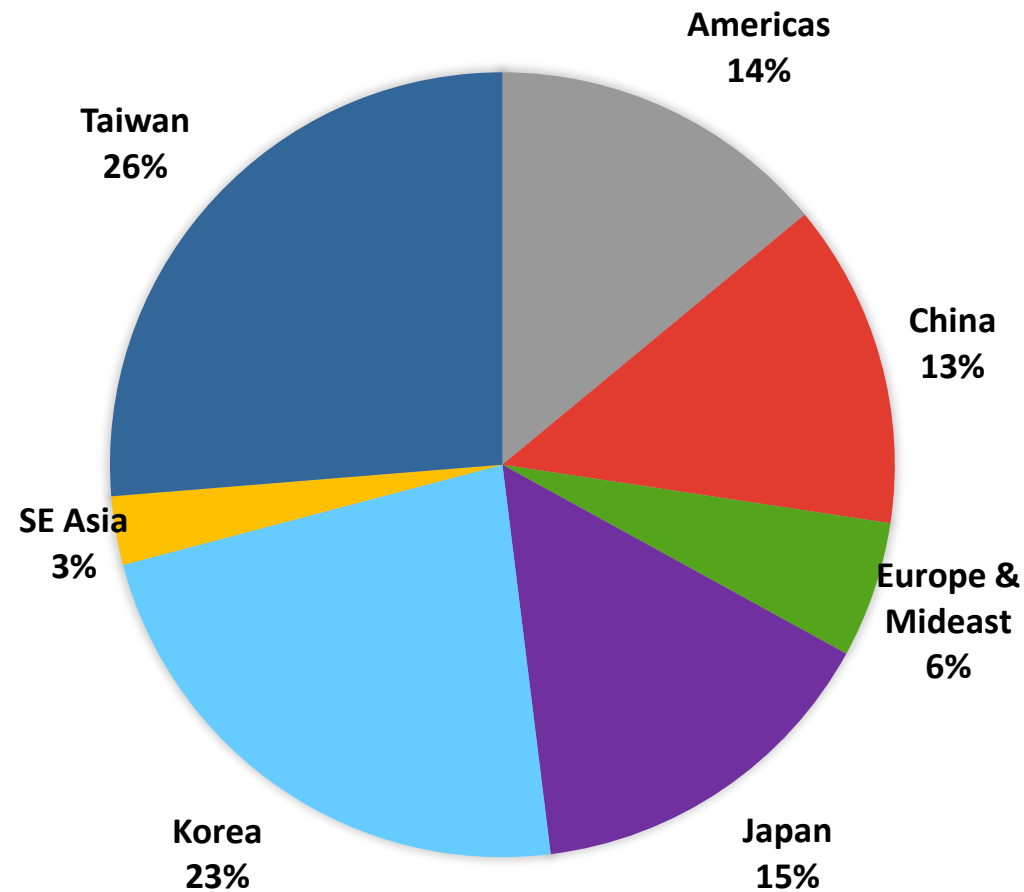
- **Total revenue reached \$83.1B**
- **YtY growth rate is 27%**



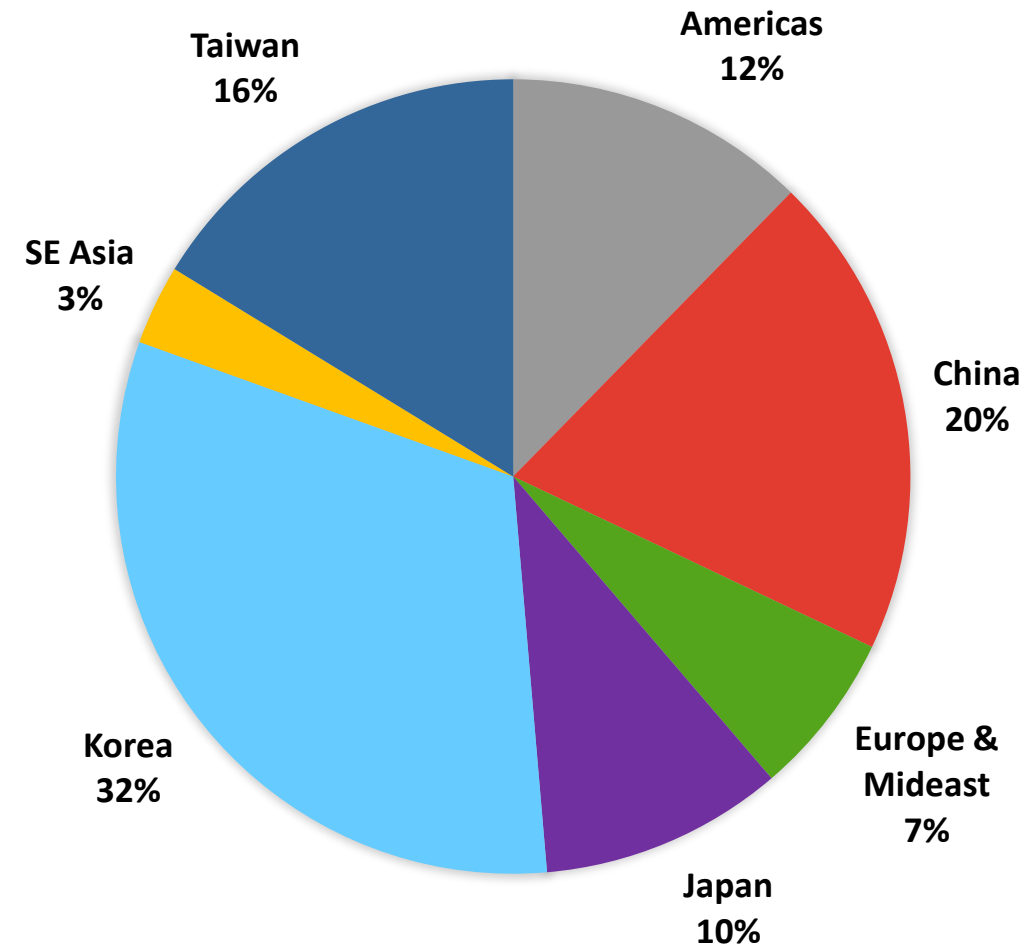
# Fab Equipment Spending by Region

## *China to become Top 2 Spender in 2018/2019*

2015 FAB EQUIPMENT SPENDING  
US\$36 BILLION



2018 FAB EQUIPMENT SPENDING  
US\$63 BILLION

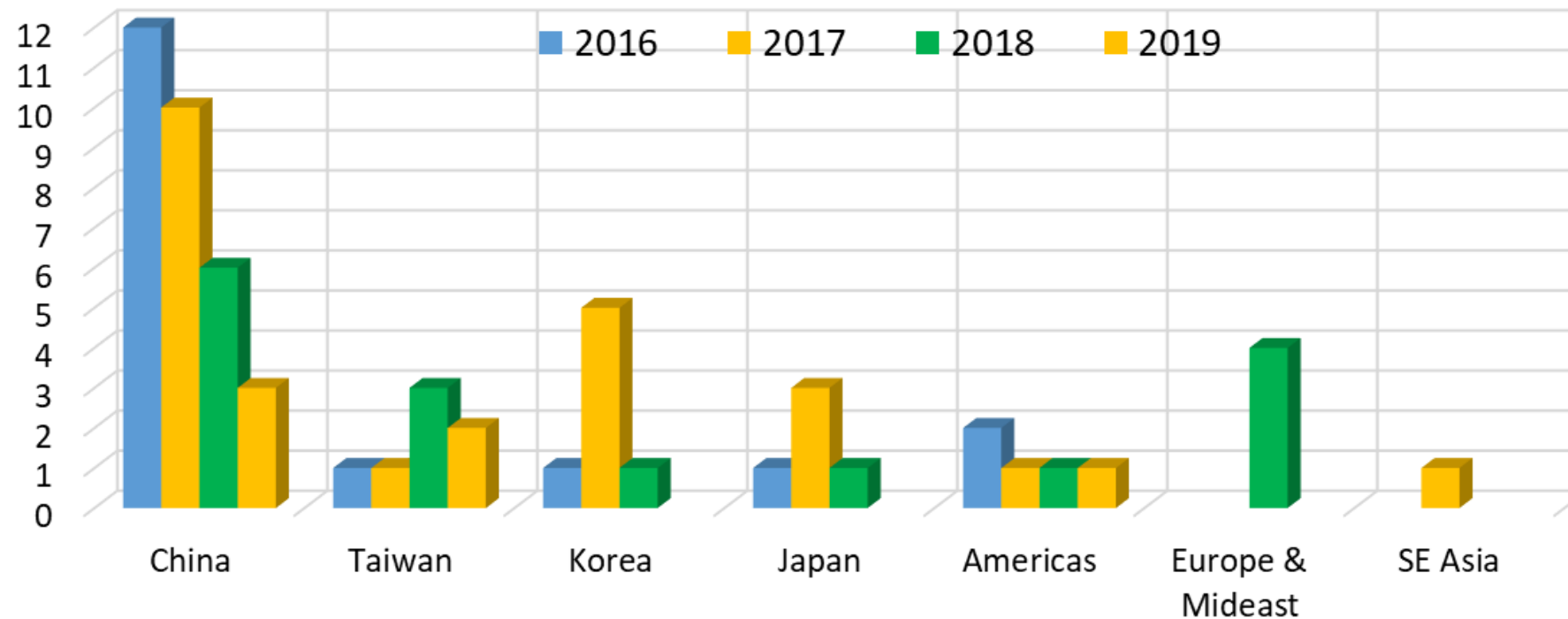


Source: SEMI World Fab Forecast, December 2017

# New Fab Projects on the Rise - *China leads the way*

## New Facilities & Lines Starting Construction

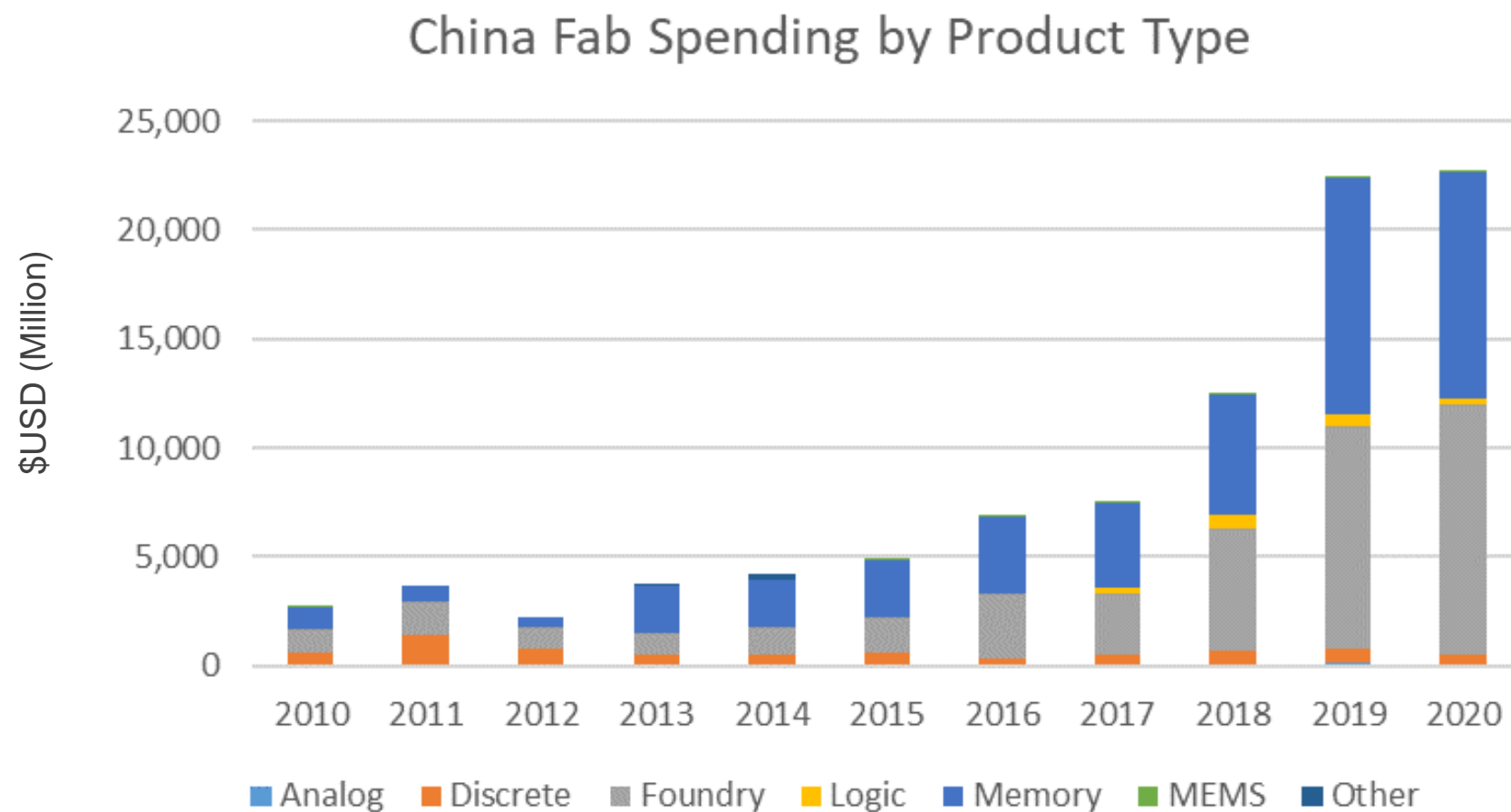
(Front End, all probabilities, excluding LED, EPI, R&D)



Source: World Fab Forecast report (December 2017, SEMI)

- ***19 new fab projects in China from 2017 on***
- ***Out of 10 upcoming 300mm projects in China, Majority (7) are from China-owned entities***

# Surging China Fab Investment – Foundry & Memory Lead



Source: SEMI World Fab Forecast, December 2017

## Key Spending Projects

### 2017

- Intel Fab 68 - *upgrade to 3D NAND*
- SK Hynix C2
- UMC Fab 12X
- SMIC B2

### 2018

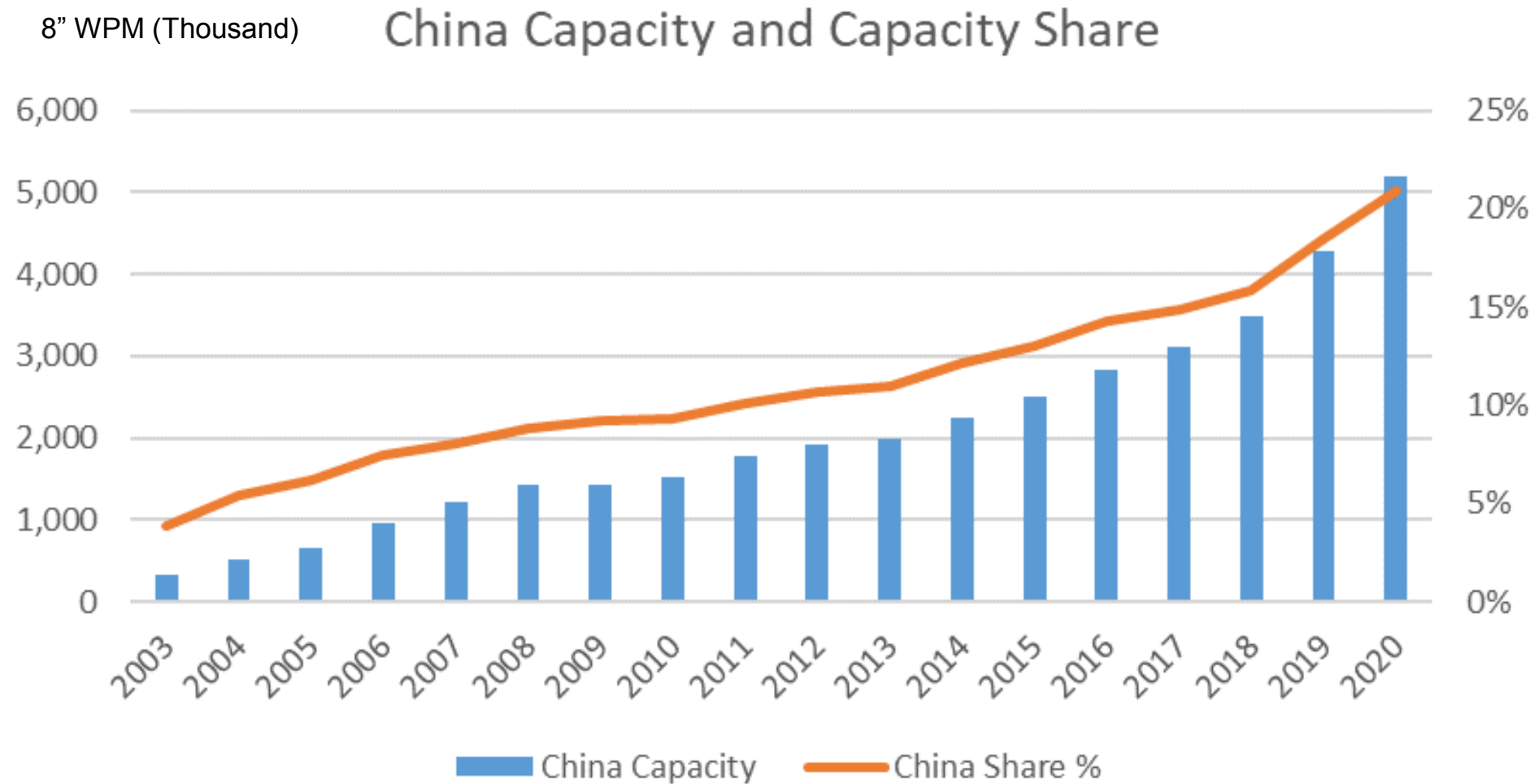
- Intel Fab 68 Phase 2
- Yangtze Memory Technology (Wuhan)
- TSMC Nanjing Phase 1
- Globalfoundries Chengdu Fab 11
- Hua Li Micro Fab 2
- Fujian Jin Hua - DRAM

### 2019/2020

- Tsinghua Unigroup (Nanjing) and Samsung Xian phase 2
- SK Hynix C3
- SMIC new Shanghai fab
- Hefei Chang Xin Memory

# The Rising Share of China Capacity

## *Strong growth from 2016 to 2020*

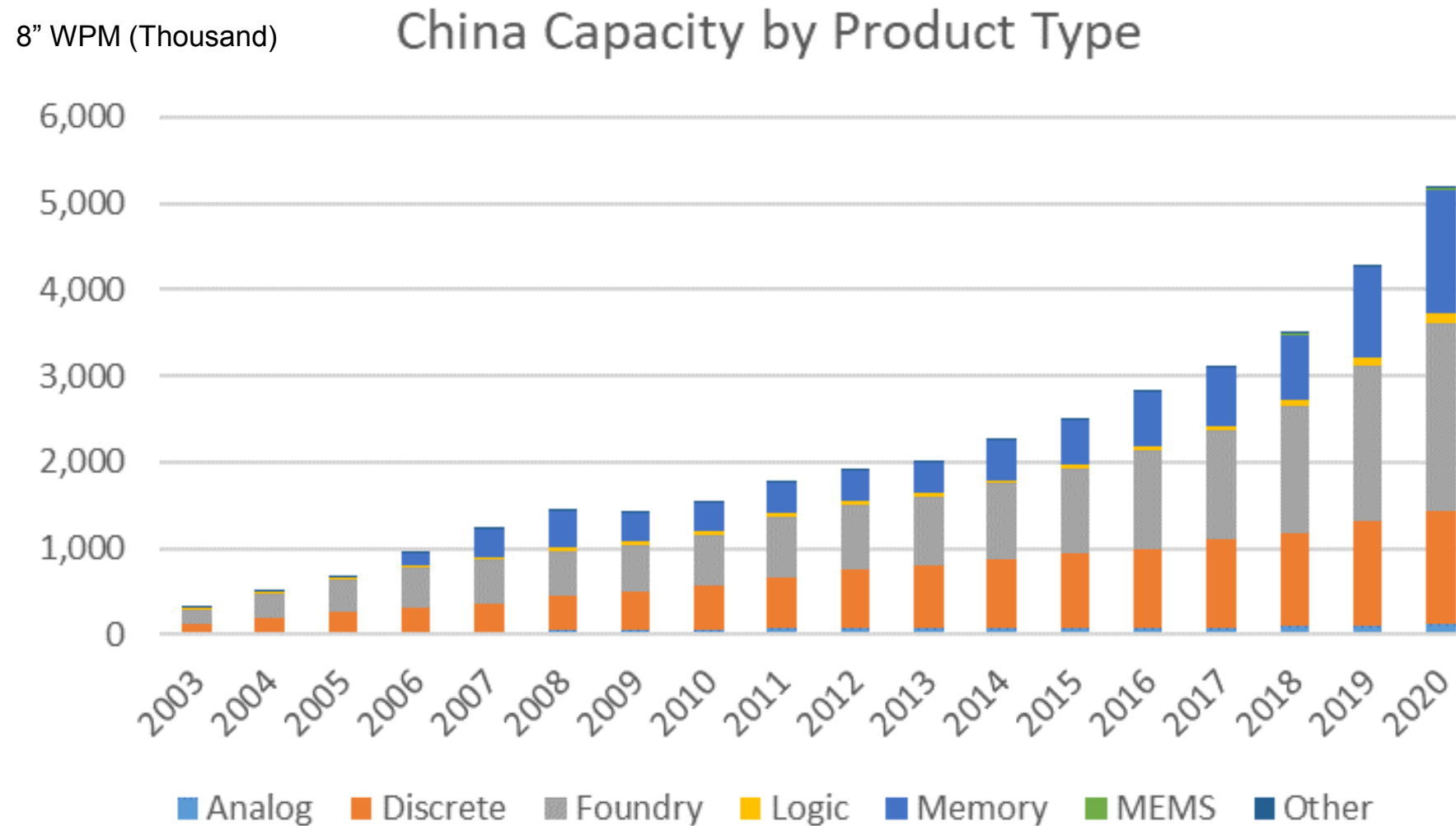


Disclaimer: The forecast is based on current announcement and is subject to change depending on actual execution.

Source: SEMI World Fab Forecast, December 2017

# Capacity Trend in China

## *Foundry, Memory and Discrete (LED) Fuel the Growth*



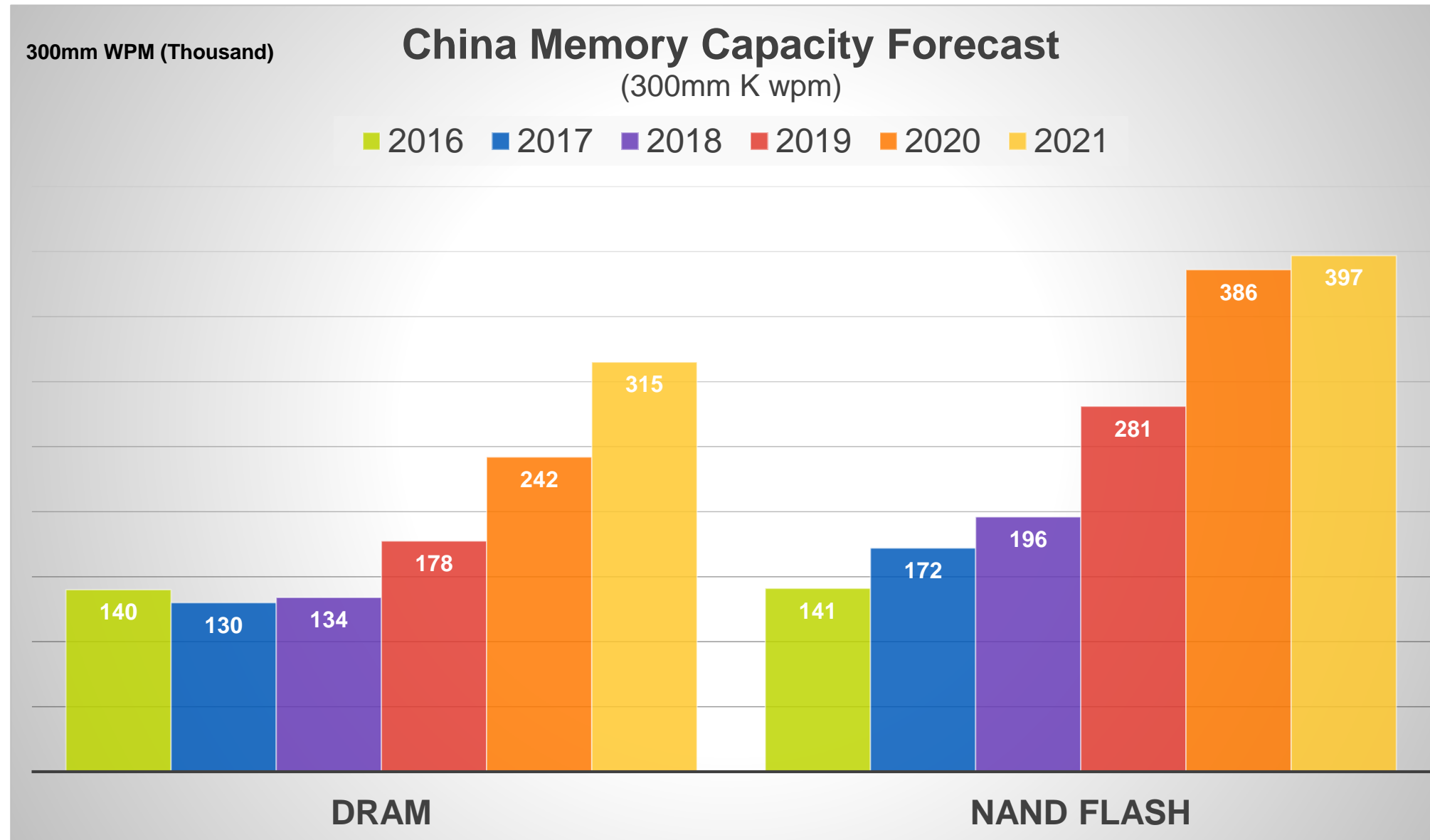
Disclaimer: The forecast is based on current announcement and is subject to change depending on actual execution.

Source: SEMI World Fab Forecast, December 2017



# Memory Capacity in China

## *3D NAND showing stronger momentum*



Disclaimer: The forecast is based on current announcement and is subject to change depending on actual execution.

Source: SEMI World Fab Forecast, December 2017

# China Momentum and Challenges

## Momentum

- The surge of China investment is both policy-driven and market-driven.
- Policies such as the National IC promotion Guidelines (2014) as well as the 13<sup>th</sup> five-year plan (2016-2020) are the key drivers of the new fab projects blossoms across the country.
- Majority of these new fab projects are supported or “invested” by National IC fund and various local government funds.
- The huge demand and rising Chinese electronics OEMs also play an important role in attracting foreign semiconductor companies to set up facilities in China.

# China Momentum and Challenges

## Challenges

- There is no shortage of capital for semiconductor fab projects in China. Though some local government funds are not really ready yet.
- Two major limiting factors are the availability of talent and the sources of technologies/IP.
- Talent sourcing is happening across Asia especially from Korea, Taiwan and Japan.
- However, talent recruiting raises some concerns about IP infringement especially in memory.
- The concerns of adding massive capacity in certain product categories may trigger oversupply in the long run.
- China faces regulatory challenges to successfully complete outbound M&A in tech sectors.

# Summary

# Summary

## Fab Investment

- Record spending in 2017 and 2018
- 3D NAND, DRAM, Foundry and China investments are key drivers to spending

## The Surge of China

- 19 new projects planned from 2017 onwards.
- China is forecasted to become the largest capital equipment market in 2019
- Investment in foundry and memory segments are paving the way for China's place on the global semiconductor stage.



# China IC Industry Outlook

## POLICIES – ECOSYSTEM – INVESTMENTS - CAPACITIES

- New Expanded Edition Coming in September, 2018
- Segmented Market Details
- Supply Chain Database
- Forward Analysis with
- Opportunities and Challenges

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