

SEMI Market Outlook

Semiconductor Equipment and Material Market Outlook and Fab Investment Dynamics

SEMI Korea Members Day 2024

September 24, 2024

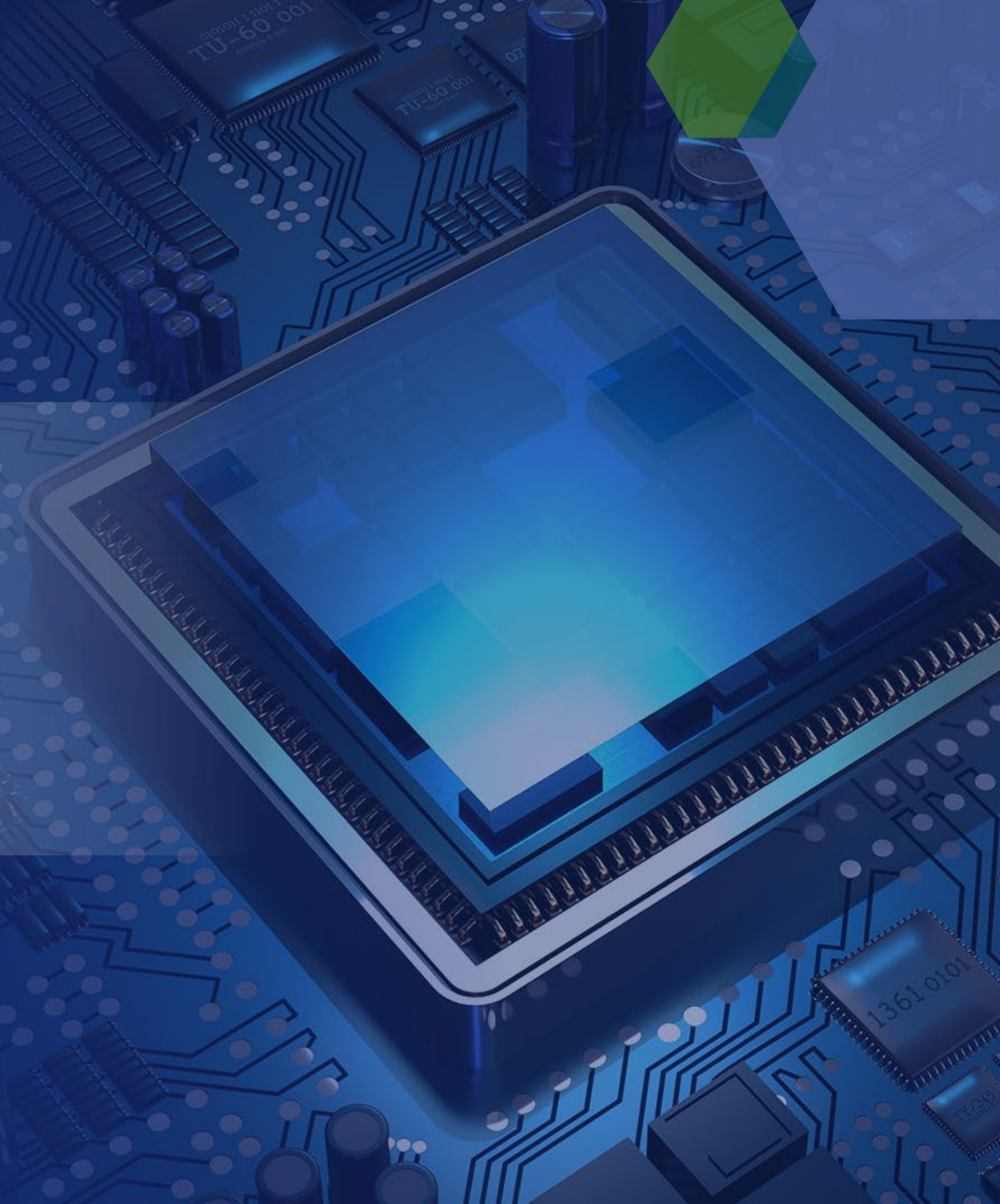
Clark Tseng

Sr. Director, Market Intelligence

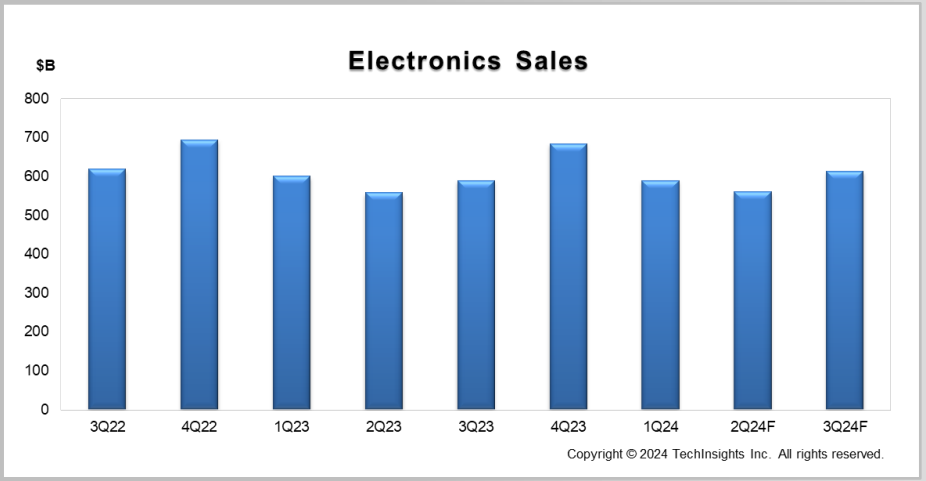
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SEMICONDUCTOR INDUSTRY PERFORMANCE

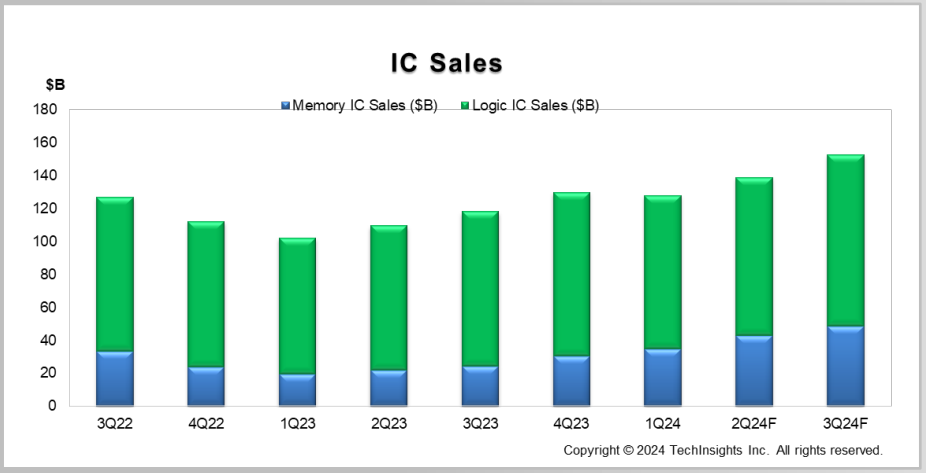


Electronics and Semiconductor Sales



Electronics Sales

- 1Q24 Electronics Sales decreased 2% YoY and 14% QoQ due to soft seasonality and weak consumer demand.
- Electronics Sales for 2Q24 are expected to be flat Year over Year. The growth will return in 3Q24, with an expected YoY growth of 4%.



IC Sales

- 1Q24 IC Sales contracted 2% QoQ but jumped 25% YoY. 1Q24 Memory IC Sales surged 79% YoY while non-Memory IC was up 13% YoY.
- Stronger growth is expected in 2Q24 (+27%) and 3Q24 (+29%) YoY as AI-fueled demand continues to boost the shipments of HPC chips, and memory pricing continues to improve..

Source: Semiconductor Manufacturing Monitor (SMM), July 2024

Inventory Level and Fab Utilization Trends

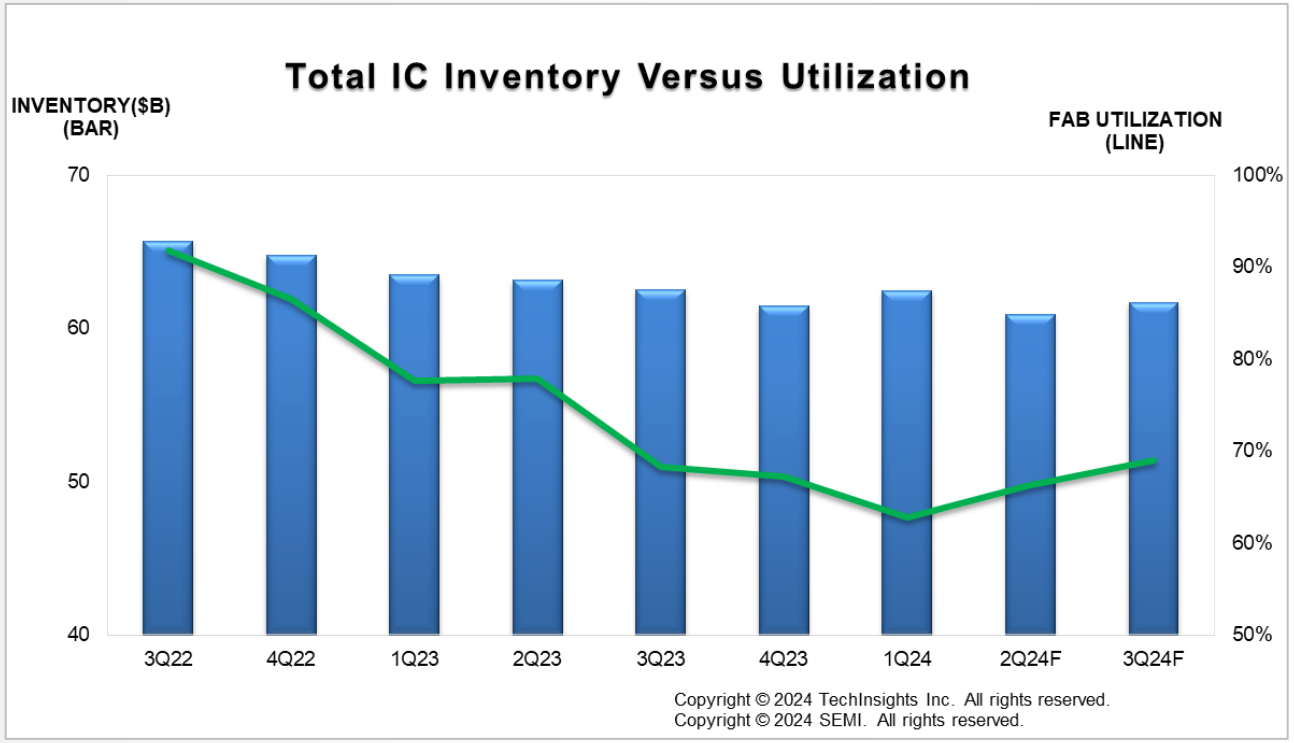
Inventory normalization has concluded for major segments except for the Industrial/Automotive markets

Inventory

- The level of IC Inventories has stabilized and declined 2% QoQ in 2Q24. Inventories have been declining on a yearly basis since Q3 2023.

Fab Utilization

- Fab utilization rates hit bottom in 1Q24 and are now improving due to inventory restocking and increased demand for AI chips and consumer electronics.
- Memory utilization is steadily recovering for both DRAM and NAND flash. Further improvement is expected in 4Q24.

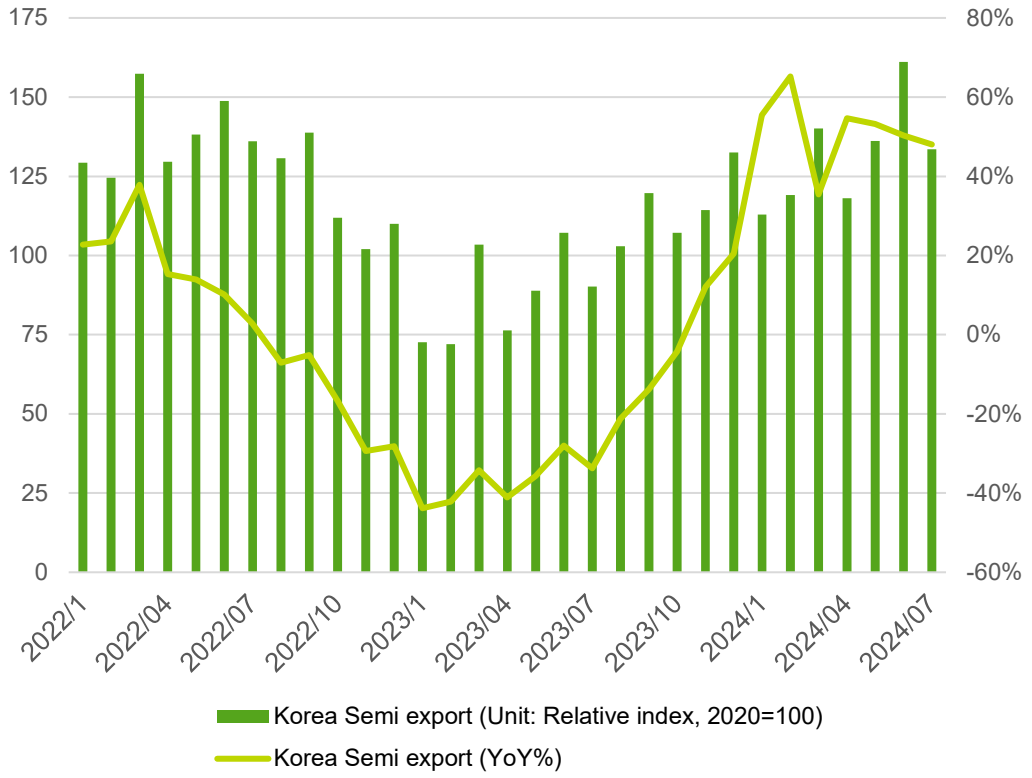


Source: Semiconductor Manufacturing Monitor (SMM), July 2024

The Recovery of Semiconductor Sales

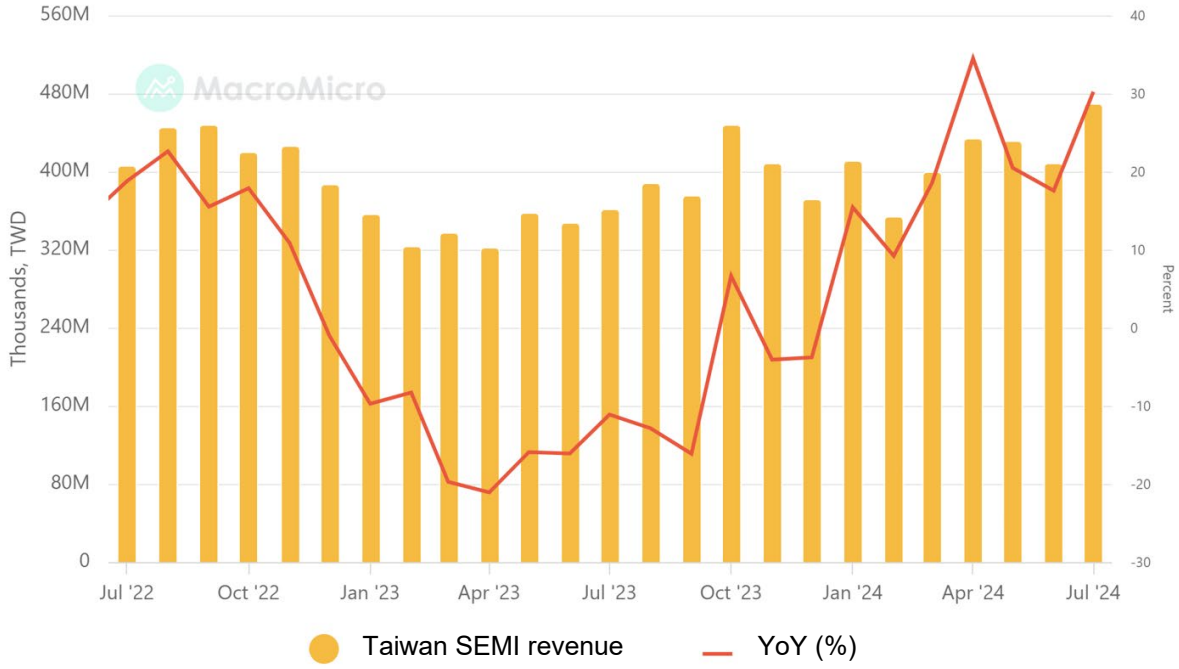
Monthly data points from Korea and Taiwan indicate the recovery of Memory, Foundry, and OSAT businesses.

Korea Semiconductor Export (Index)



Source: Bank of Korea, compiled by SEMI

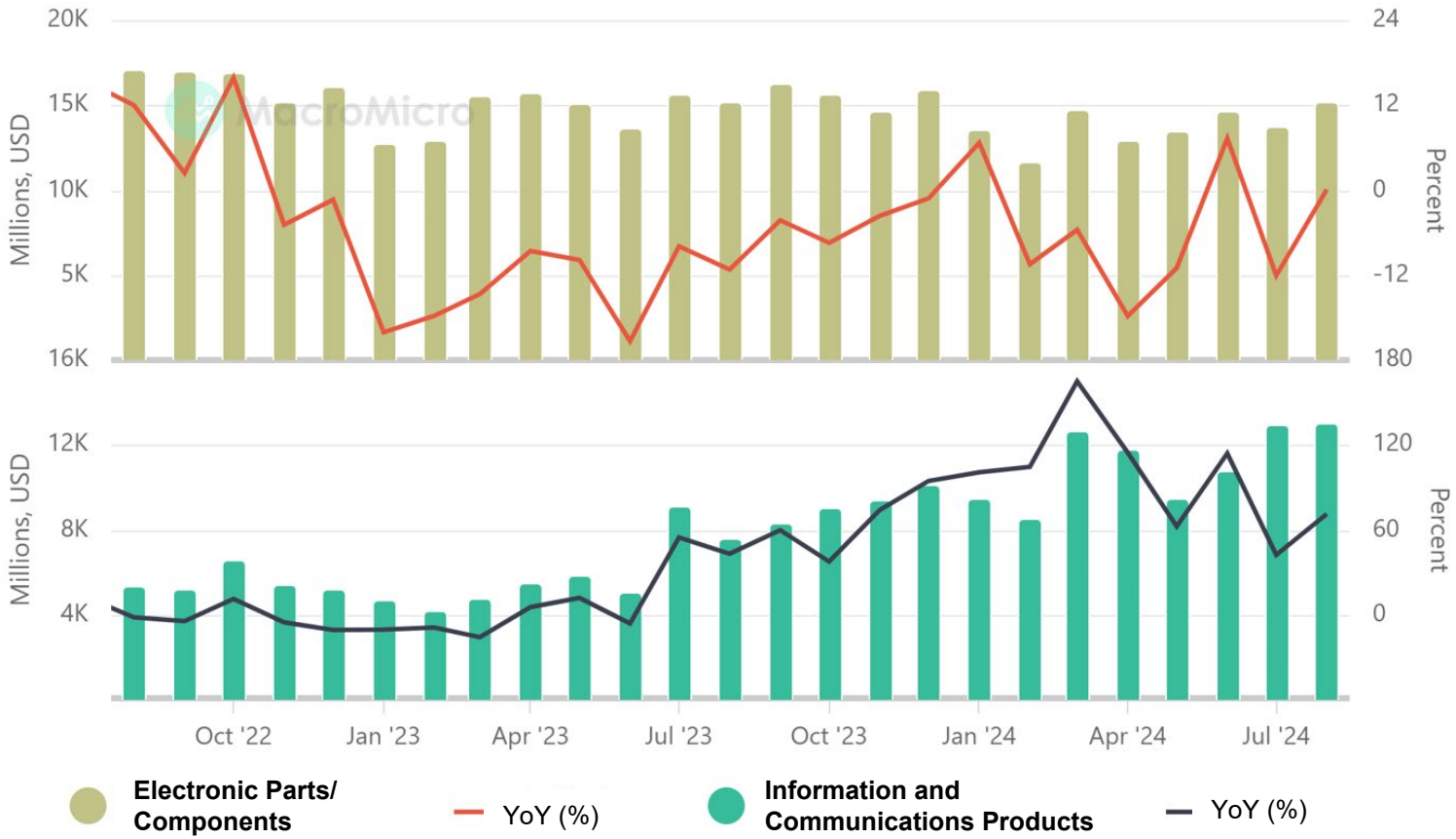
Taiwan Semiconductor Companies' Revenue



Source: Taiwan Stock Exchange, MacroMicro

How does the demand for AI change Taiwan's export mix?

Taiwan Export Comparison: **Electronic Parts/ Components** vs. **Information and Communications Products**



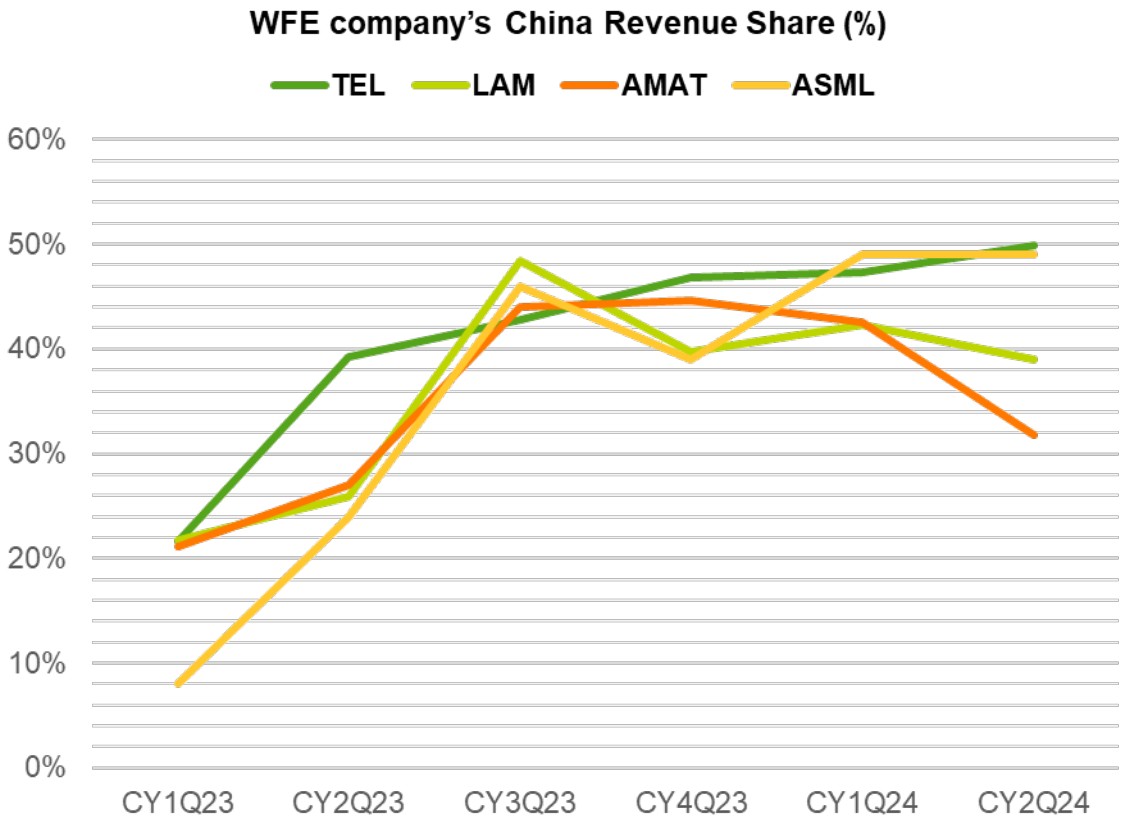
Source: Taiwan MOEA, MacroMicro

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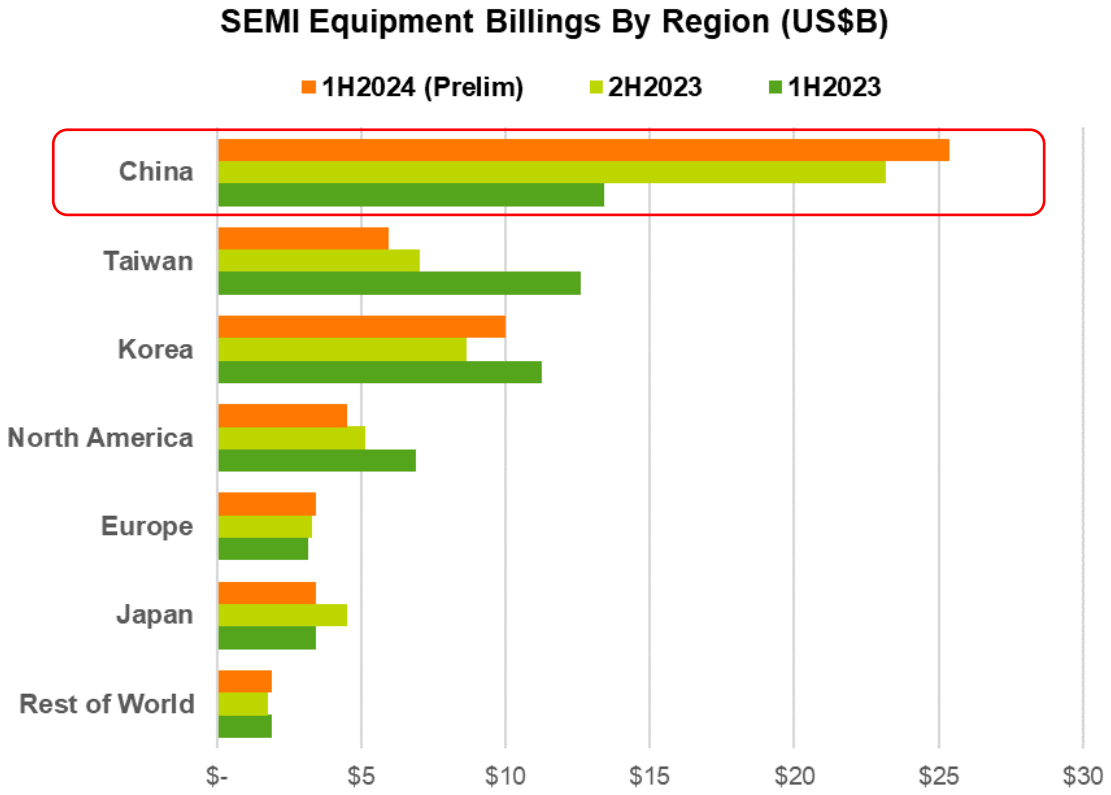
SEMICONDUCTOR Equipment Market



China Market Share and Regional Spending

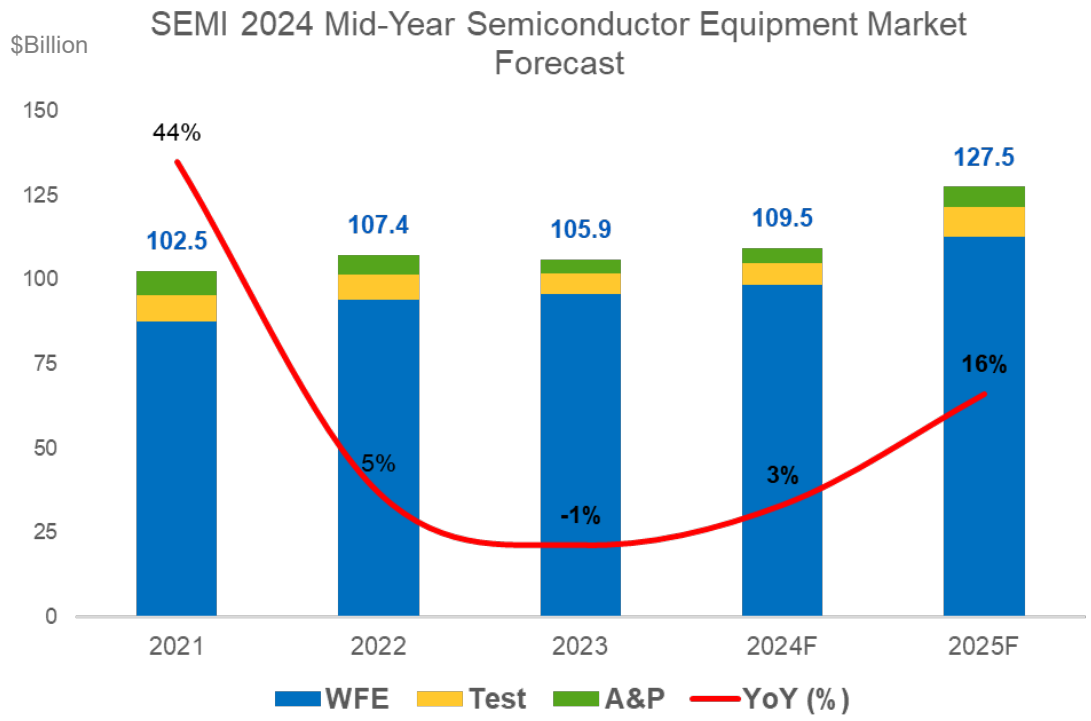


Source: Company Data, SEMI, July 2024



Source: SEMI Equipment Market Data Subscription (EMDS), July 2024

SEMI® Mid-Year Total Equipment Forecast OEM Perspective



Total equipment includes wafer fab (WFE), test, and assembly & packaging;
WFE = WPE + M/R + Fab Facilities. Total Equipment does NOT include Wafer Manufacturing Equipment.

The **2024 Total Equipment Market** is expected to **grow 3.4% to reach $109 billion**, compared to the $105 billion forecasted in December 2023**.**

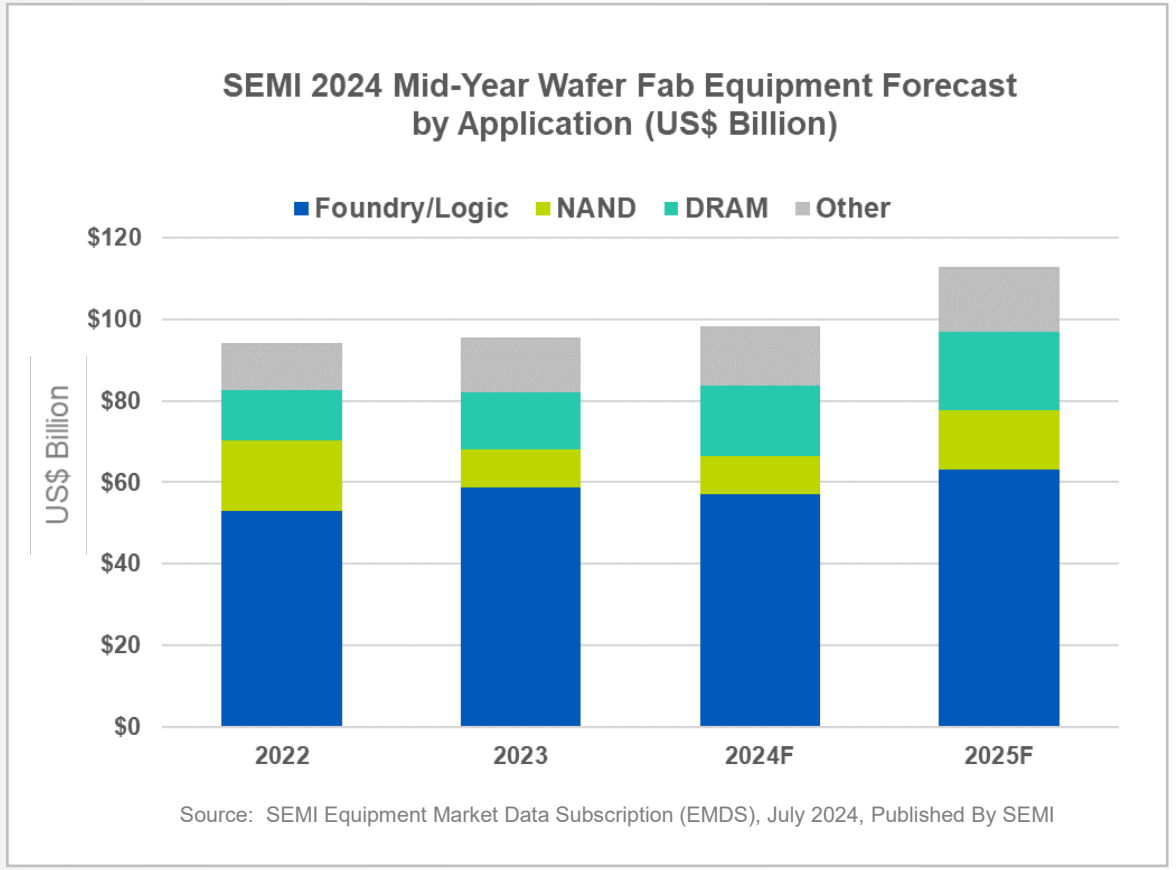
- **WFE** (Wafer Fab Equipment):
  to grow 3% to $98 billion.
- **Test** (Test equipment):
  to increase 7% to reach $6.7 billion.
- **A&P** (Assembly & Packaging) equipment:
  to rebound by 10% to $4.4 billion.

2025 is expected to see a **16% rebound** with double-digit growth across all segments, pushing the market to **surpass $127 billion,** setting a new record.

WFE Market Forecast by Device Segments

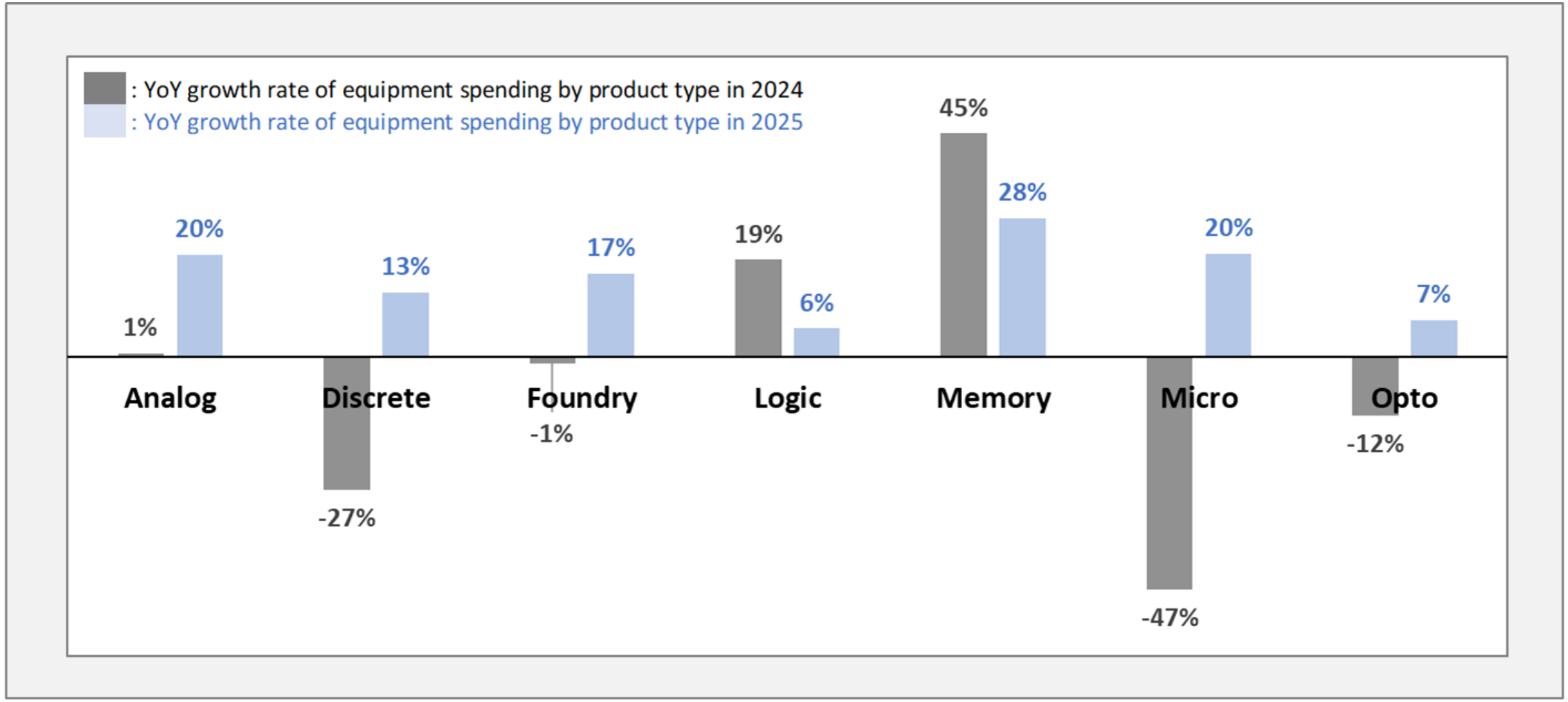
- **Overall WFE* market** reached **$95B in 2023** and is projected to grow **to ~$98B in 2024, with a further acceleration in growth** at **15% in 2025.**
- **Foundry and Logic** spending are expected to decline moderately by 3% in 2024 as a results of softer demand for mature nodes. The segment is expected to see a 10% growth in 2025, driven by leading-edge investment.
- **DRAM** spending is set to surge 24% to $17B in 2024; with a further increase of 12% to $19B in 2025 due to capacity expansion and investment in HBMs..
- **NAND equipment** sales are expected to remain flat in 2024, with 1.5% year-over-year increase, but a significant expansion of 56% to $15B is projected for 2025.

*WFE = WPE + M/R + Fab Facilities.



Fab Equipment Spending Outlook by Product Segments

Double-digit rebounds expected across major segments in 2025



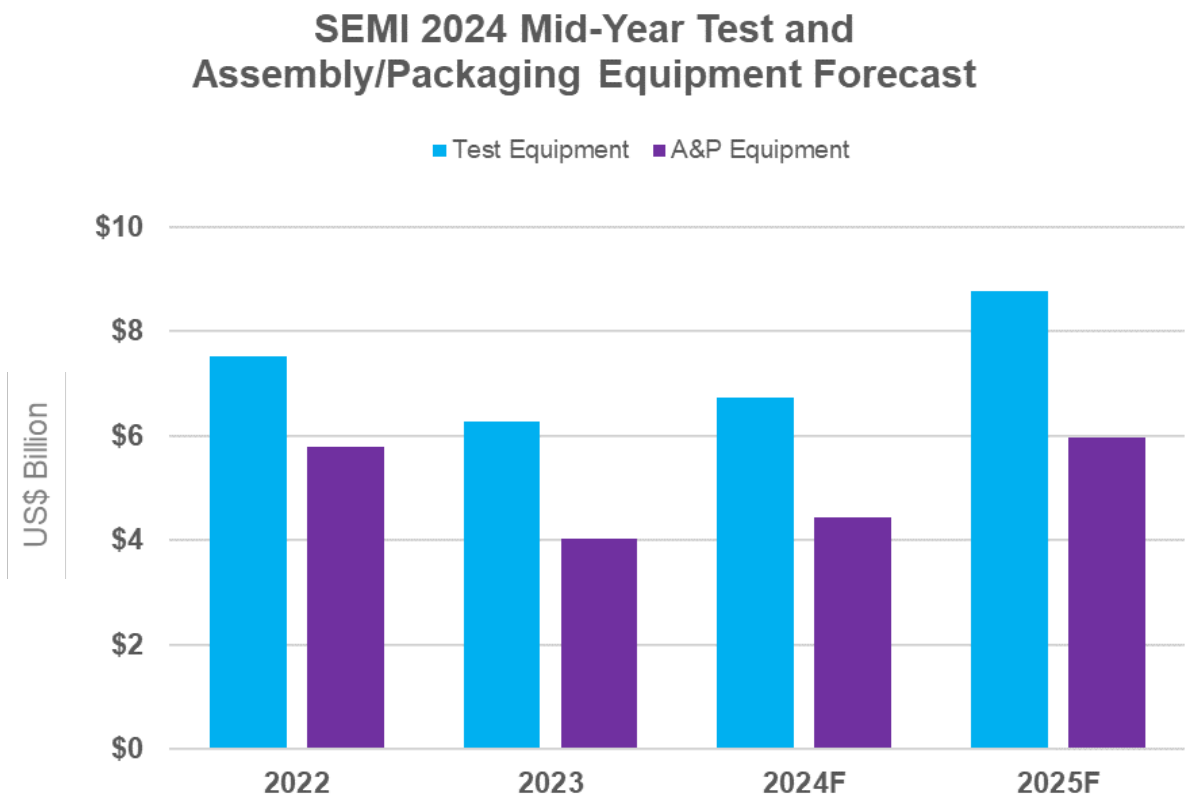
* Data source : SEMI World Fab forecast in June

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Test and Assembly/Packaging Equipment Market

- **Test Equipment** market shrank 17% in 2023 to $6.3B. Growth momentum is projected to pick up with 7% growth in 2024 and a further increase of 30% in 2025
  - **SoC test** shows softening demand for consumer electronics, automotive, and industrial, but strong demand for HPC/AI
  - **Memory test** experienced a sharper contraction in 2023, but strong strategic investments in high-end memory continue

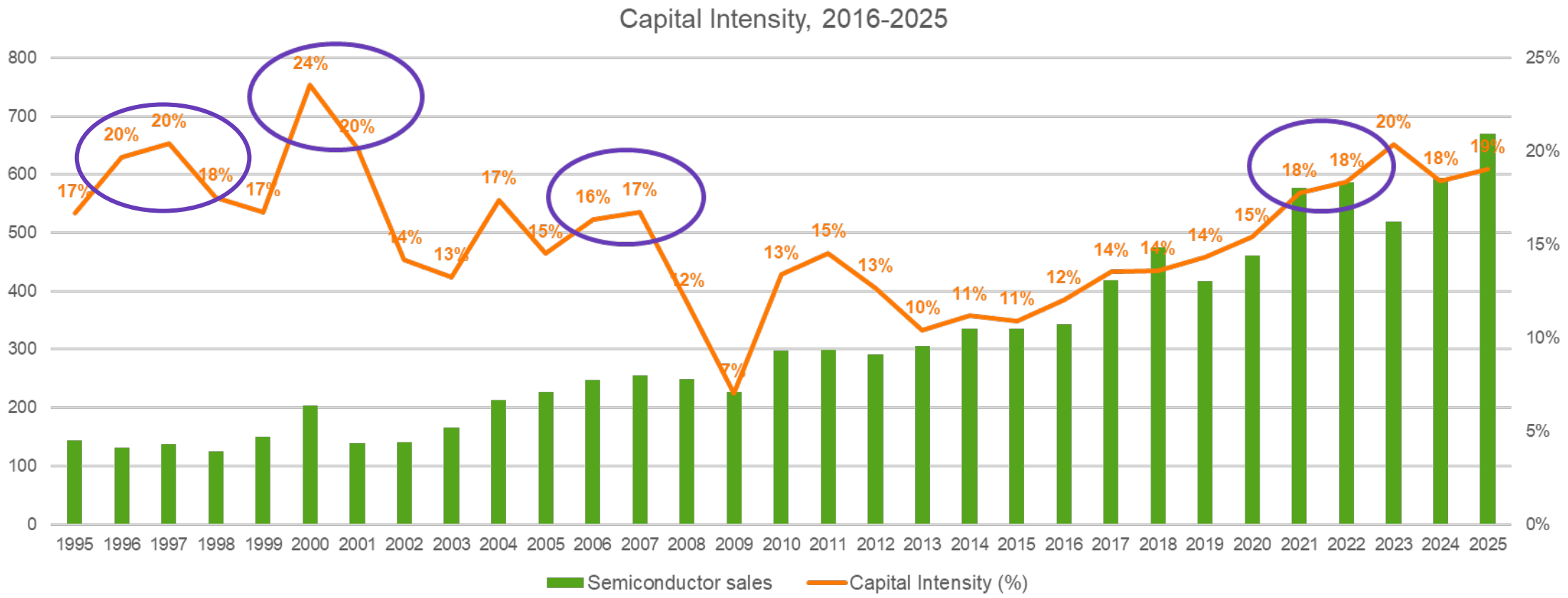
- **Assembly & Packaging** equipment dropped 30% in 2023 to $4B, reflecting weak market demand. Recovery is expected to begin in 2024 with 10% growth and a robust 35% increase in 2025
  - **Advanced packaging** (2.5D/3D packaging and Hybrid bonding) investment is notable, driven by surging demand for AI chips



Source: SEMI Equipment Market Data Subscription (EMDS), July 2024, Published By SEMI

Increasing Capital Intensity since 2021

Global Chips Acts and the regionalization of semiconductor manufacturing are boosting capital intensity



Source: SEMI, July 2024

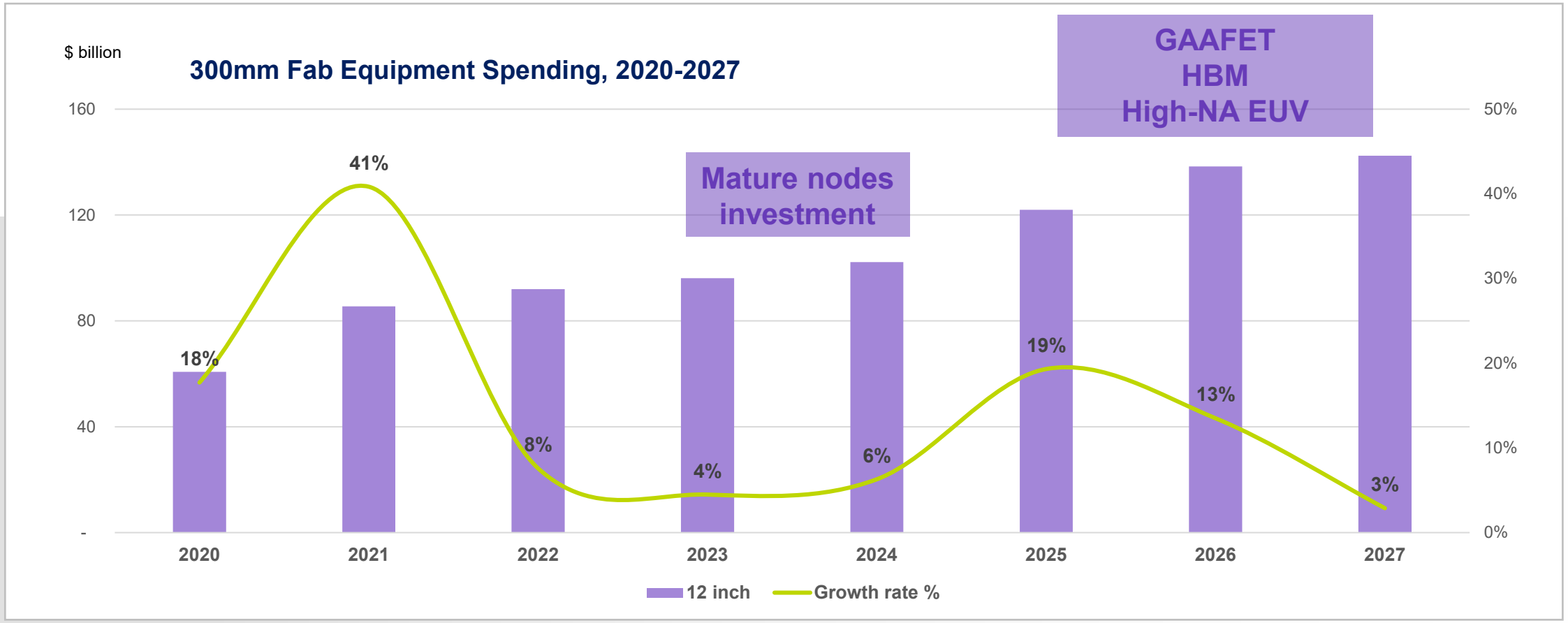
Capital intensity: Semiconductor equipment sales as % of semiconductor sales



SEMICONDUCTOR Fab Investment

300mm Fabs Investment

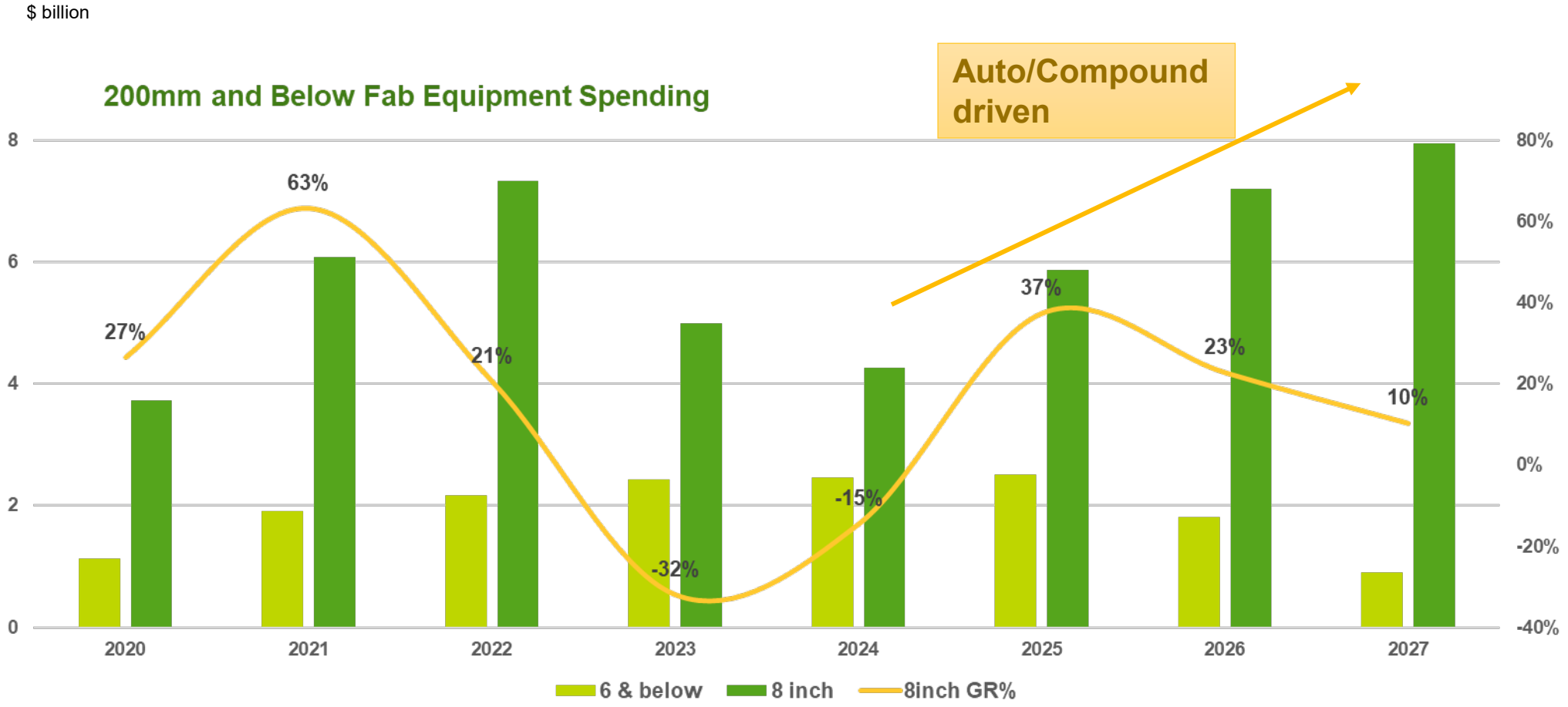
Technology, Capacity and Global Incentives



Source: SEMI World Fab Forecast, July 2024 Preliminary

The Fluctuations of 200mm Investment

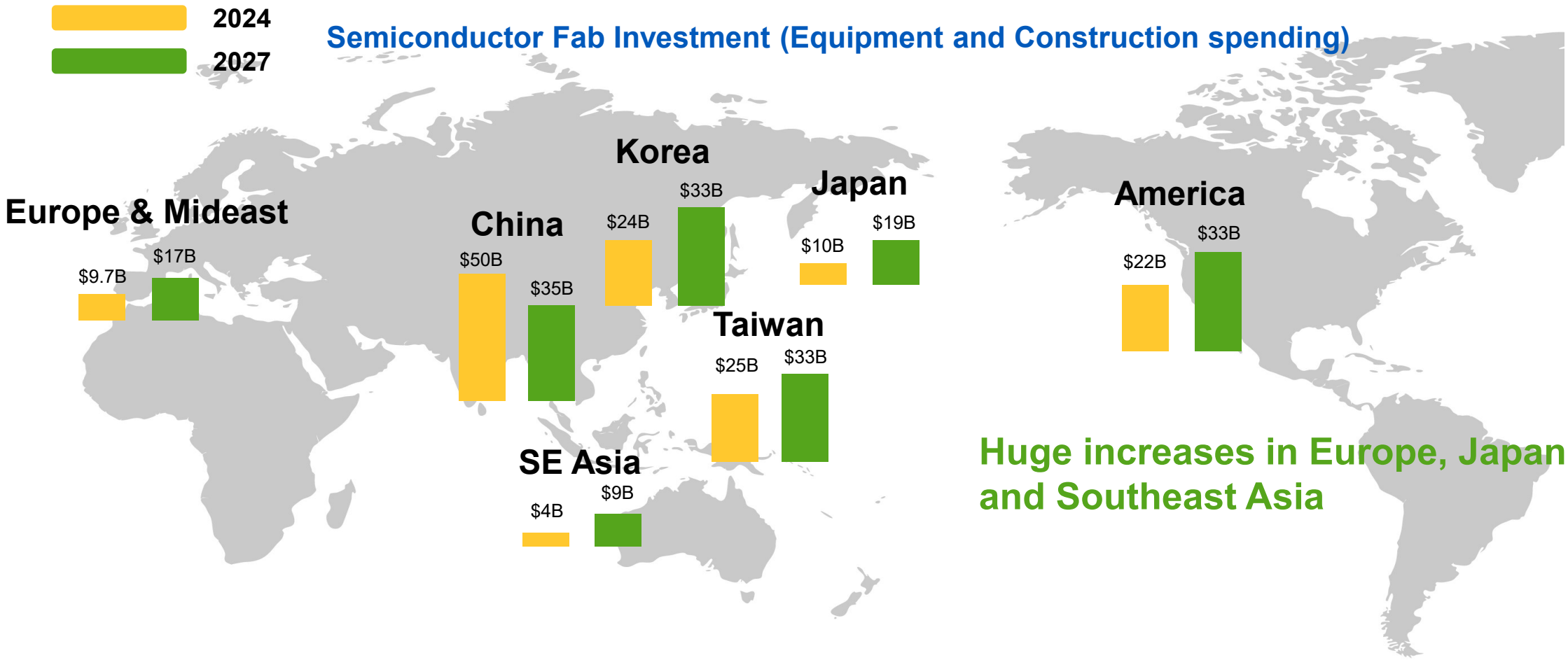
Automotive and Compound semiconductors are key drivers



Source: SEMI World Fab Forecast, July 2024 Preliminary

Dynamics and Shifts in Fab Investment

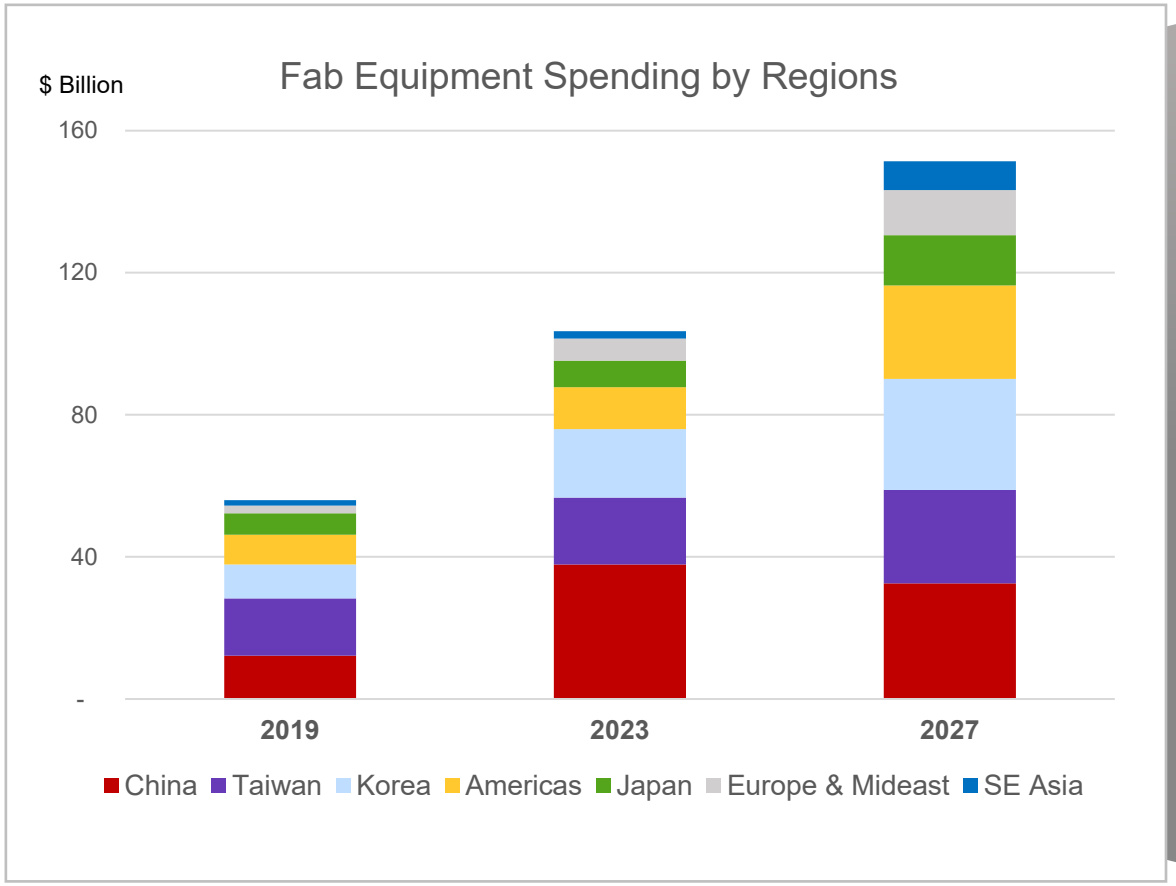
Geopolitics, Chip Acts and Supply Chain Resiliency Initiatives all contribute to the investment shifts

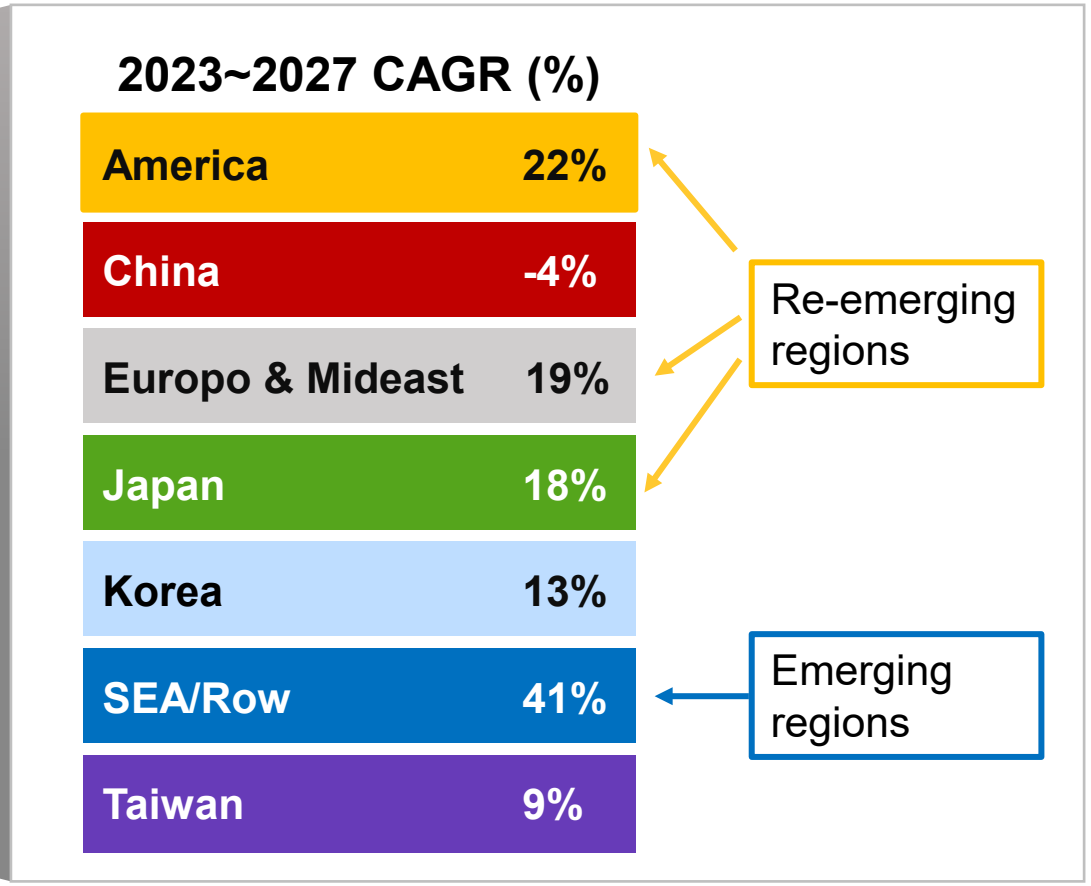


Huge increases in Europe, Japan and Southeast Asia

Source: SEMI World Fab Forecast Prelim., July 2024

Top Spending Regions V.S. Re-emerging and Emerging regions

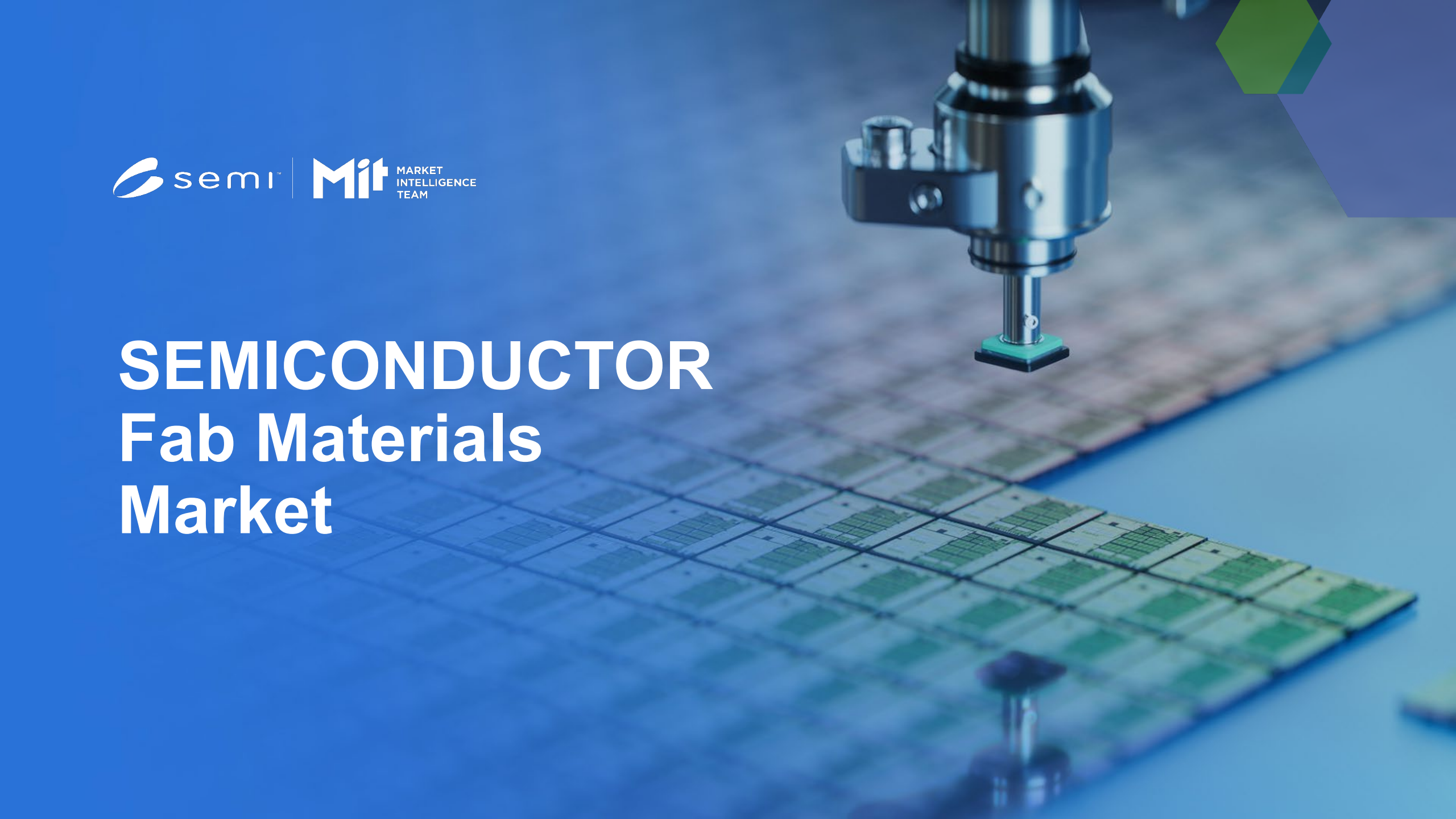




Source: SEMI World Fab Forecast Prelim., July 2024

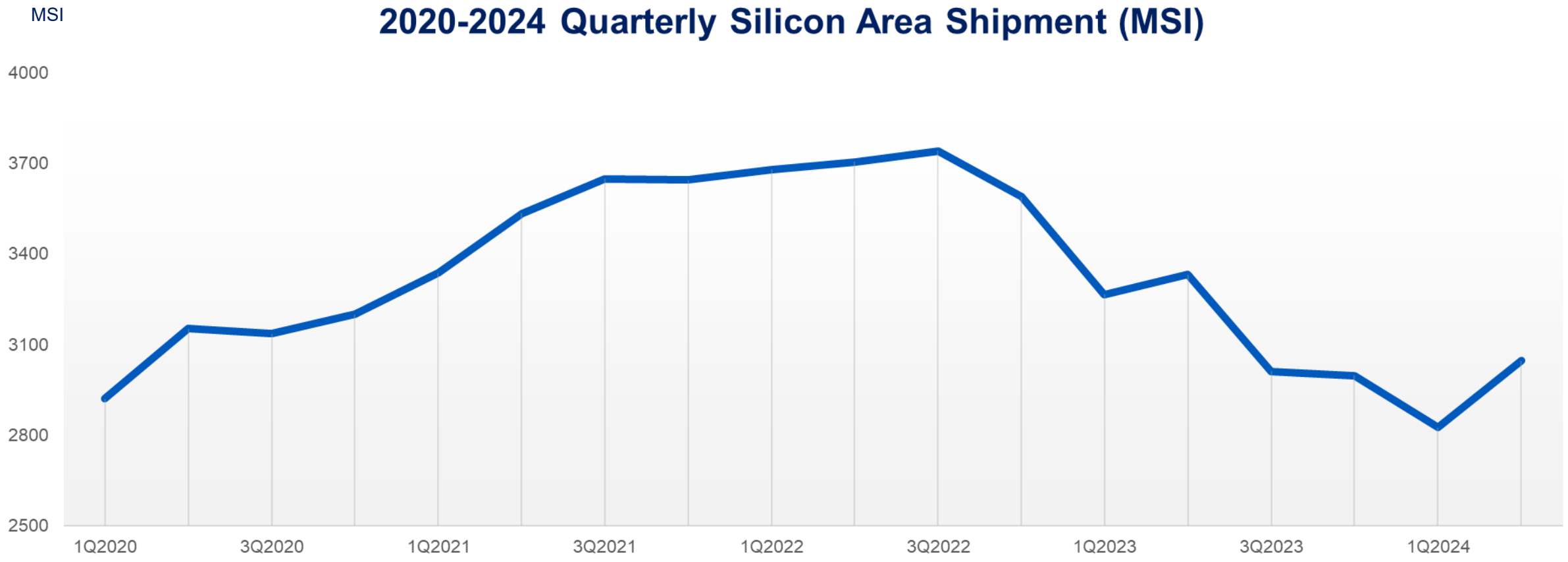
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SEMICONDUCTOR Fab Materials Market



Silicon Wafer Shipment Trends

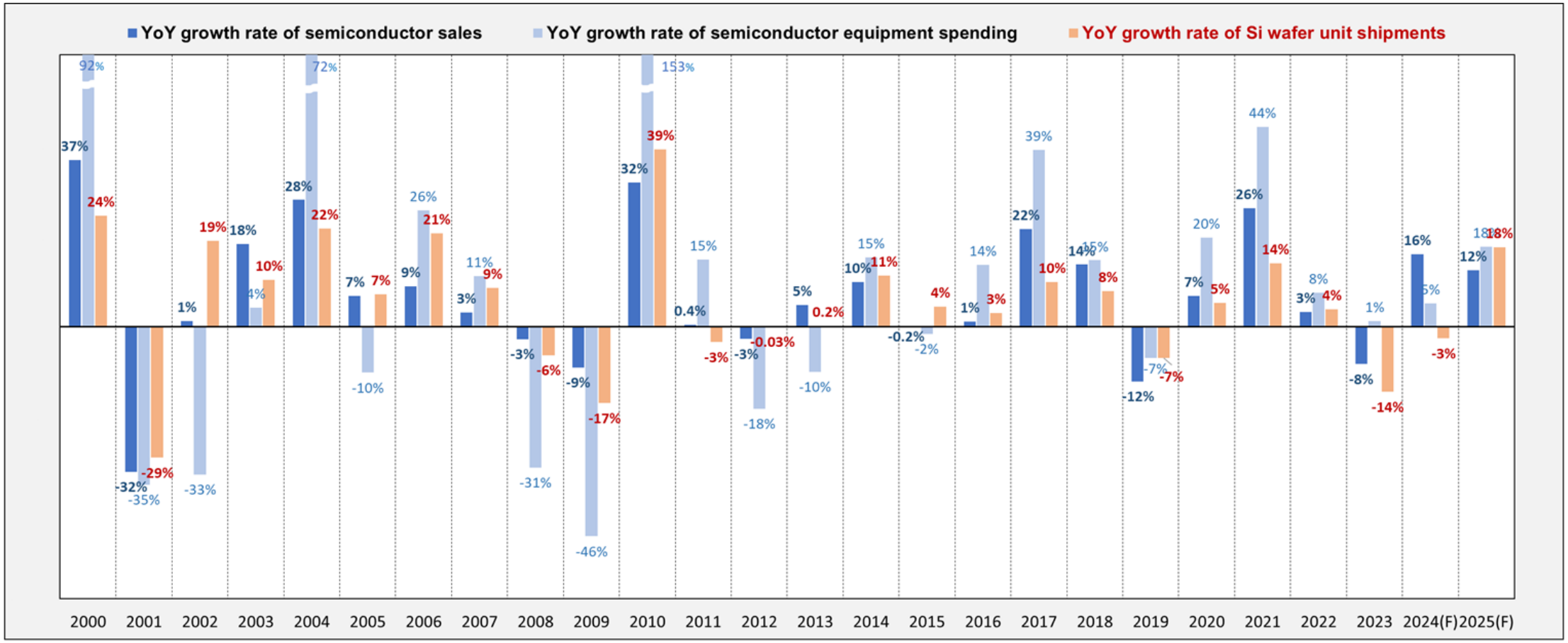
Silicon shipment bottomed in 1Q24; Steady recovery is expected throughout 2024



Source: SEMI Silicon Manufacturers Group (SMG), July 2024

2Q24 MSI grew 8% QoQ but declined 9% YoY

The Comparison of Semiconductor sales, Semicap and Silicon wafers market growth

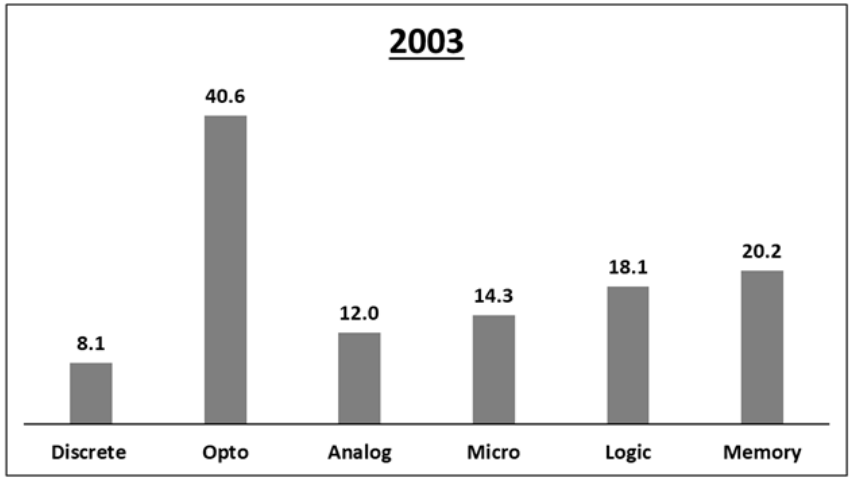


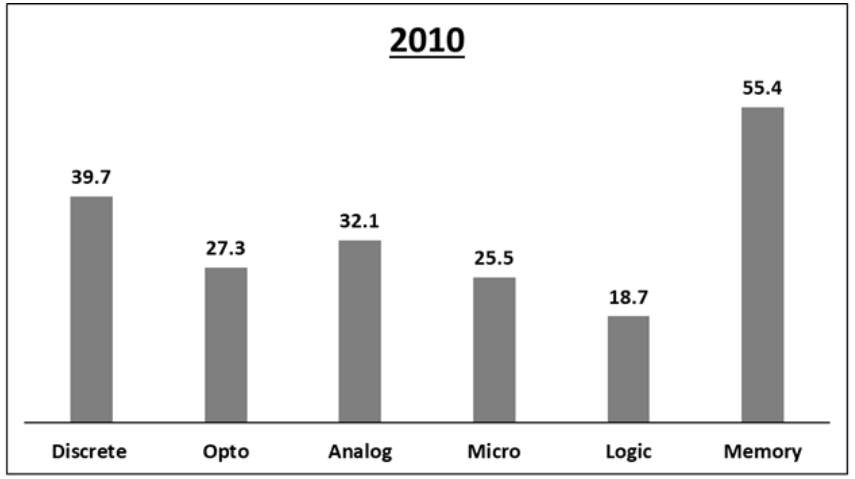
* Data source : SEMI WWSEMS & SEMI World Fab forecast & WSTS

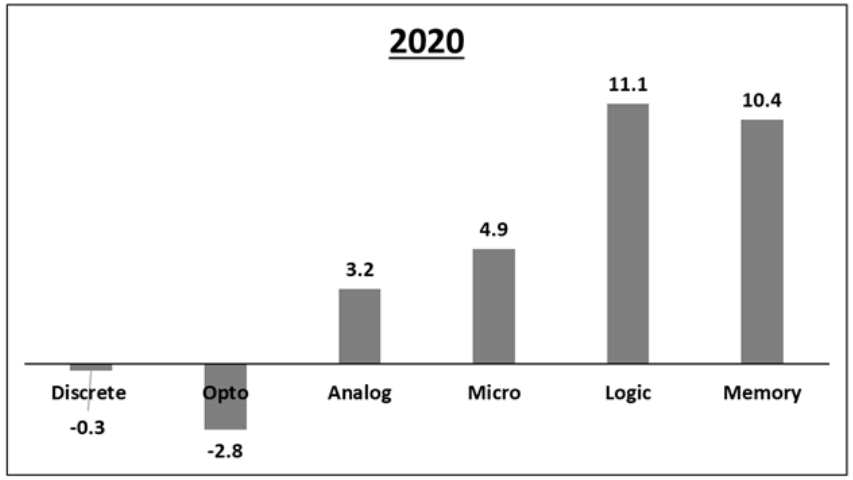
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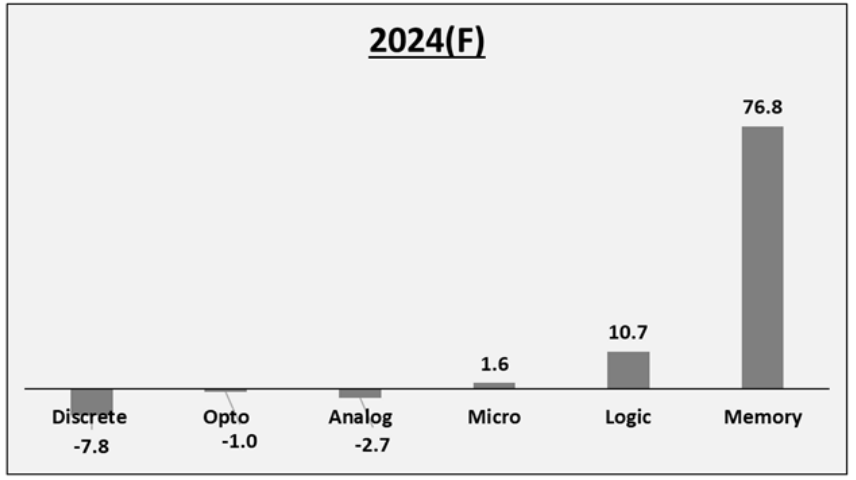
The Dependence of Memory Sales Growth in 2024

Revenue growth (%) by semiconductor device type for each year





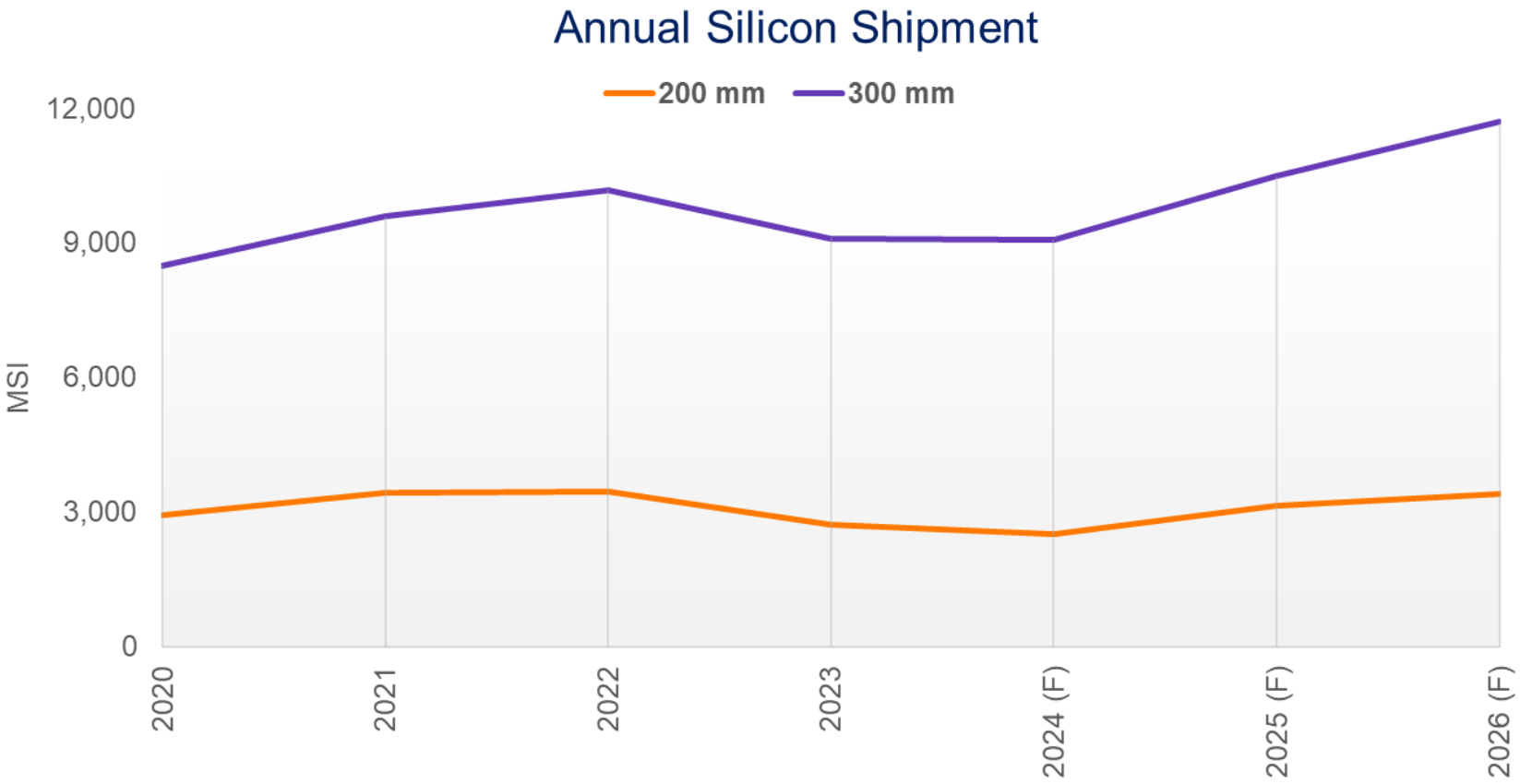




* Data source : WSTS

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Silicon Shipments Trend by Diameter



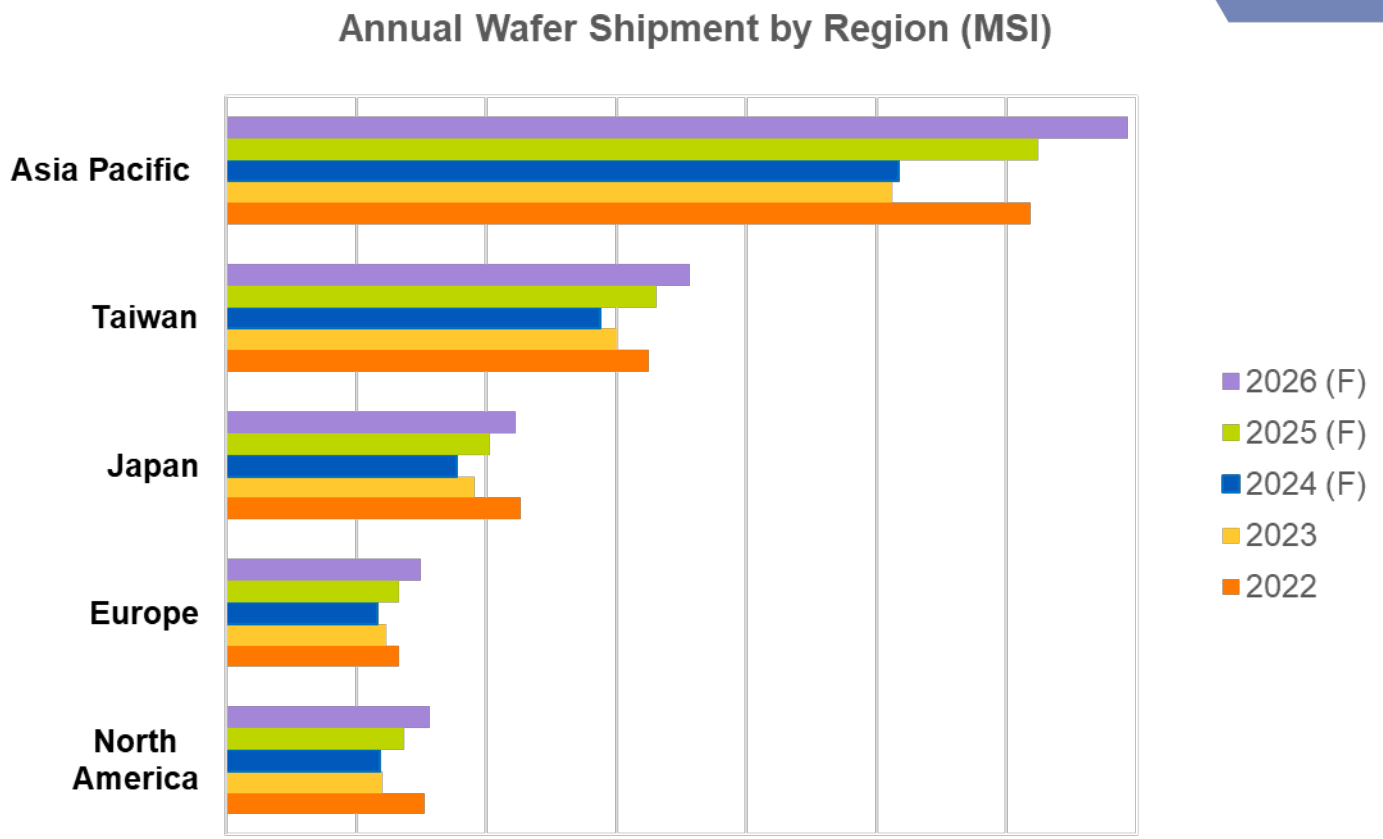
Source: SEMI Silicon Wafer Market Monitor 2Q24 update, July 2024

- In **2024**, total Silicon MSI shipments are expected to **decline 3% YoY**, following a 14% decline in 2023.
- Growth will resume from 2H24, with a projected **~18% increase in 2025 and 10% increase in 2026**.
- 300mm wafer shipment will be flat in 2024 followed by ~16% increase in 2025 and ~11% in 2026.
- 200mm wafer shipment are expected to further decrease 8% in 2024. The rebound of 25% is expected for 200mm MSI in 2025

Annual Silicon Wafer Shipments Trend by Region

Silicon shipments to all regions are expected **to rebound strongly in 2025. However, 2025 shipments may be slightly lower than the levels in 2022**.

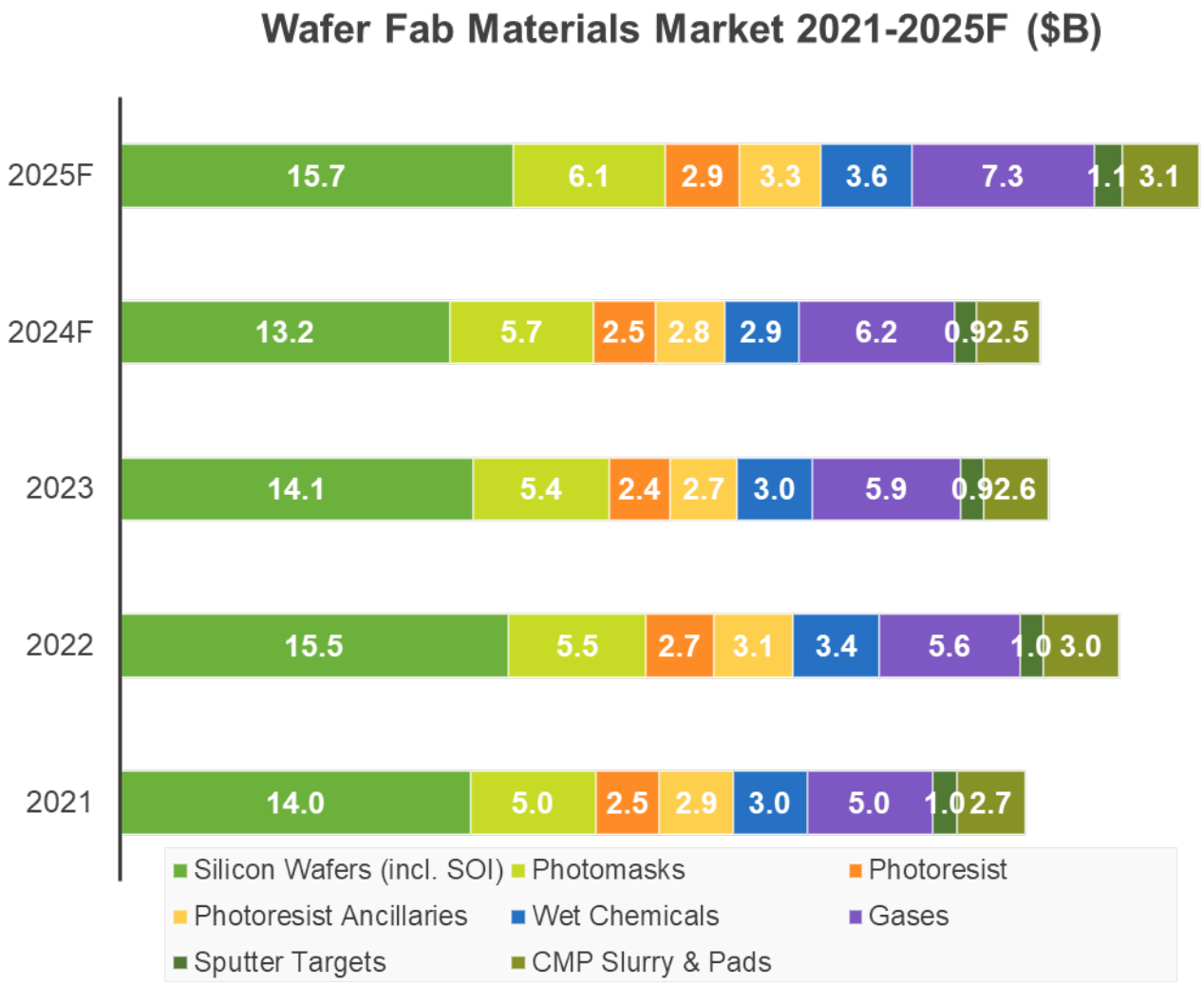
- **Asia Pacific,** including **Korea, China, and Southeast Asia,** is the only market expecting shipment growth in 2024 and is projected to **grow 21% in 2025.**
- **Taiwan** shipments are expected **to see decline of 4% in 2024 but increase 15% in 2025**
- **N. Americas** shipments are expected to **contract 2% in 2024** and **rebound 16% in 2025**
- **Japan and Europe** to show a **contraction of 7% and 6% in 2024** but **rebound by 14% in 2025**



NOTE: Silicon wafer shipments do not include etched wafer shipments

Source: SEMI Silicon Wafer Market Monitor Q2 2024 update, July 2024

Wafer Fab Materials Forecast

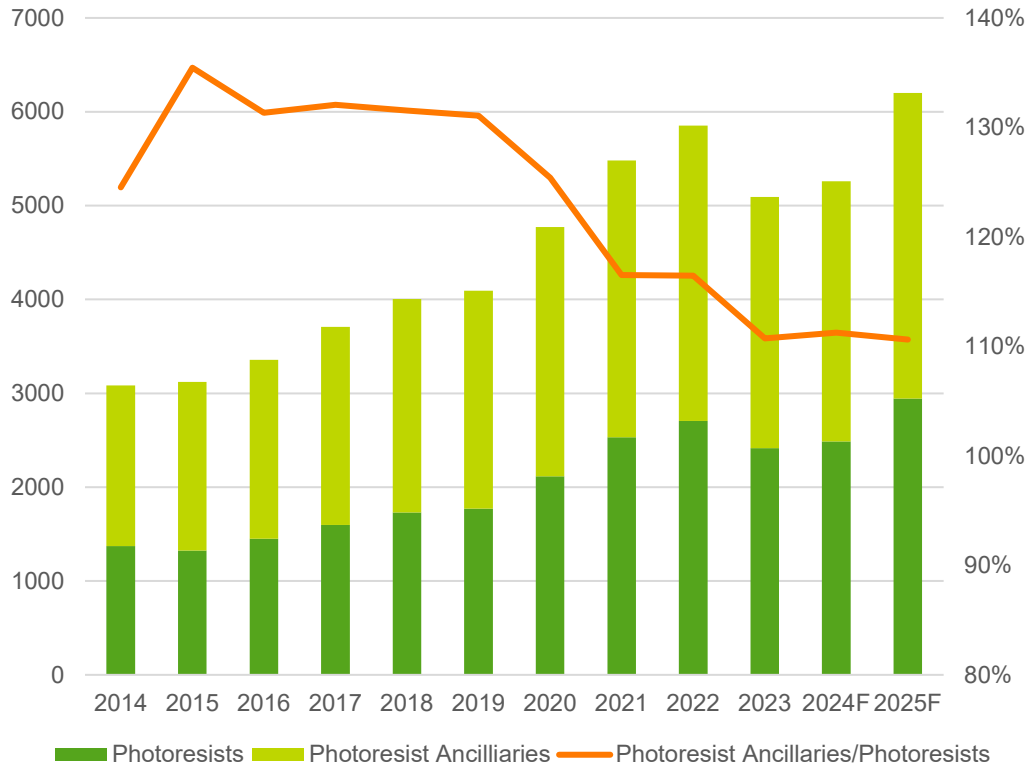


- 2024's outlook for wafer fab materials is mixed, with some segments showing continued softness while others have started to recover from 2023.
- **The Silicon wafer** market is expected to decrease to $13.2B 2024 and will recover strongly by ~20% in 2025.
- Other Fab materials, such as **Wet Chemicals**, **Sputter Targets**, and **CMPs,** are projected to experience slight declines in 2024.
- In contrast, sales of **Photomask**, **photoresists**, **photoresist ancillaries** and **electronic Gases** are expected to see single-digit growth in 2024
- WFM materials are anticipated to start recovering in H2 2024, with WFM market projected to reach a new record of $48B in 2025.

Source: SEMI, Materials Market Data Subscription (MMDS), July 2024

Innovations in wafer processes drive the growth of photoresists and peripheral materials

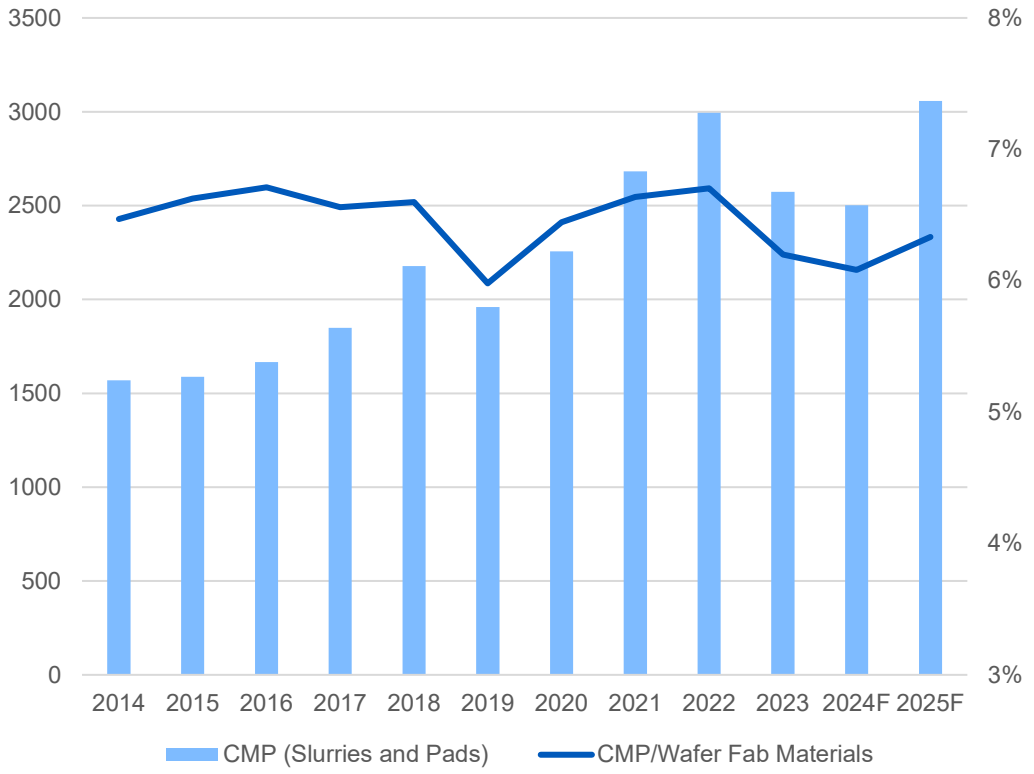
Photoresists & Photoresist Ancilliaries



Source: SEMI, Materials Market Data Subscription (MMDS), July 2024

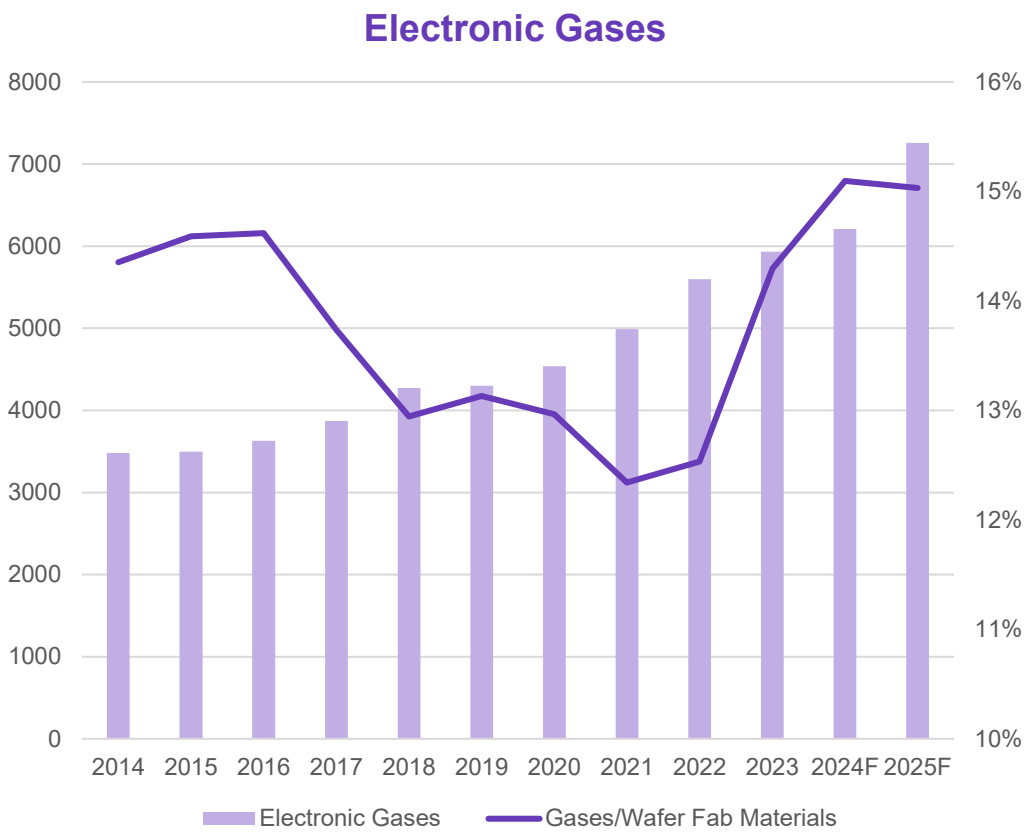
Miniaturization, 3D structure and high-density drive expansion of CMP materials

CMP



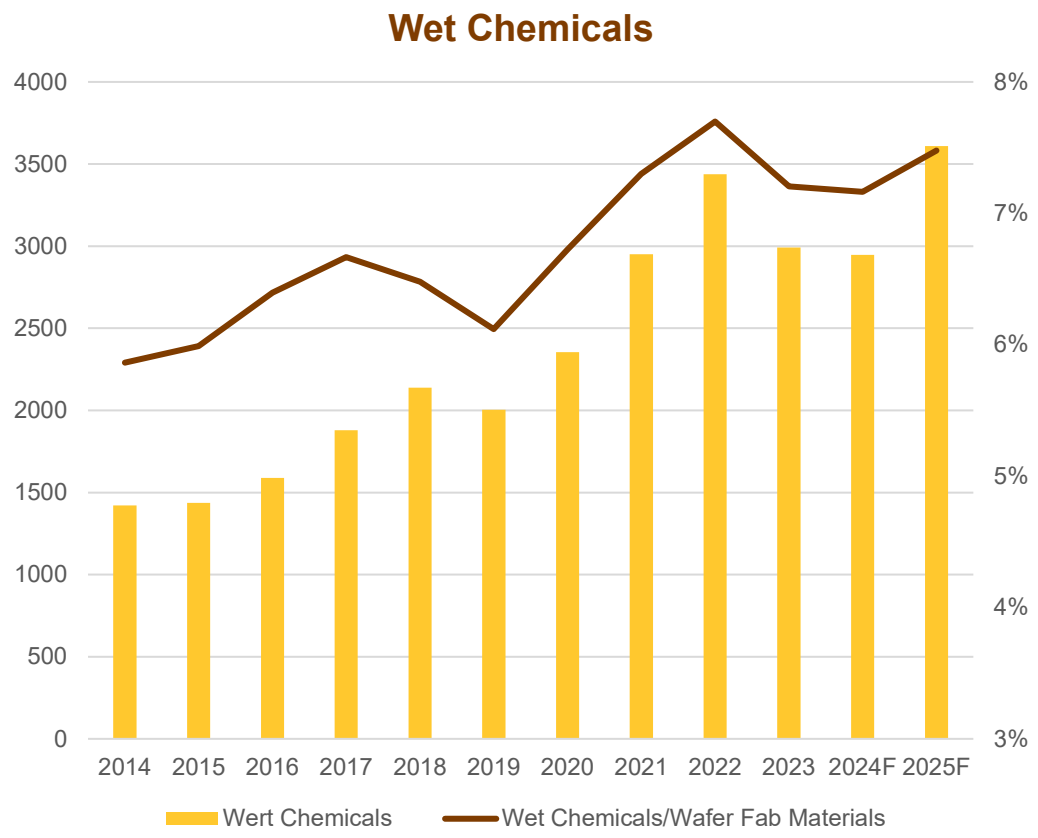
Source: Linx Consulting, SEMI, Materials Market Data Subscription (MMDS), July 2024

Electronic Gases market growth is driven by the increasing node complexity, wafer etching and chamber cleaning



Source: SEMI, Materials Market Data Subscription (MMDS), July 2024

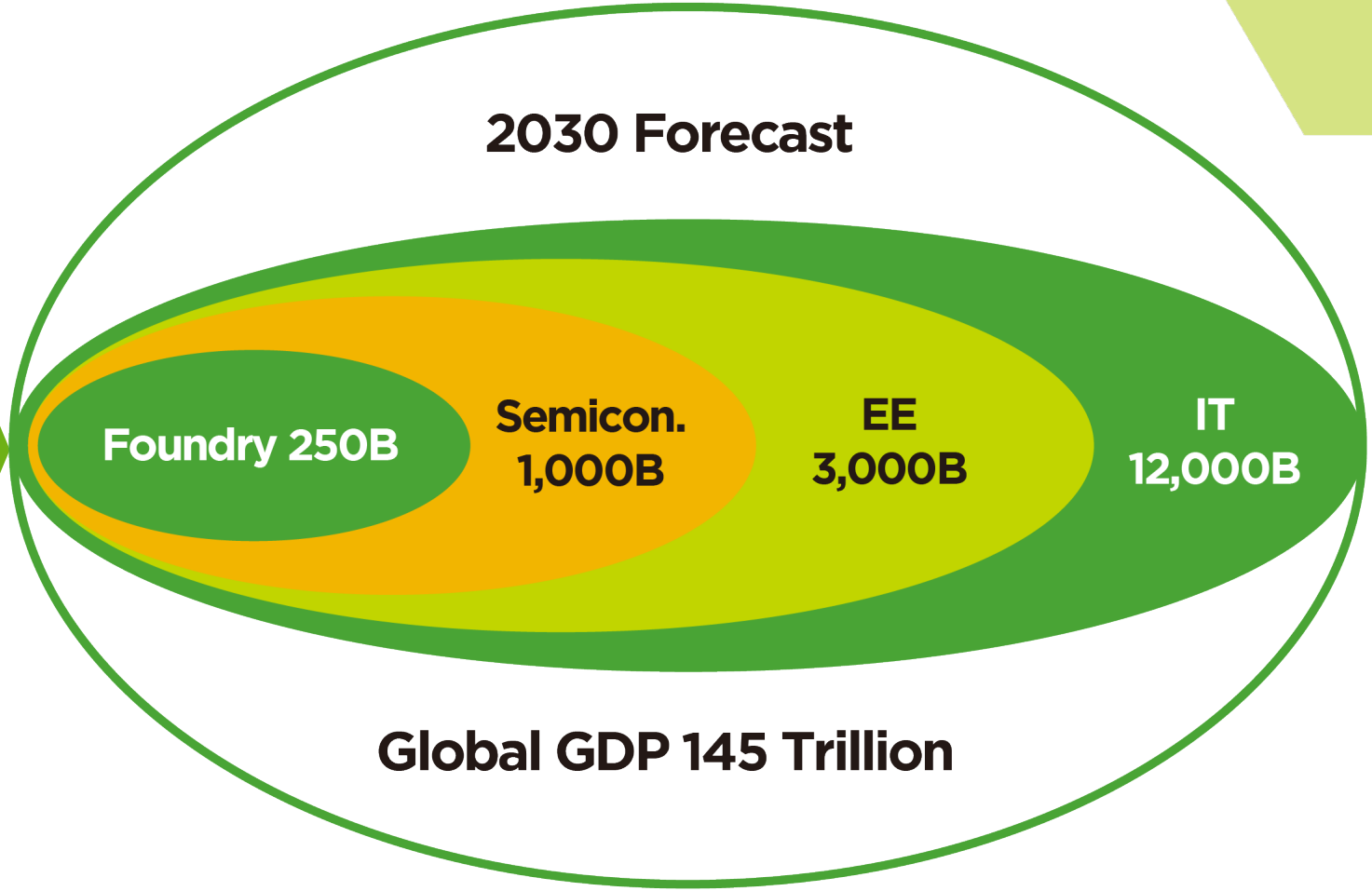
Key drivers include advanced lithography, material innovation, yield improvement, and environmental regulations.



Source: SEMI, Materials Market Data Subscription (MMDS), July 2024

Summary

The Scale and Growth Potential of Electronics and Semiconductors Supply Chain



Source: DIGITIMES, Gartner, SEMI, Feb 2024

Summary

The market is poised for a strong recovery in 2025

Near-term outlook will continue to show a mild upturn instead of a sharp rebound

- The gradual recovery will be supported by the improvement in end demand in major electronics segments and the surging demand for AI chips.

Equipment & Material markets are expected to show minimal improvement in 2024, followed by a strong recovery in 2025

- China's investment remain significant in WFE market.
- GAA, HBM and advanced packaging are key areas of new investment in the industry.
- Wafer fab materials outlook in 2024 is mixed, with some segments showing continued softness while others have begun to recover from 2023.

Fab Investment

- Global Chip Acts and Regionalization will continue to drive fab investment worldwide.
- Semiconductor investment and capacity growth will diversify across geographies in the next few years.

Thank You

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