



Global Macro- Economics and Material Trends

May 11, 2017

Topics

- **Industry overview and trends**
- **M&A Overview**
- **KPMG 2017 Semiconductor Executive Survey Results**
 - Key Takeaways
- **Expectations for 2017 & 2018**
- **What it means for suppliers and the materials industry**

Industry structure

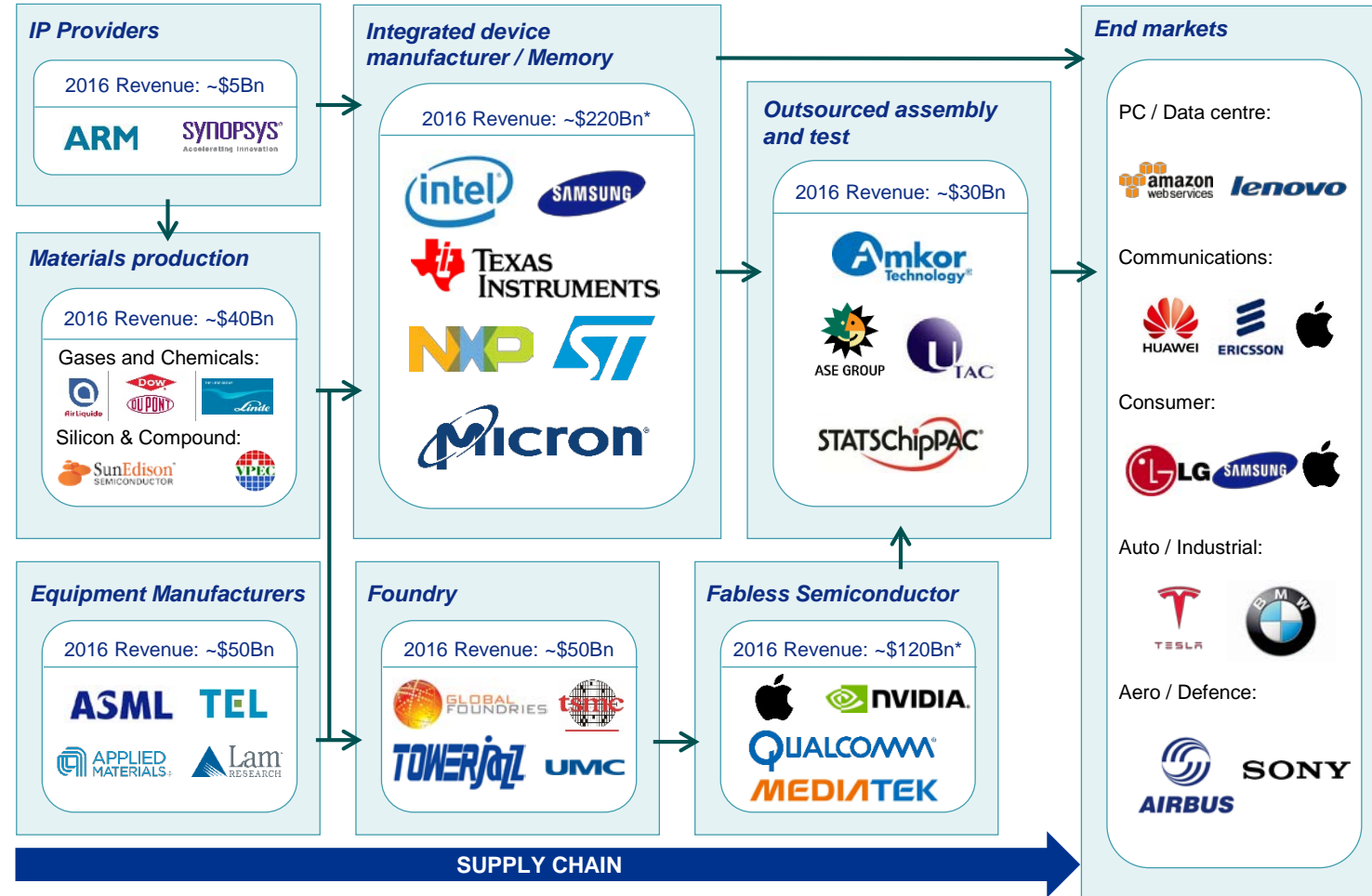
Continued consolidation across the entire semiconductor value chain:

- Dow-Dupont
- Linde-Praxair
- NXP-Qualcomm

Moore's Law is slowing creating more uncertainty on technology roadmaps

Revenue growth in Semiconductors has slowed from high single digits to low single digits after the financial crisis

As fewer companies invest in leading edge manufacturing technology more large tech companies are developing their own silicon to meet internal demand for computing capabilities



Note (*): Sum of Integrated device manufacturer / memory and Fables Semiconductor is roughly equal to the reported 2016 industry market size on the next slide

Source: Semiconductor Industry Association, KPMG

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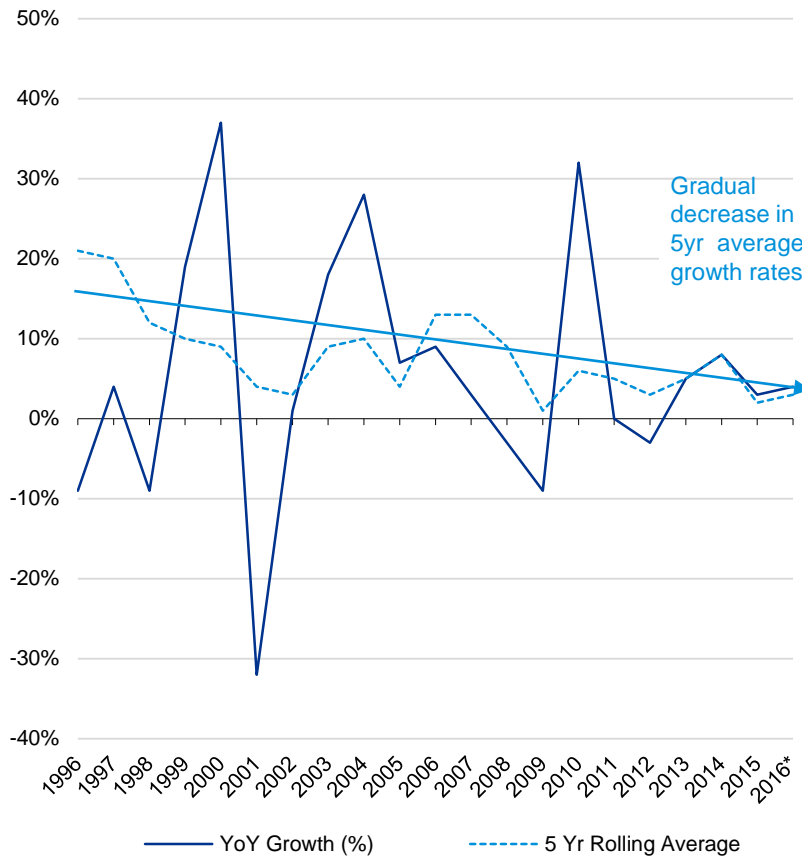
Historical semi conductor sector revenue and R&D trends

The semiconductor sector revenue was \$340Bn in 2016, growing ~1.5% in 2015-2016

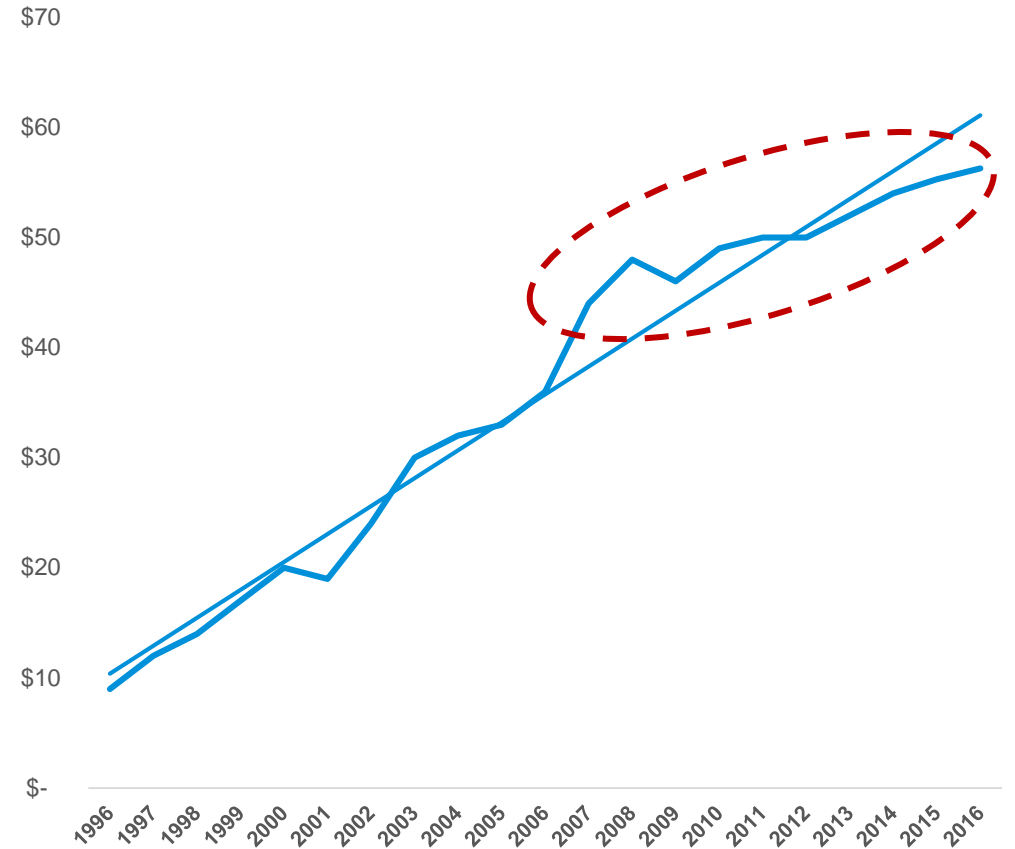
R&D spending has recently begun to grow below it's historical trend line

R&D spending peaked well above it's historical trend line in 2007 and there did not appear to be a corresponding increase in revenue following that investment., perhaps due to the financial crisis.

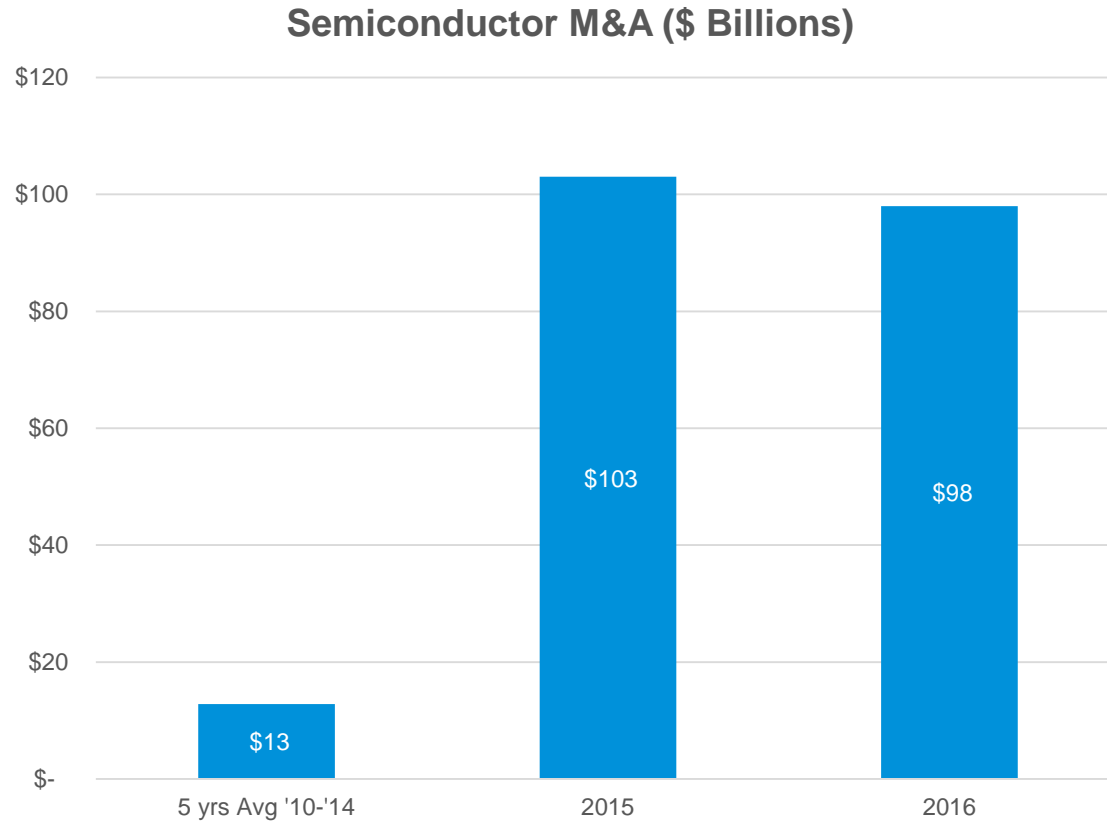
Semi conductor market revenue Growth Rate



Semiconductor R&D Spend (\$B)



Semiconductor M&A Activity in Perspective

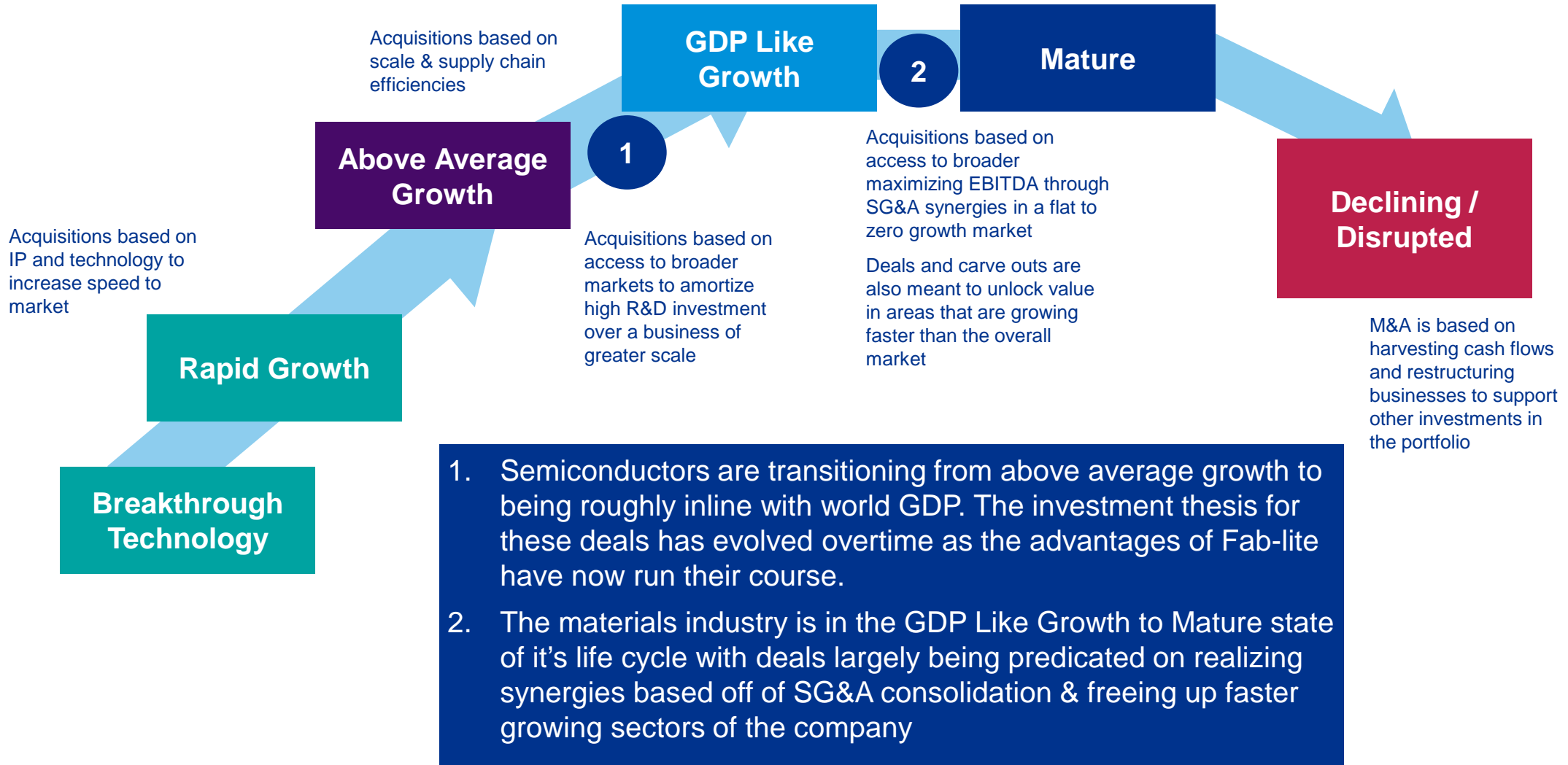


Rank	Deal - Year	Value
1	Qualcomm-NXP (2016)	\$39.0B
2	Avago-Broadcom (2015)	\$37.0B
3	Softbank- ARM (2016)	\$32.0B
4	Western Digital- SanDisk (2015)	\$19.0B
5	PE- Freescale (2006)	\$17.6B
6	Intel- Altera (2015)	\$16.7B
7	ADI- Linear (2016)	\$14.8B
8	NXP-Freescale (2016)	\$11.8B
9	Texas Instruments –BurrBrown (2000)	\$7.6B
10	Avago- LSI Logic (2013)	\$6.6B

Trends that are on our radar

- **Expectations for growth are more in line with reality and investment in R&D and Capital are coming down in line with those growth expectations**
- **Rising Cost to innovate and scale. Moore's Law is slowing.**
- **Companies are now focusing on supply chain efficiencies and obtaining greater scale for R&D investments**
- **Silicon is being seen as more of a commodity**
- **Software and services are the differentiator... Intel buys Mobileye for \$16B.**
- **Majority of Semiconductor acquisitions are small software deals**
- **China is still a major player in M&A although regulatory concerns are blocking a significant amount of deals**
- **Private equity and sovereign wealth funds are starting to come back to the table on Semis**
- **Can big deals get done in Semi Cap Equipment? Lam/KLA and AMAT/TEL were killed by the regulators based on customer feedback and concerns. Even Aixtron was blocked.**
- **Trump administration- America first? What the implications?**

Industry Life Cycles and M&A Drivers



2016/17 KPMG Semiconductor Executive Survey

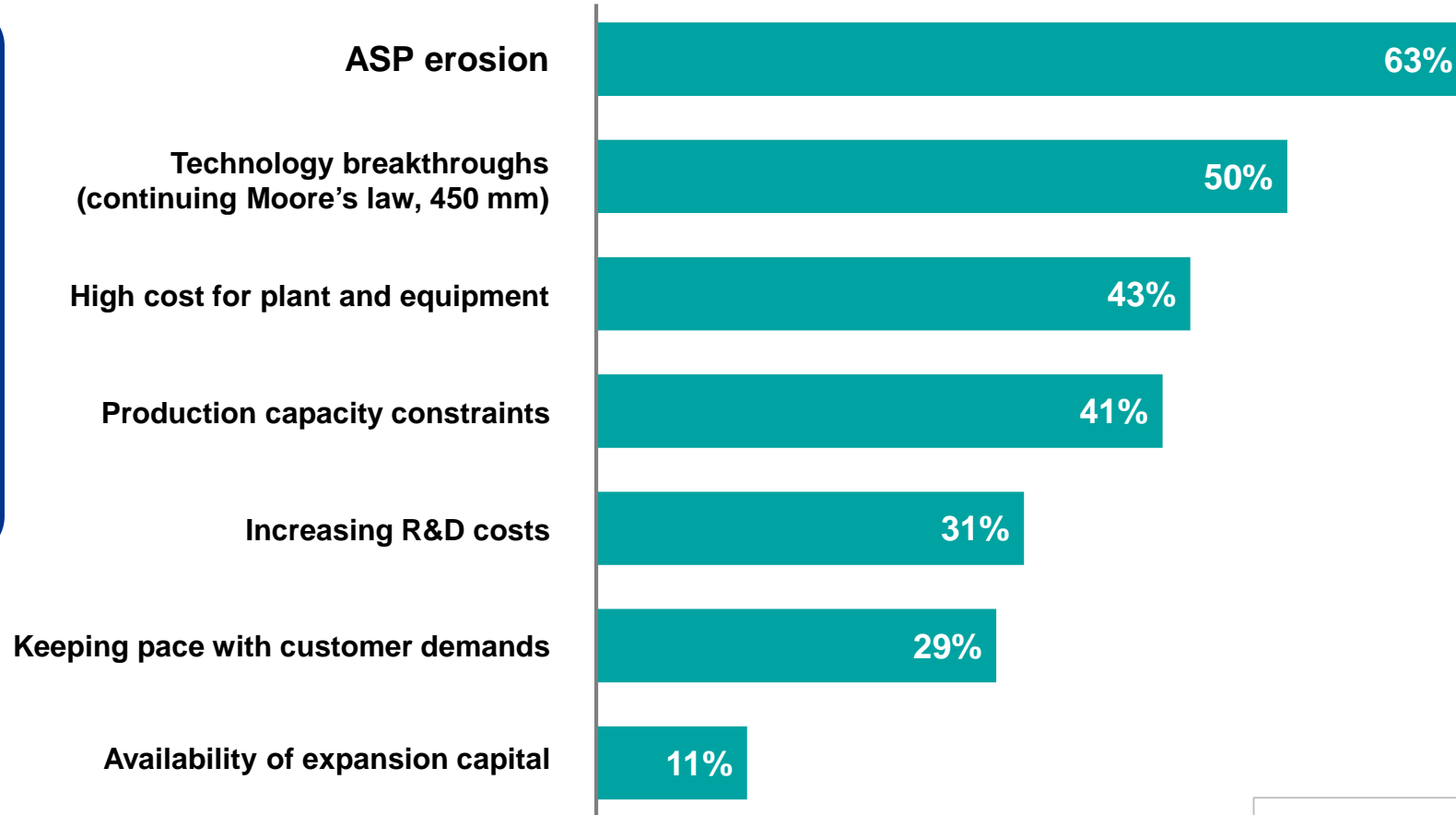


Headlines

- Revenue expectations flattening, driving cautious investment outlook in both short and medium terms
- The #1 strategic priority is “diversifying into a new business area”
- #1 concern was on ASP pressure
- Respondents expect M&A activity to continue to be higher than historic averages
- There is significant opportunity to become more efficient with R&D spending
- New competitors/disruptors seen as the biggest impact on future growth
- USA resumes #1 position as most important area for revenue and headcount growth
- Sensors/MEMS is the #1 sector expected to provide growth opportunity in 2017
- Wireless Communications, IoT, and Automotive are the top 3 applications for driving growth

Industry issues | ASP erosion

What do you see as the biggest issues facing the semiconductor industry during the next three years?



Multiple responses allowed

Source: KPMG Global Semiconductor Industry Survey 2016



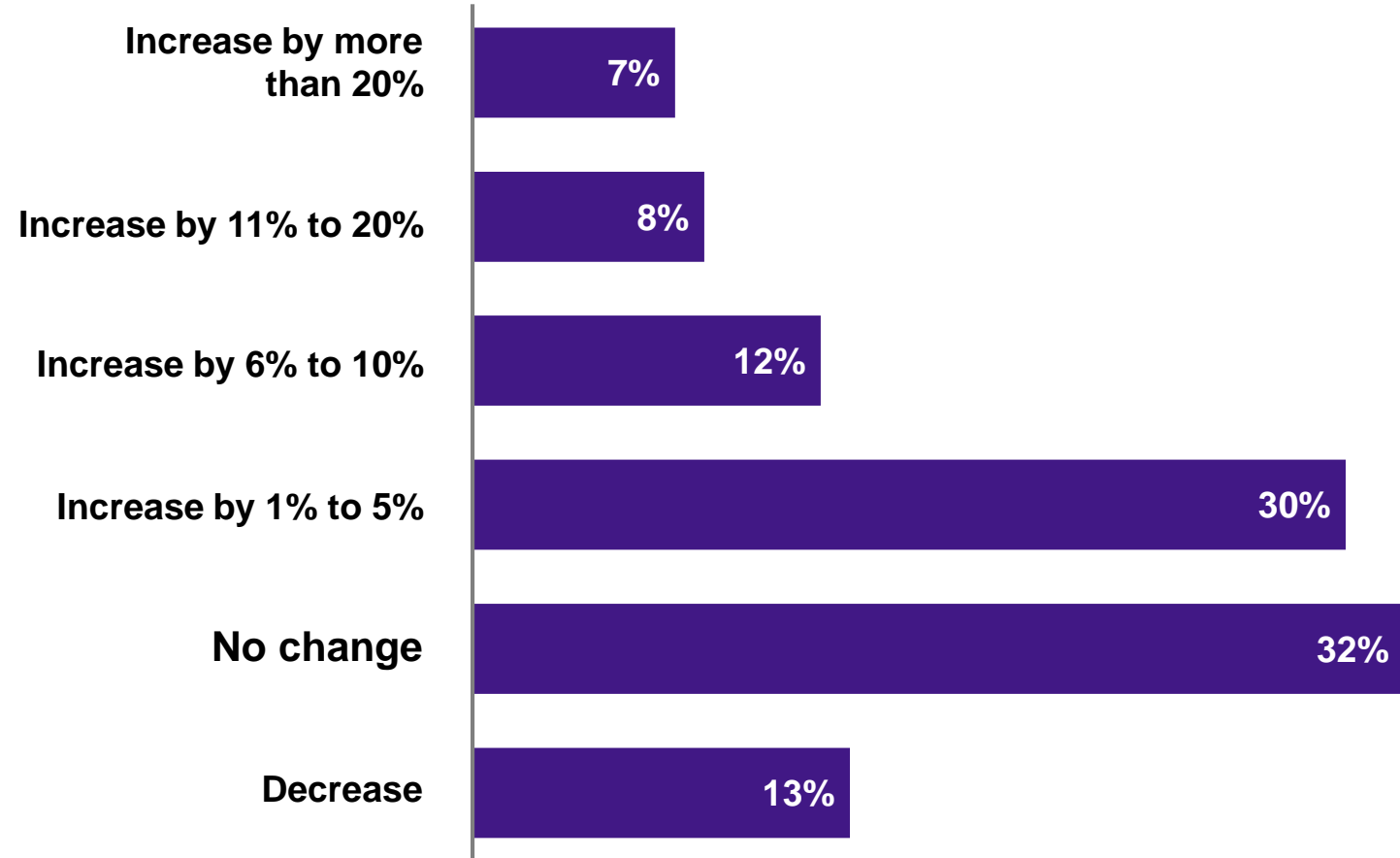
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Value of M&A deals | majority expect increase

What is your prediction for the rate of change in the aggregate valuation of semiconductor M&A deals in 2017 compared to 2016?

NOTE: This survey responses were gathered just before the ARM/Softbank and Qualcomm/NXP deals were announced.

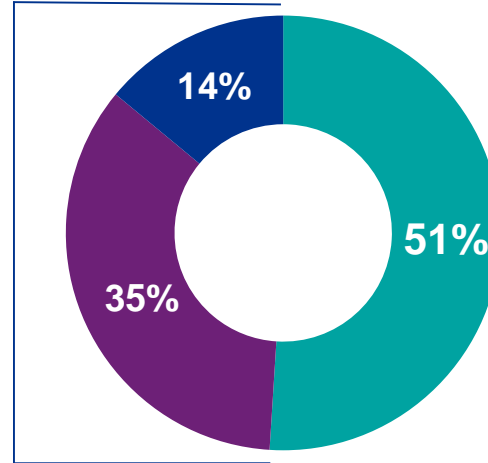
Source: KPMG Global Semiconductor Industry Survey 2016



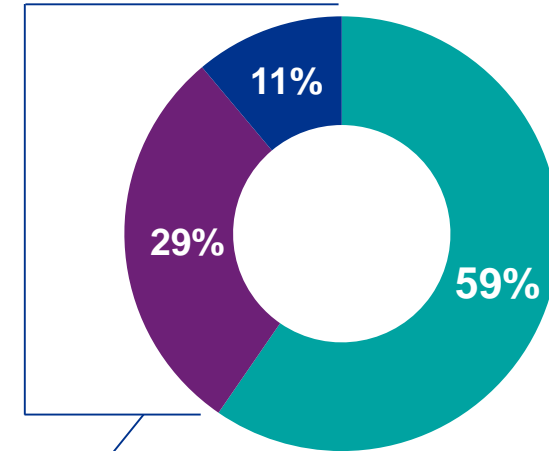
R&D efficiency | widespread inefficiencies

How efficiently is your R&D spending aligned with your current core customers and products and allocated to future growth opportunities?

Current customers/products



Future growth opportunities



40-49% indicate R&D is not efficiently aligned

■ Inefficient or very inefficient

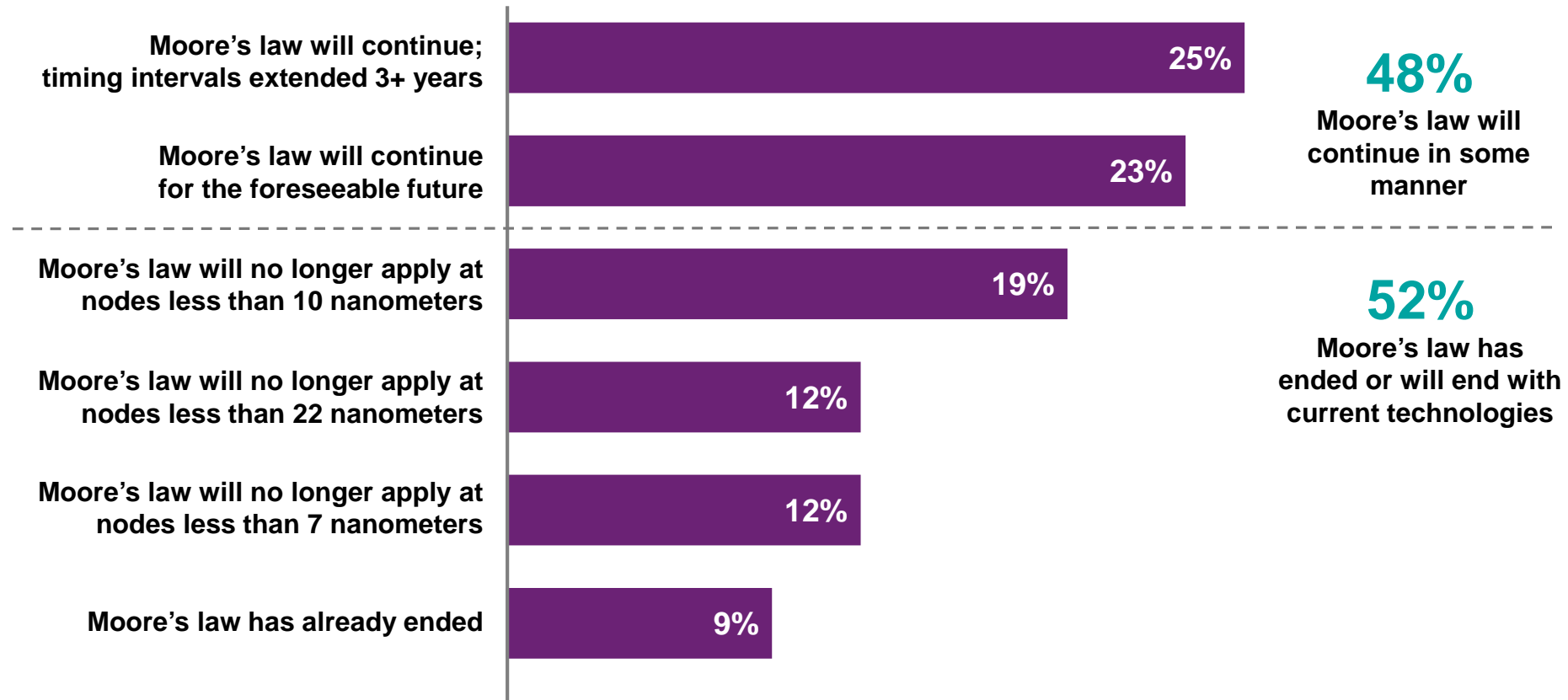
■ Somewhat inefficiently

■ Efficient or very efficiently

Source: KPMG Global Semiconductor Industry Survey 2016

Technology roadmap | opinions split on Moore's law

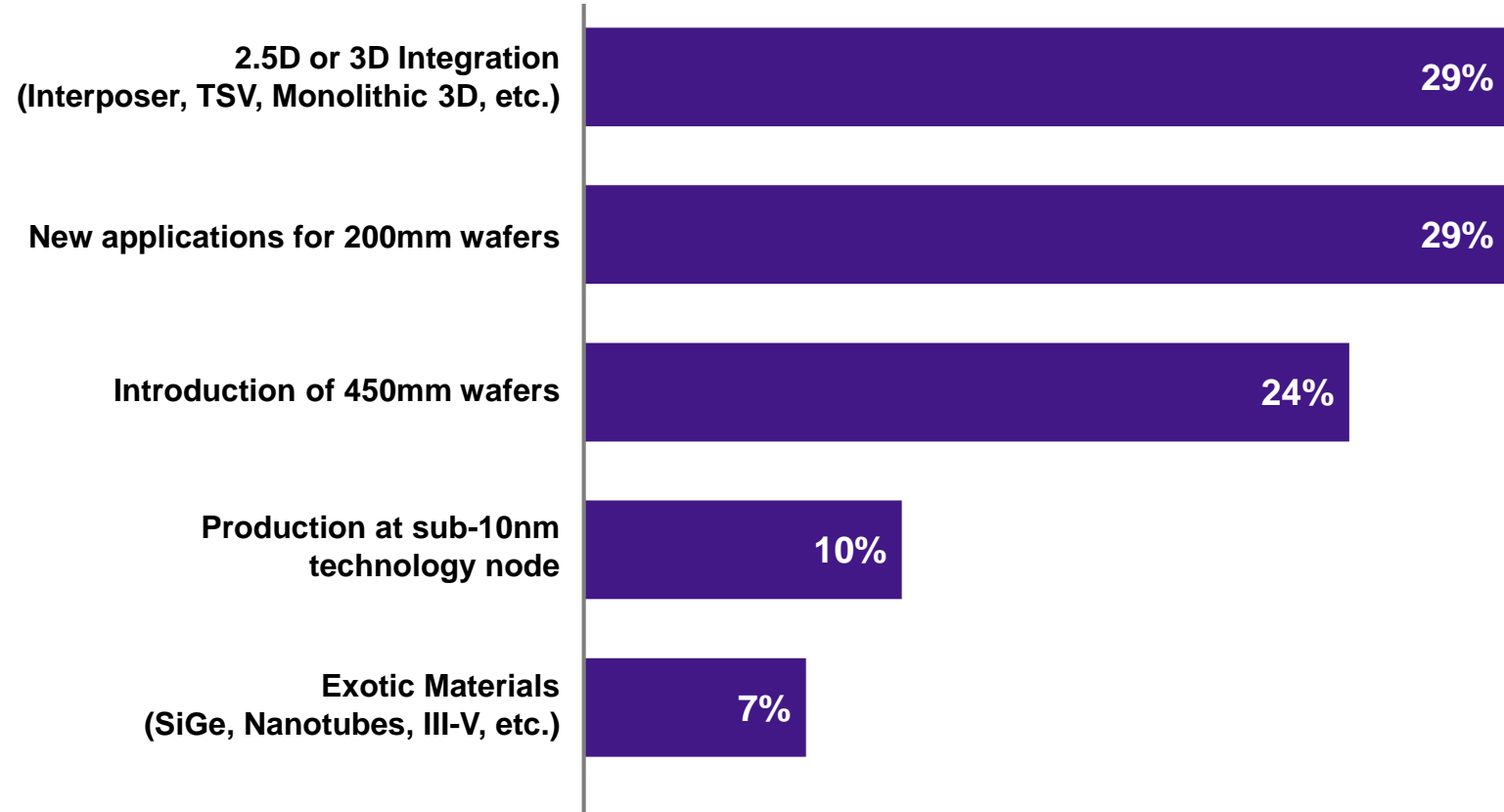
Which of the following best describes your perspective on the outlook for Moore's law?



Source: KPMG Global Semiconductor Industry Survey 2016

Technology roadmap | existing technologies still relevant

Thinking about the future of production technology, which will have the greatest impact on the semiconductor industry in the next 5 years?



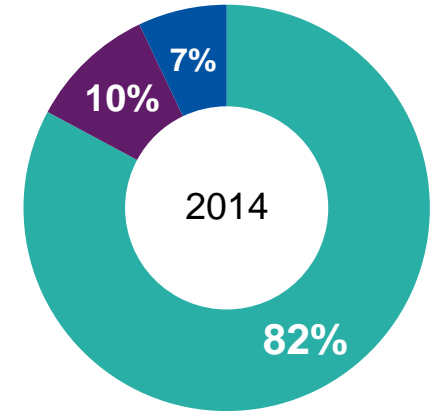
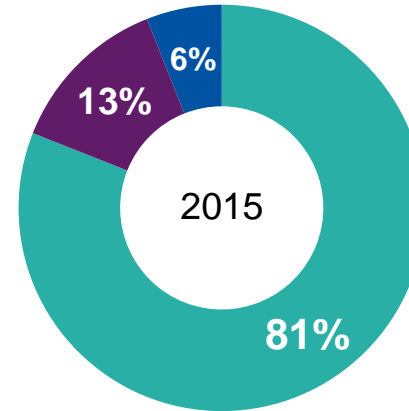
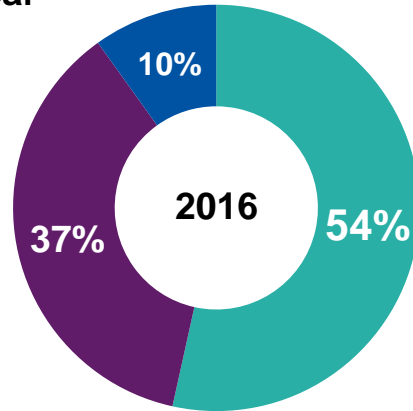
Source: KPMG Global Semiconductor Industry Survey 2016

3-year revenue growth | slowing

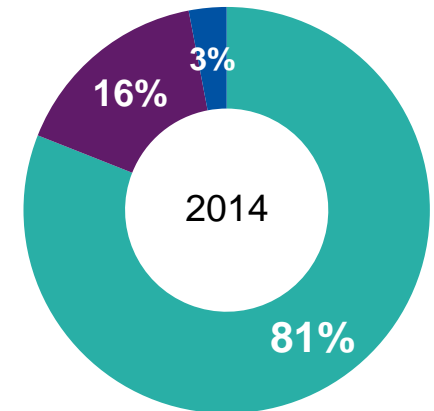
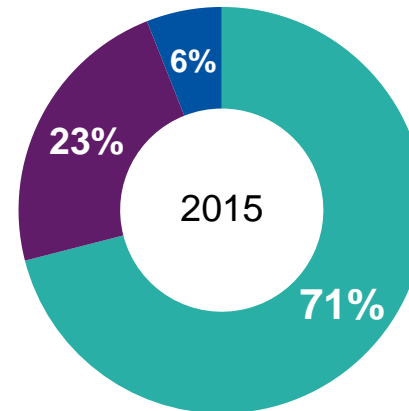
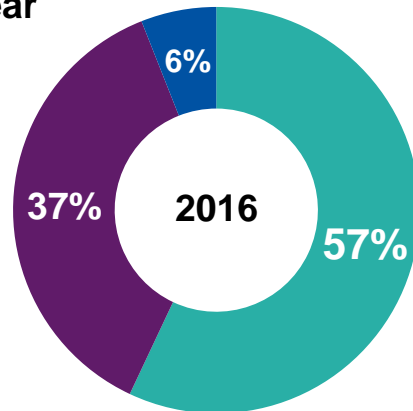
What is your outlook, for your company's semiconductor revenue growth, three years from today?

- Increase
- No change
- Decrease

3-year



1-year



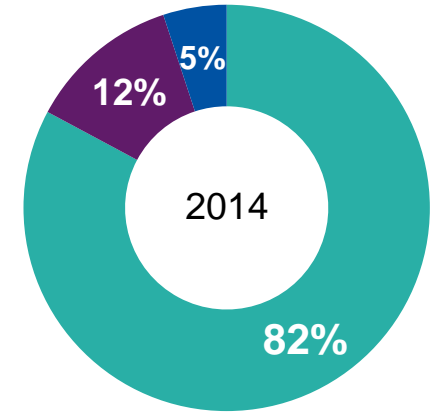
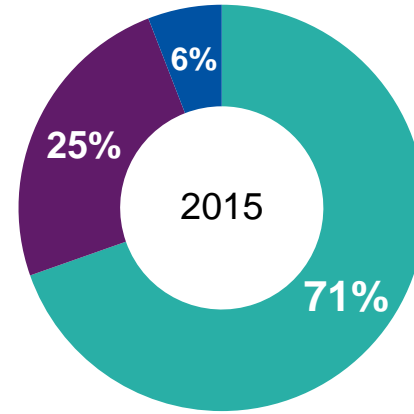
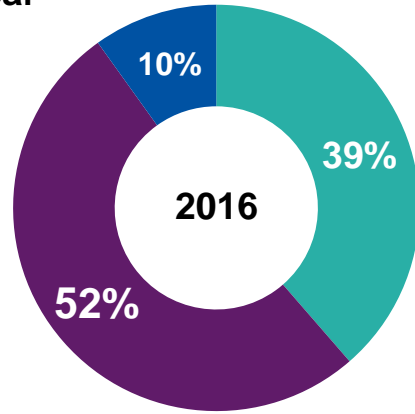
Source: KPMG Global Semiconductor Industry Survey 2016

3-year capital spending | majority now expect same/decrease

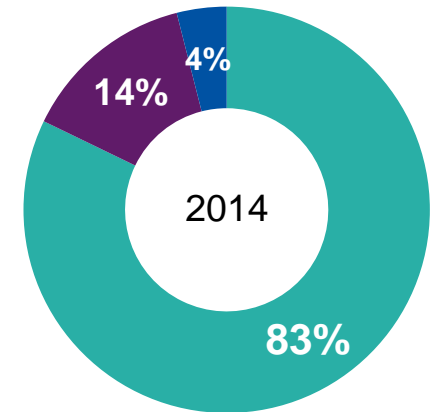
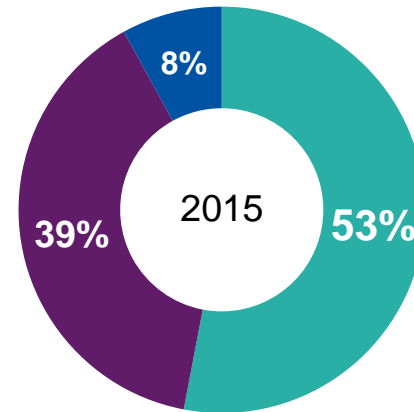
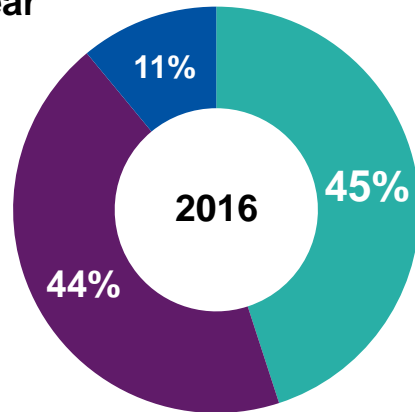
What is your outlook for semiconductor-related capital spending by your company (both equipment and software) three years from today?

- Increase
- No change
- Decrease

3-year



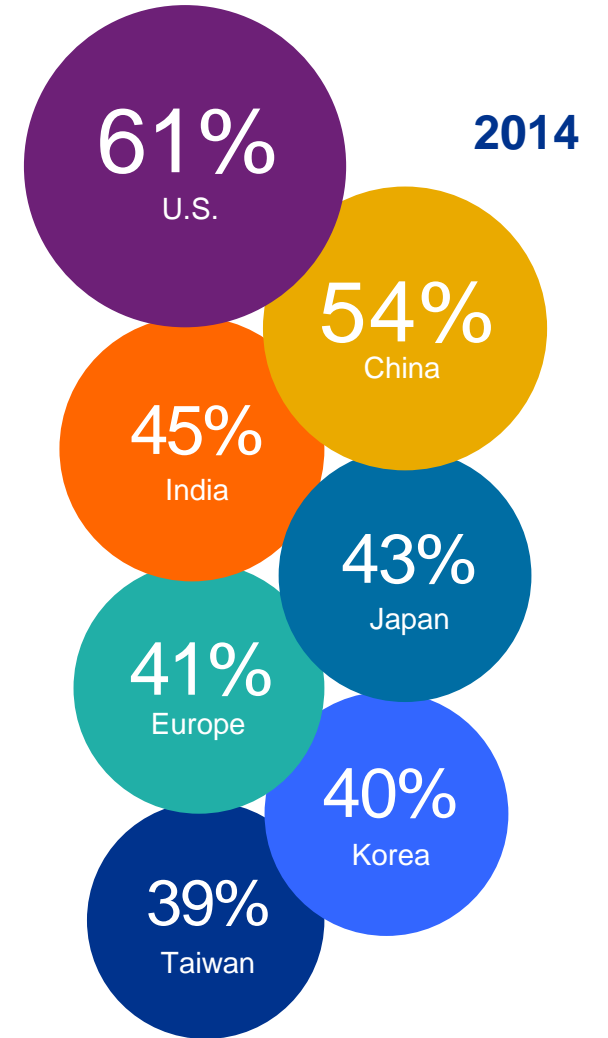
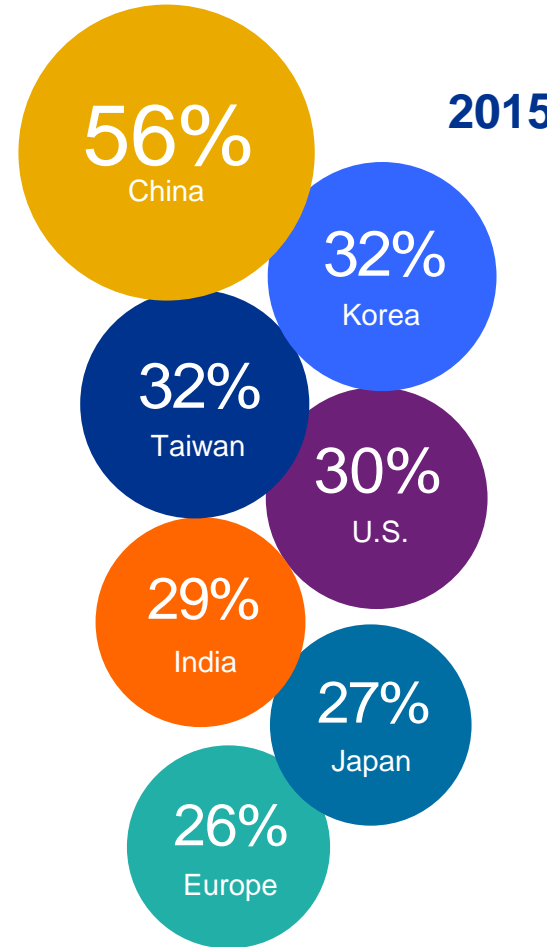
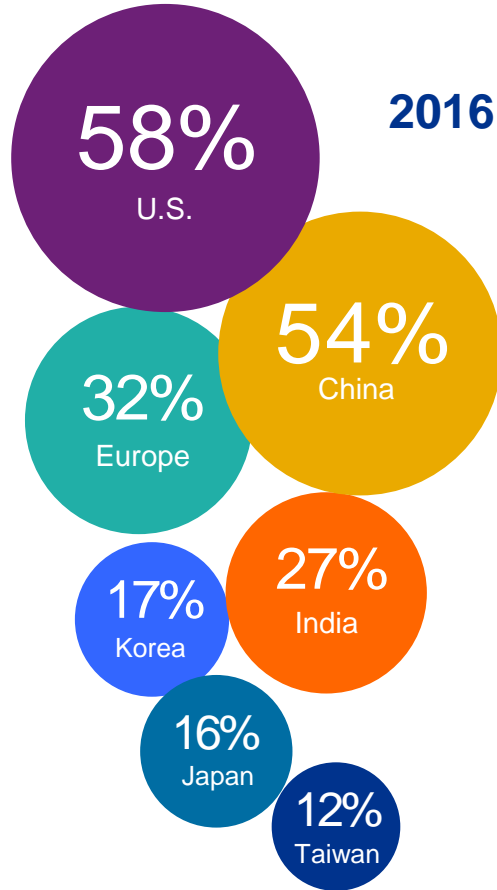
1-year



Source: KPMG Global Semiconductor Industry Survey 2016

3-year revenue outlook | U.S. leads again

Please rate the importance of the following geographic areas in terms of semiconductor revenue growth for your company three years from today.



Source: KPMG Global Semiconductor Industry Survey 2016

Conclusion



Expectation for this year...

- **Strongest growth since 2010 due to strength in the PC cycle and continuing growth in Industrial and Automotive.**
- **M&A boom will continue but likely not at the same pace as 2015 and 2016**
- **Many companies will carve out non-core pieces of their business**
- **Apple, Google, Amazon, Facebook and other “platform” companies will increase investment in custom silicon**
- **Growth will slow in the back half of the year- currently on pace for ~10% YoY growth, we expect it to come in at 6%-8% YoY growth for 2017 and a return to ~5% in 2018**
- **Increased focus on 2.5D, 3D, CSC and “More than Moore” technologies**
- **China will continue to push the boundaries of M&A and test regulatory appetite for deals**

What does it mean to you?

The Challenge: The same tricks are not producing the same results below 28nm. Scaling is failing...

The Opportunity: Semiconductor companies are becoming more open minded to leveraging established technologies that were shunned previously.

- **2.5D and 3D applications**
- **Compound Semiconductors**
- **New materials**

New value creation approaches are being considered. – Preventative maintenance, analytics, etc.

Understanding how your product impacts Cost of Ownership for the tools and modules in the fab and test sites is critical to positioning your product with the buyer.

Thank you!

Questions?