What is the “New Normal” for Semiconductors?

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Presentation Overview

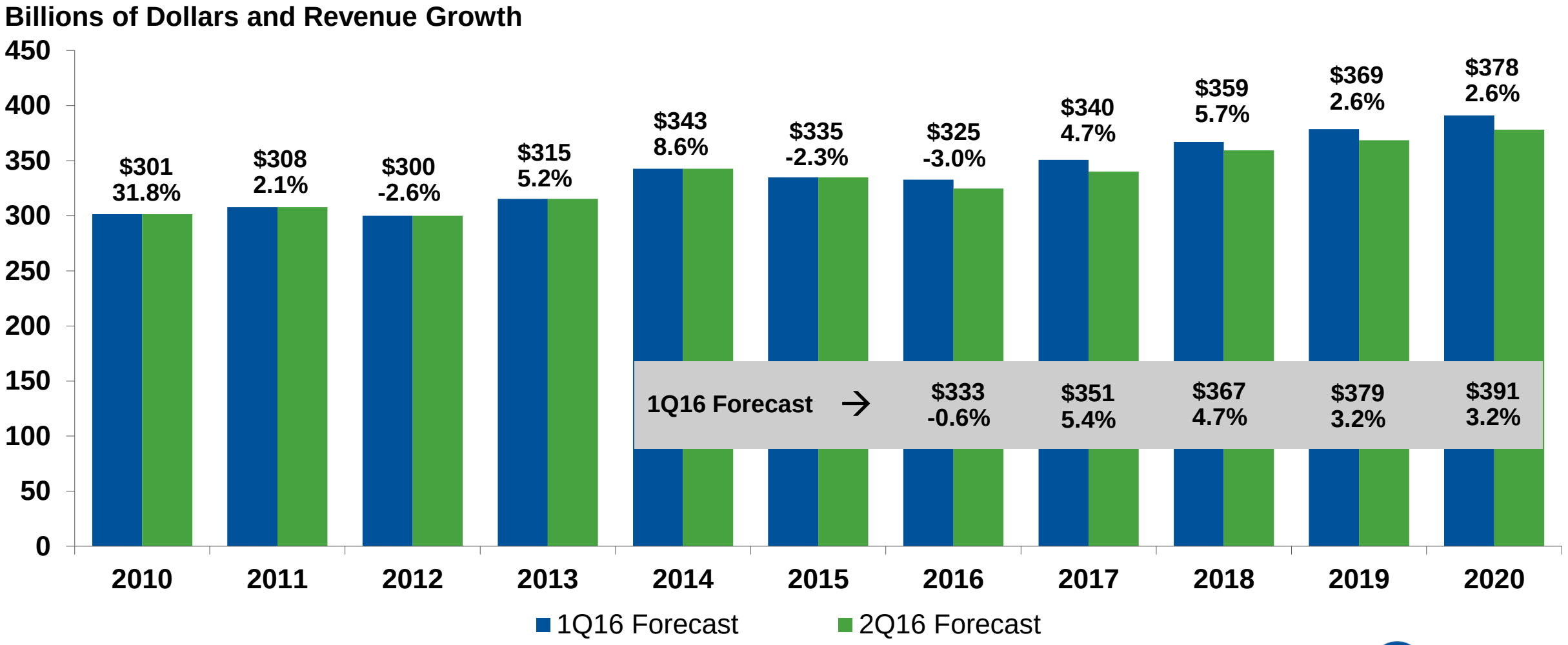
- Semiconductor Market Conditions and Outlook
- Application Markets
- Device Markets
- Outsourcing Services – Foundry & SATS/OSAT
- Mergers, Acquisitions & China
- Summary & Recommendations

Semiconductor Market Conditions and Outlook

Key Assumptions: Semiconductors and Electronic Equipment Forecast, 3Q16 Preliminary Update

1. Consumer demand continues to remain weak. Slight spending increase developing in Q3 and Q4.
2. No significant near-term, large volume demand driver expected to emerge that will dramatically affect current market conditions.
3. Inventory levels in traditional PC, ultramobile, smartphone and industrial equipment channels still impacting production levels and equipment ASPs.
4. iPhone 7 momentum increasing, positively impacted by Samsung Galaxy Note7 problems (1/3 of Note7 users opt for refund vs. exchange).
5. NAND and DRAM in oversupply for the rest of 2016, impacting prices.
6. Uncertain macroeconomic climate following Brexit.

Worldwide Semiconductor 2Q16 Revenue Forecast: 2016 Goes Deeper into Negative Territory



Source: "Semiconductor Forecast Database, Worldwide, 2Q16 Update"

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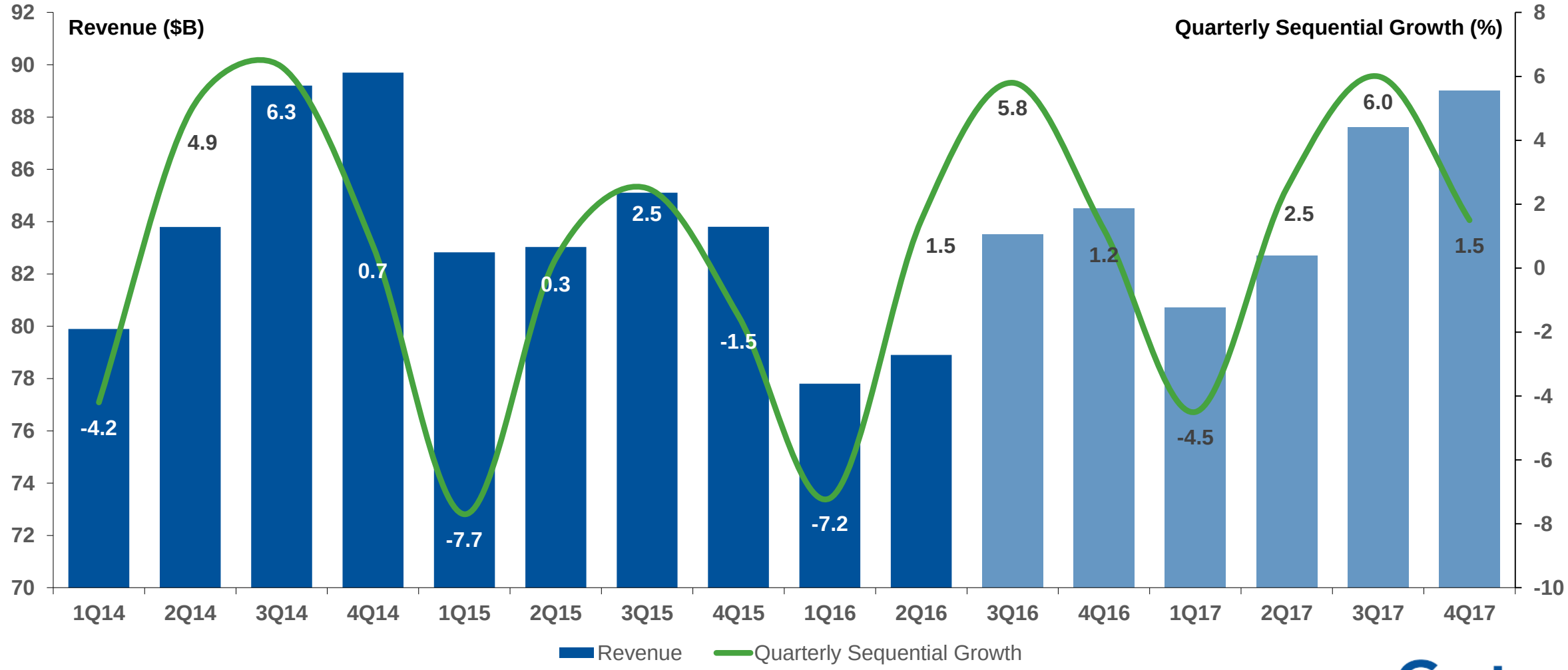
Semiconductor Quarterly Revenue Profile: Dismal First Half Drives Full-Year Growth into Negative Territory



Source: "Semiconductor Forecast Database, Worldwide, 2Q16 Update"

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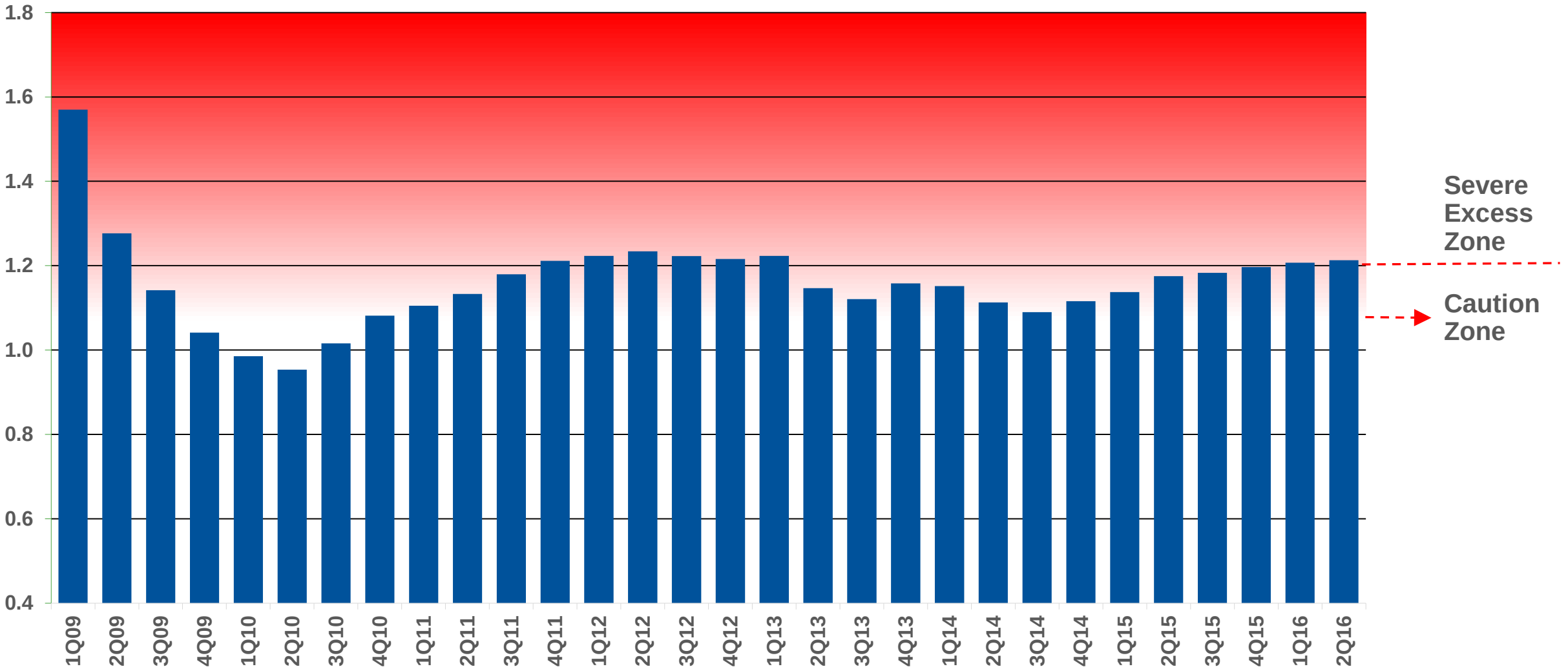
2Q16 Semiconductor Inventory Index Enters the Severe Excess Zone



Source: "Semiconductor Forecast Database, Worldwide, 2Q16 Update"

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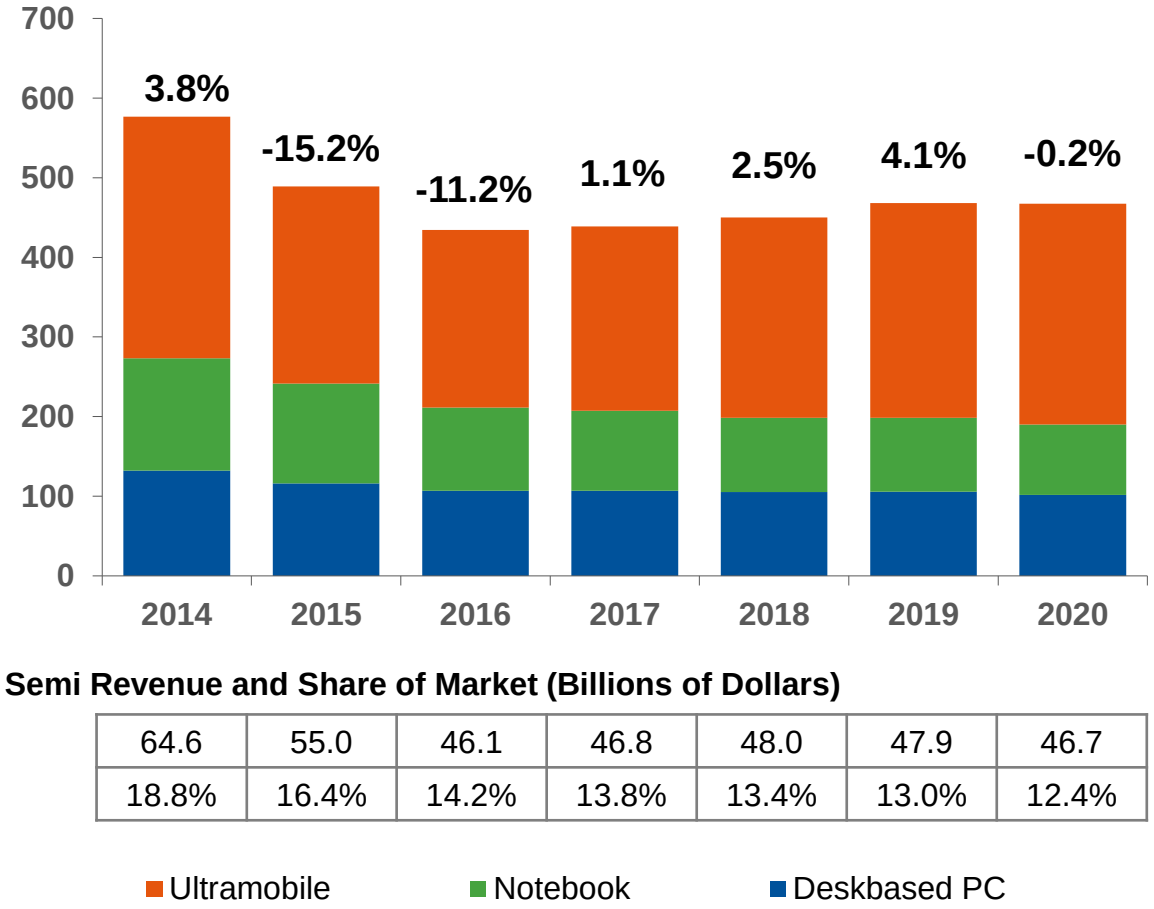
Key Electronic Equipment Market

PC and Ultramobile: 2Q16 Production Forecast Update

PC and Ultramobile Unit Production (Millions of Units)



Semi Revenue and Share of Market (Billions of Dollars)

64.6	55.0	46.1	46.8	48.0	47.9	46.7
18.8%	16.4%	14.2%	13.8%	13.4%	13.0%	12.4%

- Weak consumer demand will negatively impact production of PC and ultramobile.
- Through 2016-17 consumers in Eurasia, sub-Saharan Africa, Middle East and North Africa and LATAM will extend the lifecycles of their Notebooks by 6 months.
- In emerging markets, smartphones will take the majority of disposable income, removing new PC and ultramobiles purchases by 10% through 2020.
- One third of basic ultramobile consumer tablets users will not replace their device through 2020.

Source: "Semiconductor Forecast Database, Worldwide, 2Q16 Update"

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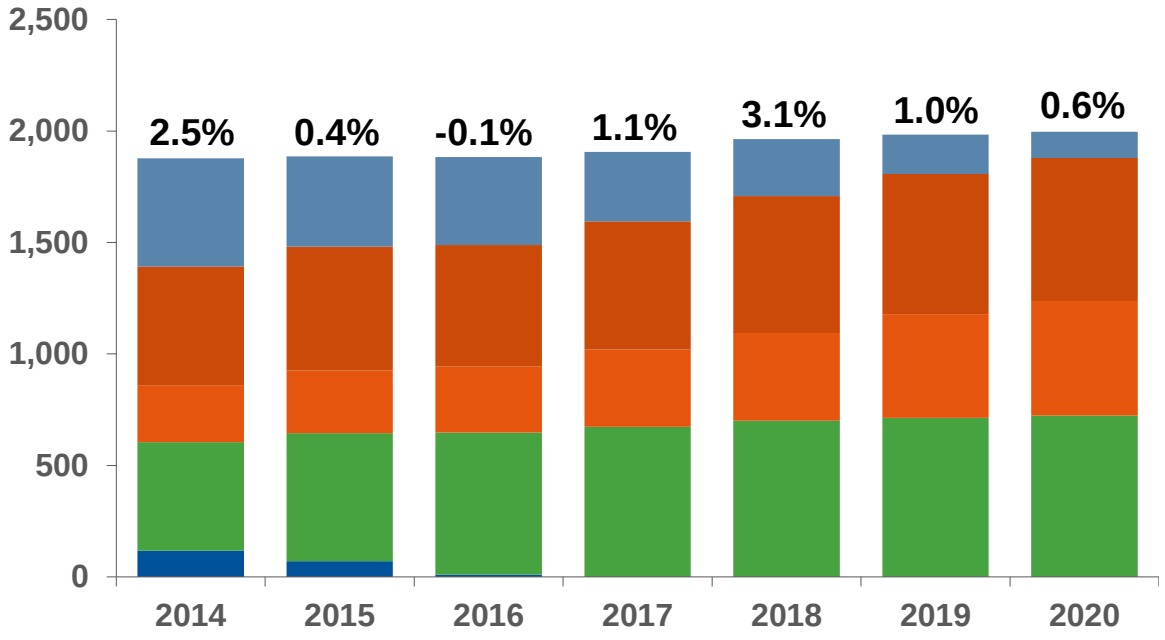
Smartphone: 2Q16 Production Forecast Update

Smartphone Unit Production (Millions of Units)



Semi Revenue and Share of Market (Billions of Dollars)

74.1	80.3	82.1	86.4	91.7	91.6	91.2
21.6%	24.0%	25.3%	25.4%	25.5%	24.9%	24.1%

Phone, Utility, Traditional OS
Phone, Premium, Smart OS
Phone, Utility, Smart OS
Phone, Basic, Smart OS
Phone, Basic, Traditional OS

- Softness to continues in China smartphone market with high inventory through 2016.
- Rising inventories and declining smartphone ASPs put Smartphone application processor prices come under severe pressure.
- Shift to midrange basic smartphones continues at the expense of premium and low-cost utility smartphones. Premium smartphone will decline in 2016.
- Shift to LTE remains the key driver for semiconductor content.
- The iPhone SE will help to drive additional sales in 2016 as users look to upgrade their dated iPhones.

Source: "Semiconductor Forecast Database, Worldwide, 2Q16 Update"

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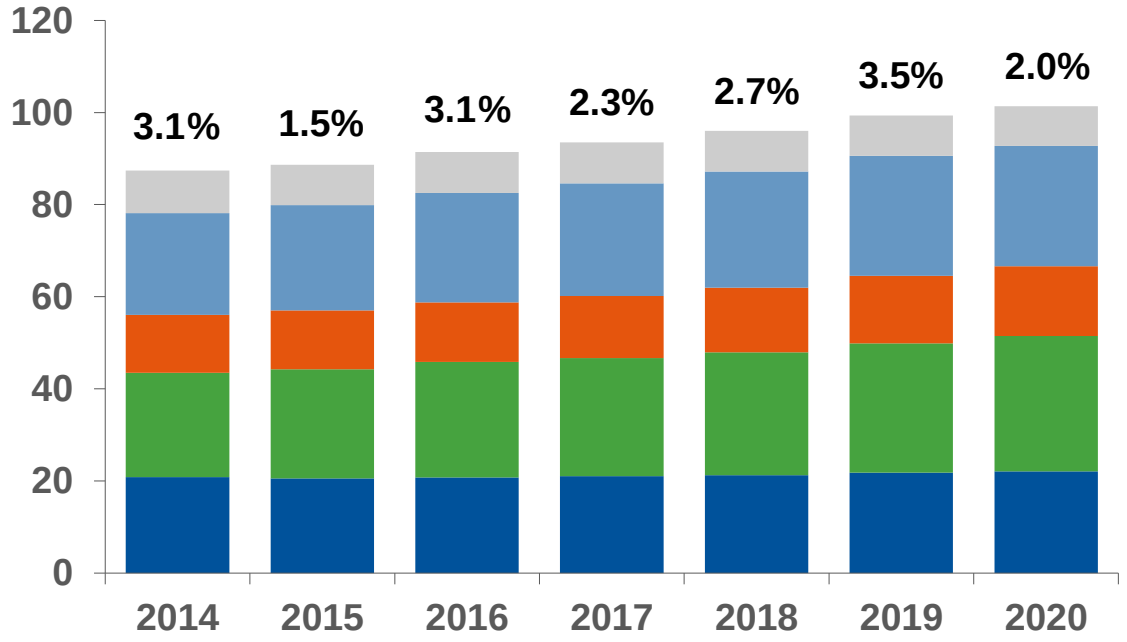
Automobile: 2Q16 Update Production Forecast

Light Vehicle Production and Growth (Millions of Units)



Semi Revenue and Share of Market (Billions of Dollars)

30.0	30.3	31.4	33.4	36.0	38.6	41.0
8.8%	9.1%	9.7%	9.8%	10.0%	10.5%	10.8%

Japan EMEA Asia/Pacific China Americas

- Auto sales strengthening in China in response to stimulus programs
- EV and PHEV incentives in China driving demand
- ADAS and infotainment adoption accelerating in mature markets
- Japan production will recover by year-end
- Brazil and Russia remain weak
- Production CAGR '15-'20 is 2.7%
- Semi TAM CAGR '15-'20 is 6.2%

Source: Gartner and IHS Automotive, June 2016

Source: "Semiconductor Forecast Database, Worldwide, 2Q16 Update"

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Semiconductor Devices and Memory Market

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Semiconductor Device Revenue and Annual Growth, 2Q16 Update

Billions of Dollars	2014	2015	2016	2017	2018	2019	2020	CAGR 2015-2020
Memory	80.3	79.3	70.9	75.0	82.5	80.3	79.5	0.1%
	16.7%	-1.3%	-10.6%	5.8%	10.0%	-2.7%	-1.0%	
Microcomponents	63.8	60.9	60.7	63.1	65.4	67.9	69.5	2.7%
	6.4%	-4.5%	-0.3%	3.9%	3.7%	3.8%	2.3%	
Logic IC	12.9	12.2	12.0	12.4	13.1	13.7	14.1	2.9%
	4.8%	-4.9%	-1.9%	3.5%	5.3%	4.4%	3.1%	
ASSP	88.9	86.0	84.0	86.5	89.1	92.1	94.3	1.9%
	4.0%	-3.3%	-2.3%	3.0%	3.0%	3.4%	2.4%	
ASIC	21.2	22.3	22.3	23.5	24.3	25.0	26.3	3.3%
	7.4%	5.2%	-0.3%	5.6%	3.5%	2.5%	5.5%	
Analog IC	21.0	21.0	21.2	21.6	22.2	22.6	23.5	2.3%
	8.4%	0.2%	0.7%	2.0%	2.9%	1.4%	4.3%	
Discrete	19.2	17.7	17.5	18.5	19.1	19.9	20.8	3.3%
	7.9%	-8.0%	-1.2%	5.6%	3.5%	4.4%	4.3%	
Optical	27.4	26.9	27.1	29.1	32.1	34.7	37.1	6.6%
	7.1%	-1.9%	0.7%	7.4%	10.2%	8.3%	6.8%	
Non-optical Sensor	7.9	8.4	9.1	10.3	11.4	12.3	12.8	8.9%
	24.4%	6.5%	8.7%	13.2%	10.2%	8.6%	4.1%	
Total Market	342.6	334.8	324.7	340.0	359.3	368.6	378.0	2.5%
	8.6%	-2.3%	-3.0%	4.7%	5.7%	2.6%	2.6%	
Total Excluding Memory	262.3	255.5	253.9	265.0	276.8	288.3	298.5	3.2%
	6.4%	-2.6%	-0.6%	4.4%	4.4%	4.2%	3.6%	

Source: “Semiconductor Forecast Database, Worldwide, 2Q16 Update”

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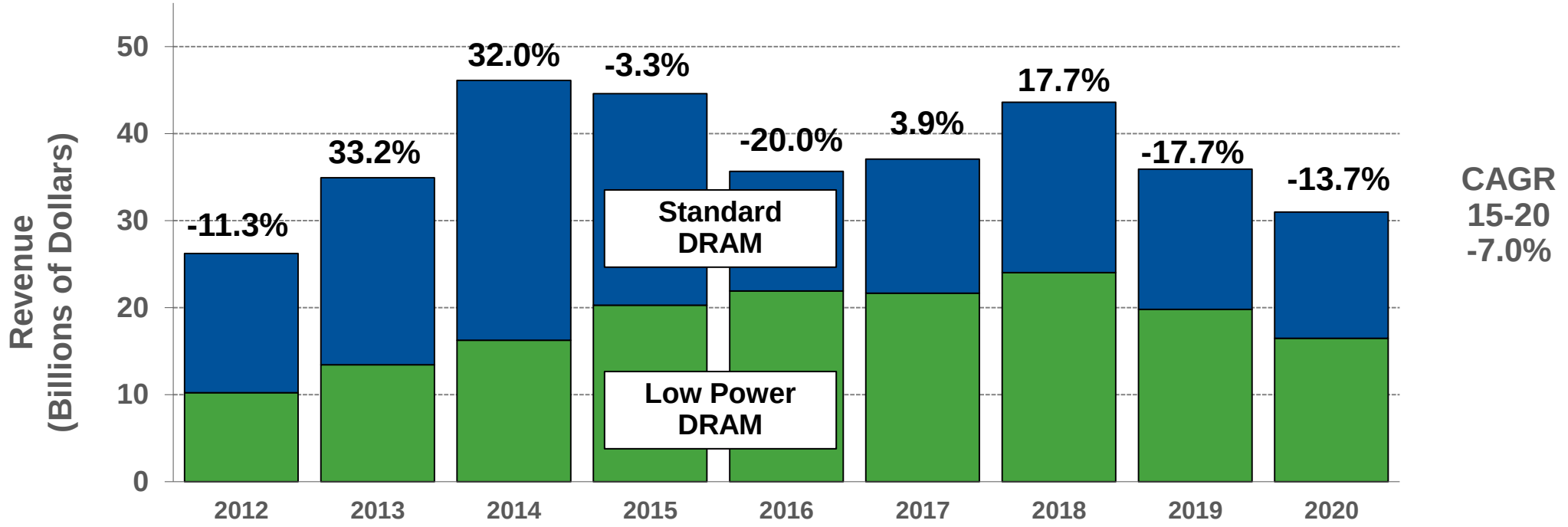
DRAM Market Metrics – The Cycles Continue

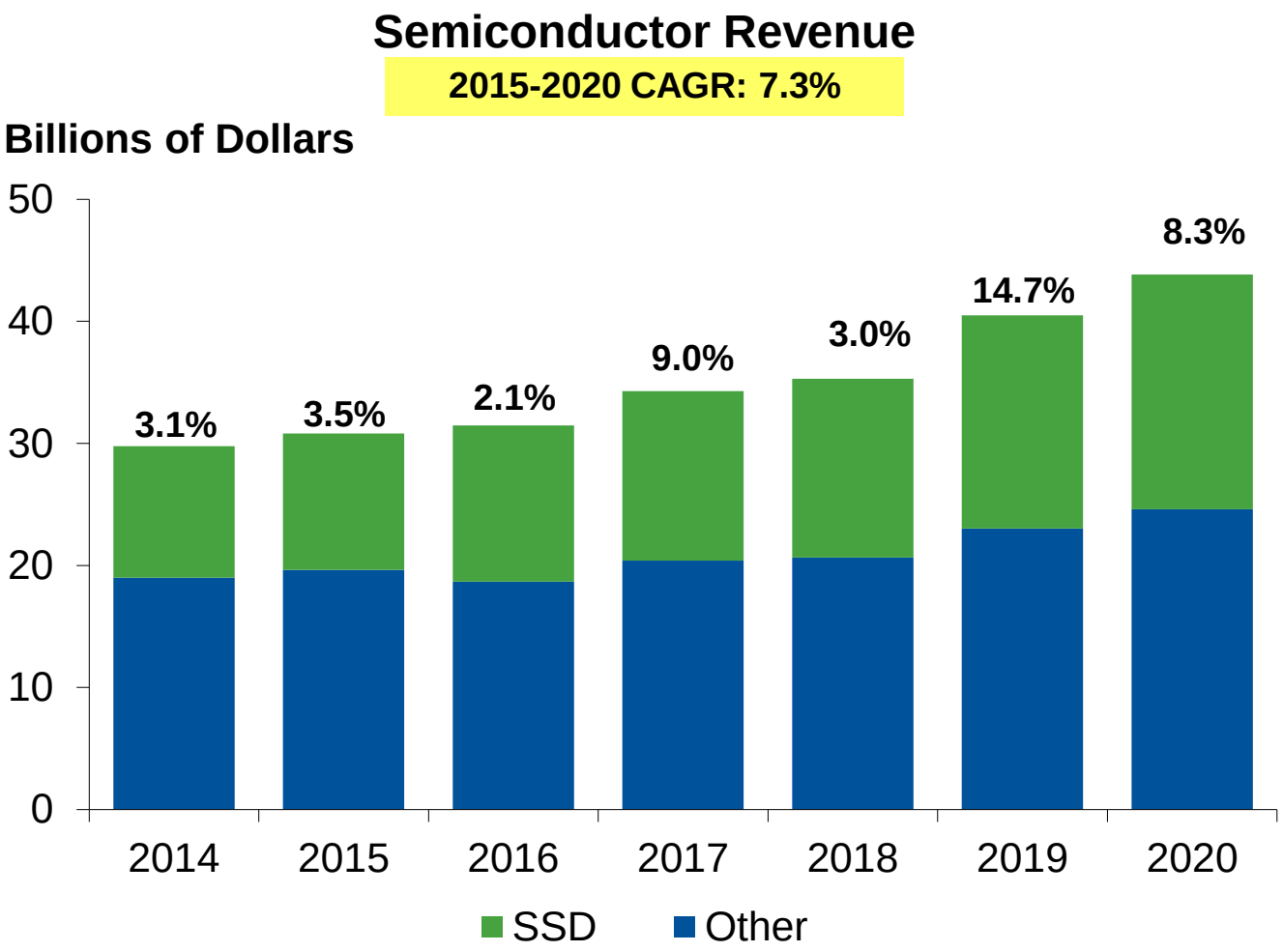
Megabytes Bn	3,837	4,716	6,156	7,403	9,091	11,455	15,020	18,870	22,893	CAGR 15-20
Bit Growth	31.9%	22.9%	30.5%	20.3%	22.8%	26.0%	31.1%	25.6%	21.3%	25.3%



ASP 4Gb eqv.	3.50	3.79	3.83	3.08	2.01	1.66	1.49	0.97	0.69	-25.8%
ASP Change	-32.7%	8.4%	1.1%	-19.6%	-34.9%	-17.5%	-10.3%	-34.5%	-28.9%	
ASP 4Gb eqv.*	2.08	2.80	3.52	2.47	1.19	1.13	1.10	0.66	0.48	-28.1%
ASP Change	-42.7%	34.7%	25.7%	-29.7%	-52.1%	-4.7%	-2.8%	-39.7%	-28.2%	

* Commodity pricing, the blended average of device densities being sold into the PC market.

2Q16 NAND Flash: SSDs Drive Market Growth



- Oversupply in 1H 2016 due to weak end markets, increased output of 3B/cell planar
- Initial 3D NAND ramp timing uncertain
  - 19% of total PB in 2016; 70% by 2019
- SSDs lead growth:
  - 55% of total PB by 2020
  - 84% of SSDs will use 3D NAND
- Assume China entering NAND market 2018-19 with at least one new fab

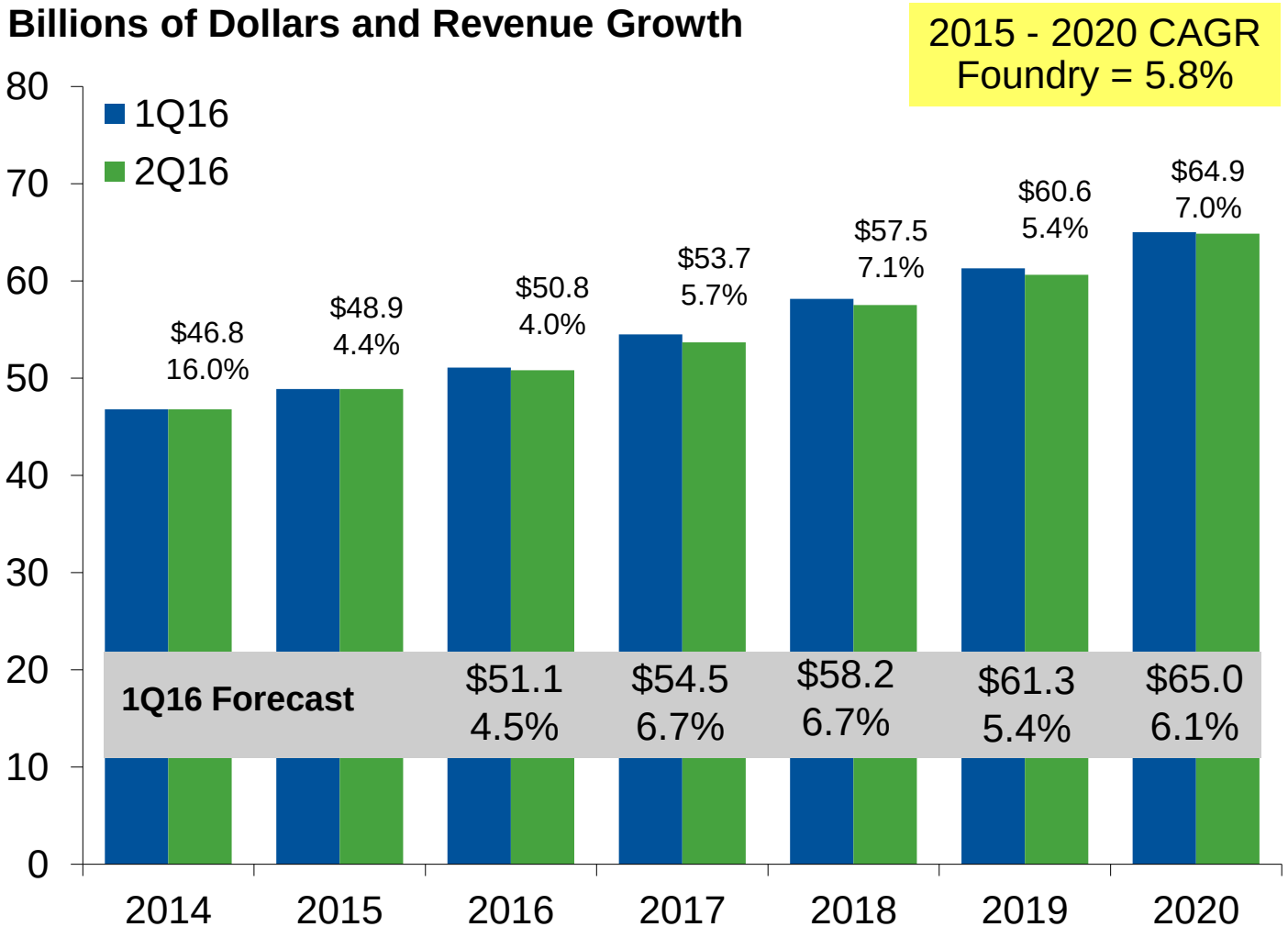
Outsourced Manufacturing Services:

Foundry and SATS/OSAT)

2Q16 Foundry Forecast Highlights

- Slow growth in the device market will cause foundry revenue to grow only by 4.0% to $50.8 billion
- The optimistic business outlook guided by foundries and the impact of Brexit result could cause high wafer inventory levels later in 2016
- Foundry wafer demand in 2016 is driven by the feature advancement of Android smartphones
- 10nm and 7nm are considered as the same technology
- More foundry activities in China are announced in recent months
- Fab utilization rate of foundries in 2016 will be 93% in advanced nodes and 81% overall
- Capital investment by foundries will increase from $19.2 billion in 2016 to $20.4 billion in 2017

2Q16 Foundry Revenue Forecast

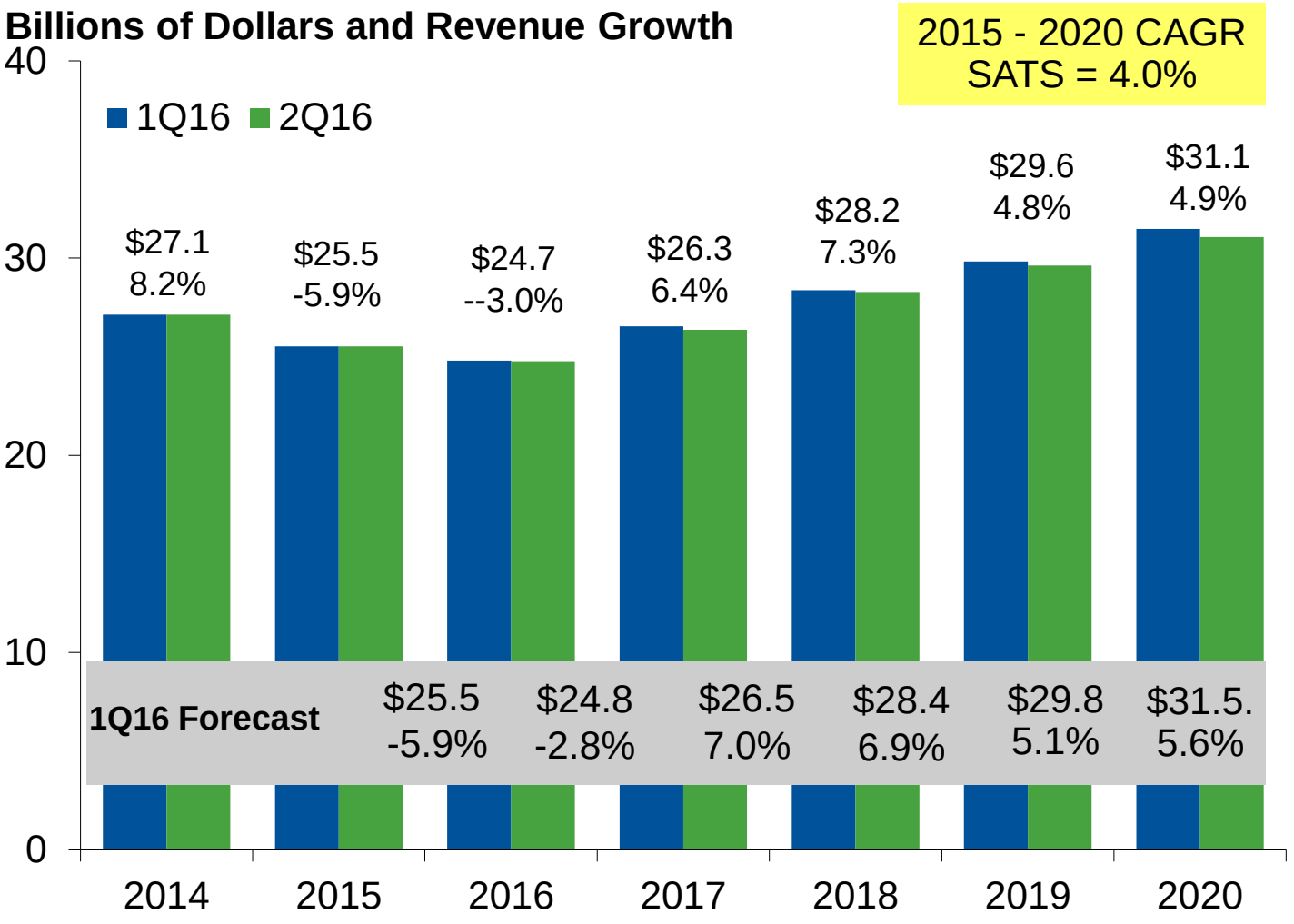


- The impact of Brexit is not factored in the current foundry forecast
- Breaking the three years of double digit growth streak, foundries revenue increase just by 4 - 6% in recently years
- Only minor adjustment is made on foundry revenue from the last forecast
- Foundry percent growth in US dollars could be affected as currency exchange rates continue to come into play
- Foundries gear up the value-added services on fan-out and wafer level packaging business

2Q16 SATS Forecast Highlights

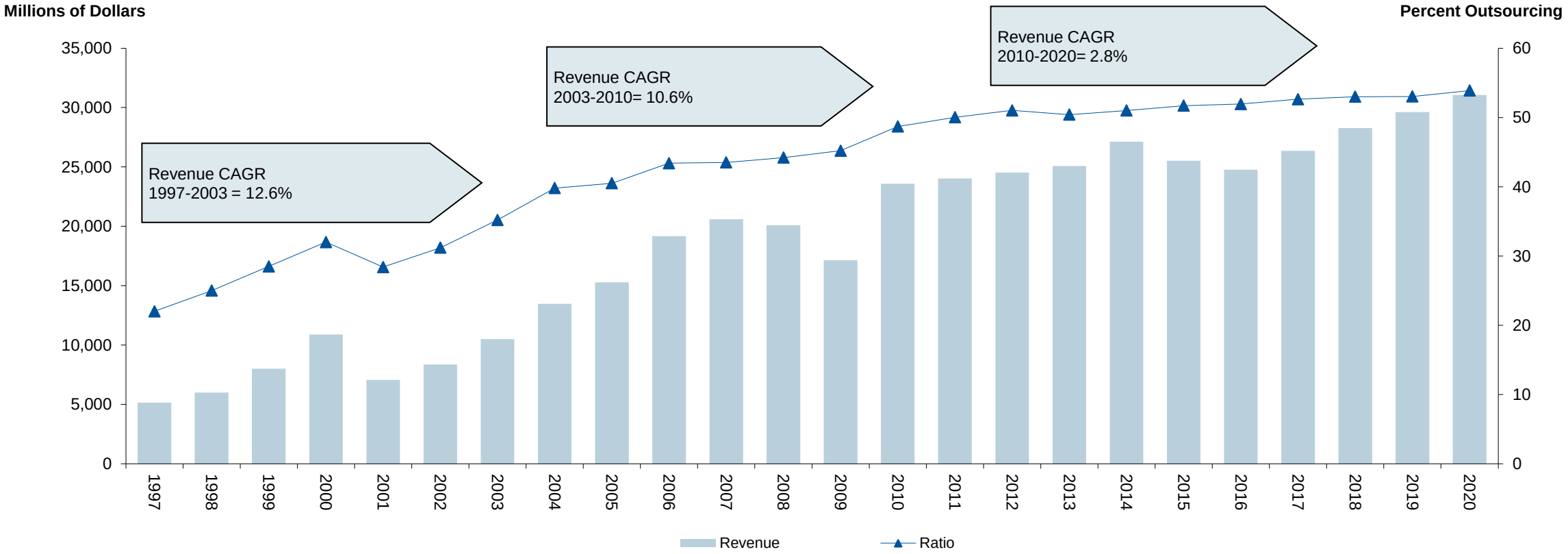
- Packaging demand improves in Q3 and into Q4. Utilization rates increasing
- Test Services growth now faster than packaging, with record revenues in first half 2016 for KYEC
- Advanced packaging capital costs forcing stratification of SATS market:
  - Advanced Packaging
  - Mature/Sunset players..
- SiP and WLP ramp up expanding as new phones adopt FOWLP and POP (iPhone7). IoT and wearable markets considering the technology for faster time-to-market and lower product costs.
- 2016 China investment in SATS companies will increase further as China targets back-end packaging/test. Industry consolidation among the top 25 leaders continues.
- Currency fluctuations/devaluations versus a strong US dollar in 2016 will affect SATS market growth negatively, resulting in negative growth in dollars.

2Q16 SATS Revenue Forecast



- SATS revenue drops in 2016 as product drivers - smartphones and tablets - demand decreases further.
- SATS percent growth in US dollars is reduced - currency exchange rates fluctuate vs. strong US dollar
- SATS competition with foundries for value-added services on bumping, fan-out and wafer level packaging businesses.

SATS Industry Maturing



- SATS growth is single digits
- No new “Killer App” growth driver.
- Typical price decline of 2-5%/yr. for past 20+ years
- Foundry now competing with SATS
- China-based packaging nearing half of all worldwide packaging value

Top 20 SATS/OSAT Company Sales, 2015 (Millions USD)

2015 Rank	2014 Rank	Company	Region	2014 Revenue	2015 Revenue	2014 Market Share	2015 Market Share	Change 2014-2015
1	1	ASE	Taiwan	5,170	4,769	19.1%	18.7%	-7.7%
2	2	Amkor Technology	U.S.	3,129	2,885	11.5%	11.3%	-7.8%
3	3	SPIL	Taiwan	2,741	2,612	10.1%	10.2%	-4.7%
4	6	JCET	China	982	1,678	3.6%	6.6%	70.9%
5	5	Powertech Technology	Taiwan	1,321	1,339	4.9%	5.2%	1.4%
6	8	UTAC	Singapore	734	878	2.7%	3.4%	19.6%
7	4	STATS ChipPAC	Singapore	1,586	842	5.8%	3.3%	-46.9%
8	7	J-Devices	Japan	864	816	3.2%	3.2%	-5.6%
9	12	Tianshui Huatian Microelectronics	China	519	617	1.9%	2.4%	18.9%
10	9	ChipMOS Technologies	Taiwan	696	606	2.6%	2.4%	-13.0%
11	10	Chipbond Technology	Taiwan	575	525	2.1%	2.1%	-8.7%
12	13	King Yuan Electronics	Taiwan	477	478	1.8%	1.9%	0.2%
13	11	STS Semiconductor	S. Korea	522	456	1.9%	1.8%	-12.6%
14	14	Nantong Fujitsu Microelectronics	China	343	370	1.3%	1.4%	7.7%
15	15	Carsem Semiconductor	Malaysia	336	360	1.2%	1.4%	7.1%
16	17	Unisem	Malaysia	319	323	1.2%	1.3%	1.5%
17	18	OSE	Taiwan	317	315	1.2%	1.2%	-0.5%
18	20	Formosa Advanced Technologies	Taiwan	304	276	1.1%	1.1%	-9.2%
19	19	AOI Electronics	Japan	306	264	1.1%	1.0%	-14.0%
20	16	Walton Advanced Engineering	Taiwan	331	251	1.2%	1.0%	-24.1%
		Top 20 Total		**21,572**	**20,659**	**79.5%**	**80.9%**	**-4.2%**
		Other Companies		5,558	4,871	20.5%	19.1%	-12.4%
		Total Market		**27,130**	**25,530**	**100.0%**	**100.0%**	**-5.9%**

Notes: Numbers may not add to totals shown because of rounding.

JCET includes STATS ChipPAC starting in August 2015, when the company was acquired.

STATS ChipPAC revenue is for part of the year.

Source: Gartner (April 2016)

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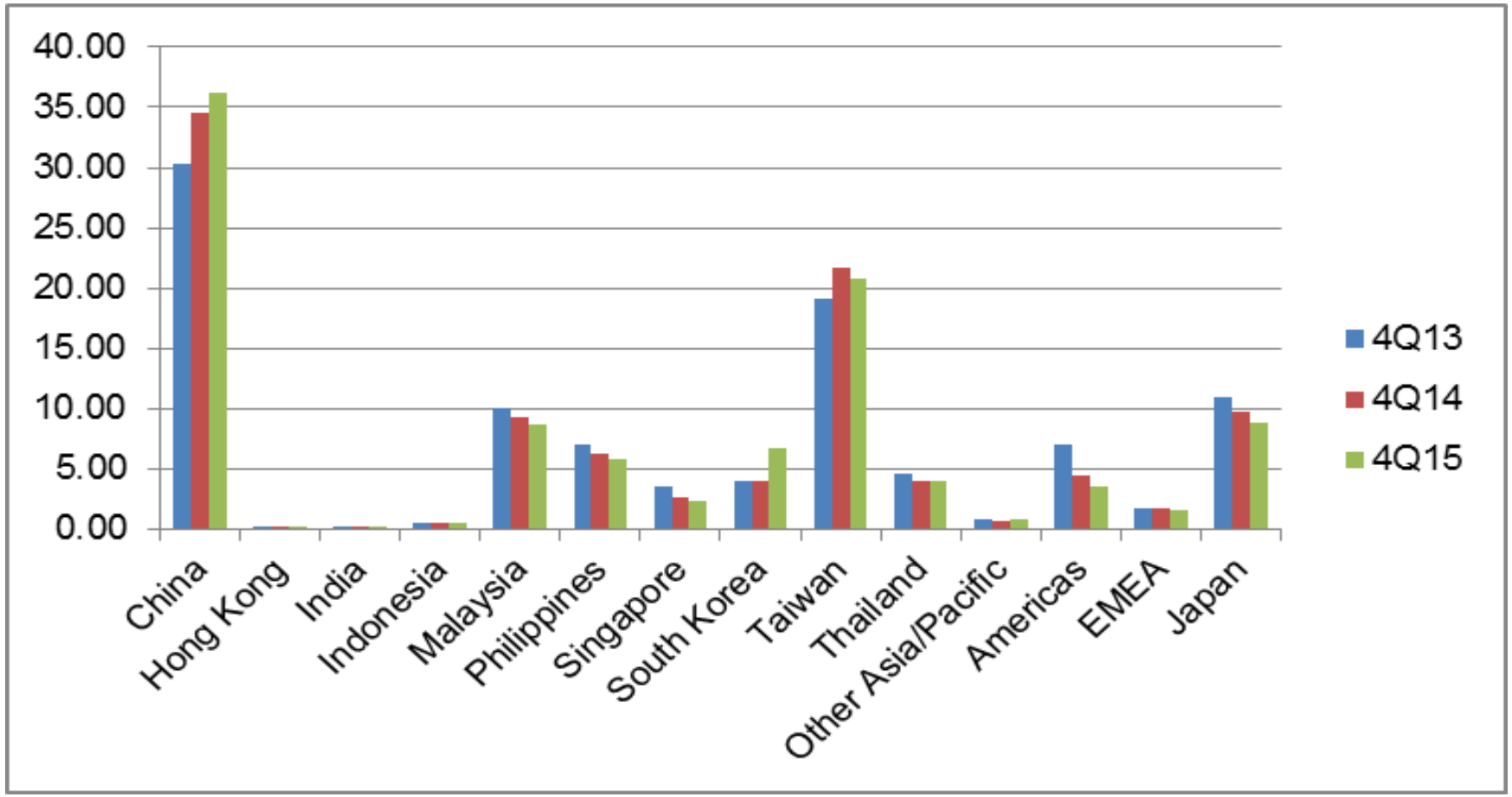
The China Effect

China SATS Investment: 2014-2016

- ✓ National IC Fund invests in 31% in JCET (2014)
- ✓ JCET acquires STATSChipPAC (2015)
- ✓ JCET/National IC Fund invests in SJ SEMI (2015)
- ✓ Tsinghua Unigroup invests in 25% of ChipMOS (2015)
- ✓ Tsinghua Unigroup Invests in 25% of Powertech (PTI) (2014)
- ✓ Tsinghua Unigroup offers on SPIL (2015)
- ✓ Hua Capital Fund in China WLCSP via Omnivision acquisition (2016)
- ✓ China WLCSP acquired Gerad Suzhou (2014)
- ✓ Tianshui Huatian buys Flip Chip Technology (US) (2014)
- ✓ Nantong Fujitsu forms JV, acquiring AMD plants in Penang and Suzhou (2015)
- ✓ International Brand Marketing acquires Kingpak Technology (2015)

Percent Worldwide Semiconductor Packaging, Assembly and Test Factory Space by Country/Region



Source: Gartner (November 2015)

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Is China Already a Done Deal?

- 33% of the entire worldwide IDM and SATS Packaging/Test manufacturing floor space (sq ft) is located in China (Taiwan is 2nd with 23%)
- 25% of the entire worldwide IDM and SATS Packaging/Test employees are in China (Taiwan 2nd with 19%)
- 22% of the entire worldwide IDM and SATS Packaging/Test factory locations are in China (122 factories)
- 43% of the entire worldwide IDM and SATS Packaging/Test production value is done in China-based factories

Taiwan and Korea: Watch Out
The Big Red Machine is Coming Fast

Semiconductor Industry as a Percentage of Country GDP

	GDP	Semi Industry	Percentage of GDP
USA	$17.4 Trillion	$172 Billion	< 1%
China	$10.4 Trillion	$77 Billion	< 1%
Taiwan	$530 Billion	$72 Billion	>13%
Korea	$1.4 Trillion	$52 Billion	<4%

Summary – The “New Normal”

- ✓ Until inflation increases and interest rates rise, slow growth is here to stay
- ✓ Expect inventory corrections in 3Q16 with the traditional holiday season build; but be cautious of double booking.
- ✓ Collaborate with, and invest in, research and manufacturing in the China market
- ✓ But do not overly commit to China; protect your IP and core value; move up your capability by continuous innovation in technology and ecosystem
- ✓ Urge your government to support semiconductor development. It will be difficult to stay competitive in the future unless the country is investing in the business