

# Meptec Luncheon Briefing: September 19, 2012

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# Semiconductor Manufacturing Market: Q3 2012

## Key Issues

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- What is the latest outlook for the semiconductor market?
- What is the outlook for outsourced semiconductor manufacturing services (foundry and SATS)?
- What is the latest forecast for capital equipment, spending and packaging markets?

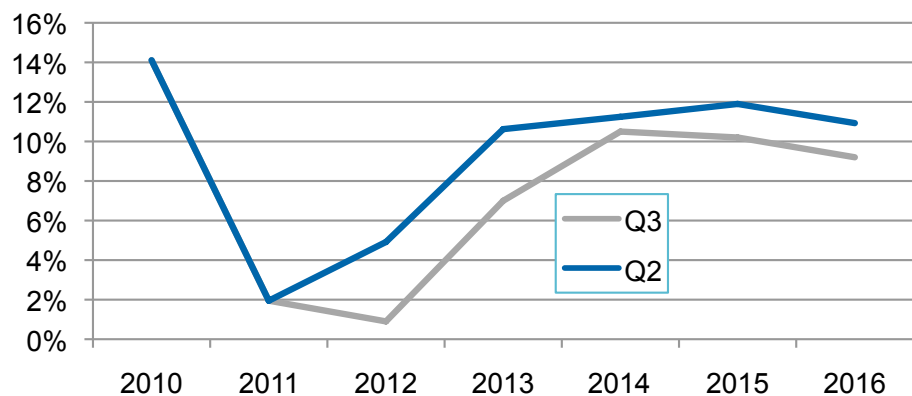
# Global Economic Summary

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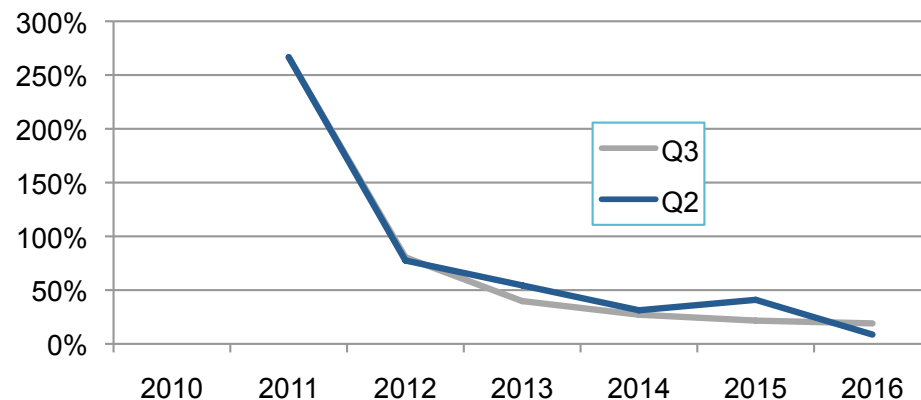
- Global GDP growth now expected to register 2.6% in 2012, 2.7% in 2013 and 3.6% in 2014
- Data over the past month confirm economic growth in all the key economies of the world have slowed down, almost simultaneously
- With few exceptions, consumer and business pessimism has become more pervasive and more pronounced
- Central bank concerns about the economic outlook have also increased considerably—and many are easing policies further
- The distribution of growth remains largely the same:
  - recession in much of Europe
  - lacklustre growth in the United States and Japan
  - slower growth in much of the emerging world, albeit still faster than in the developed world

# Major Application Unit Growth Rates

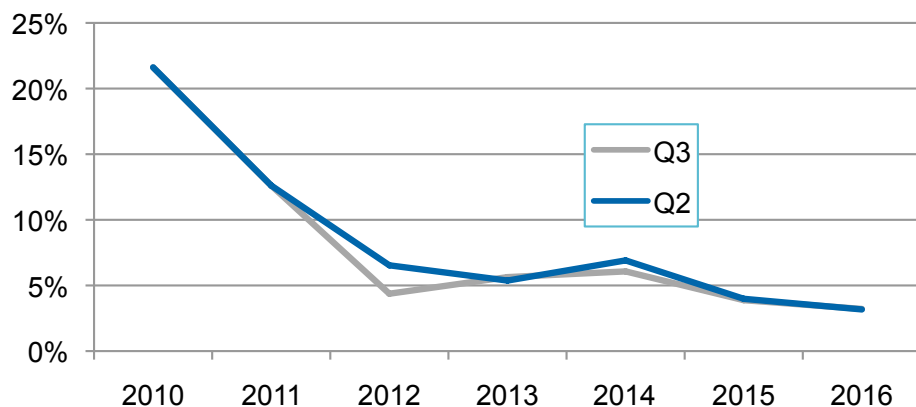
## PC



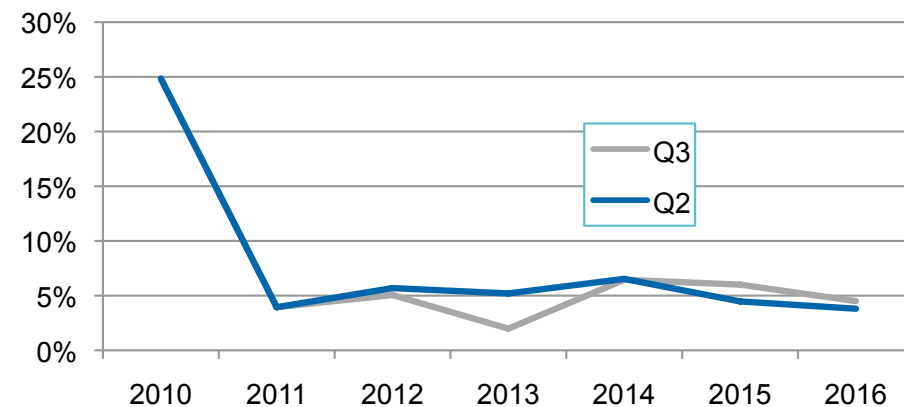
## Media Tablet



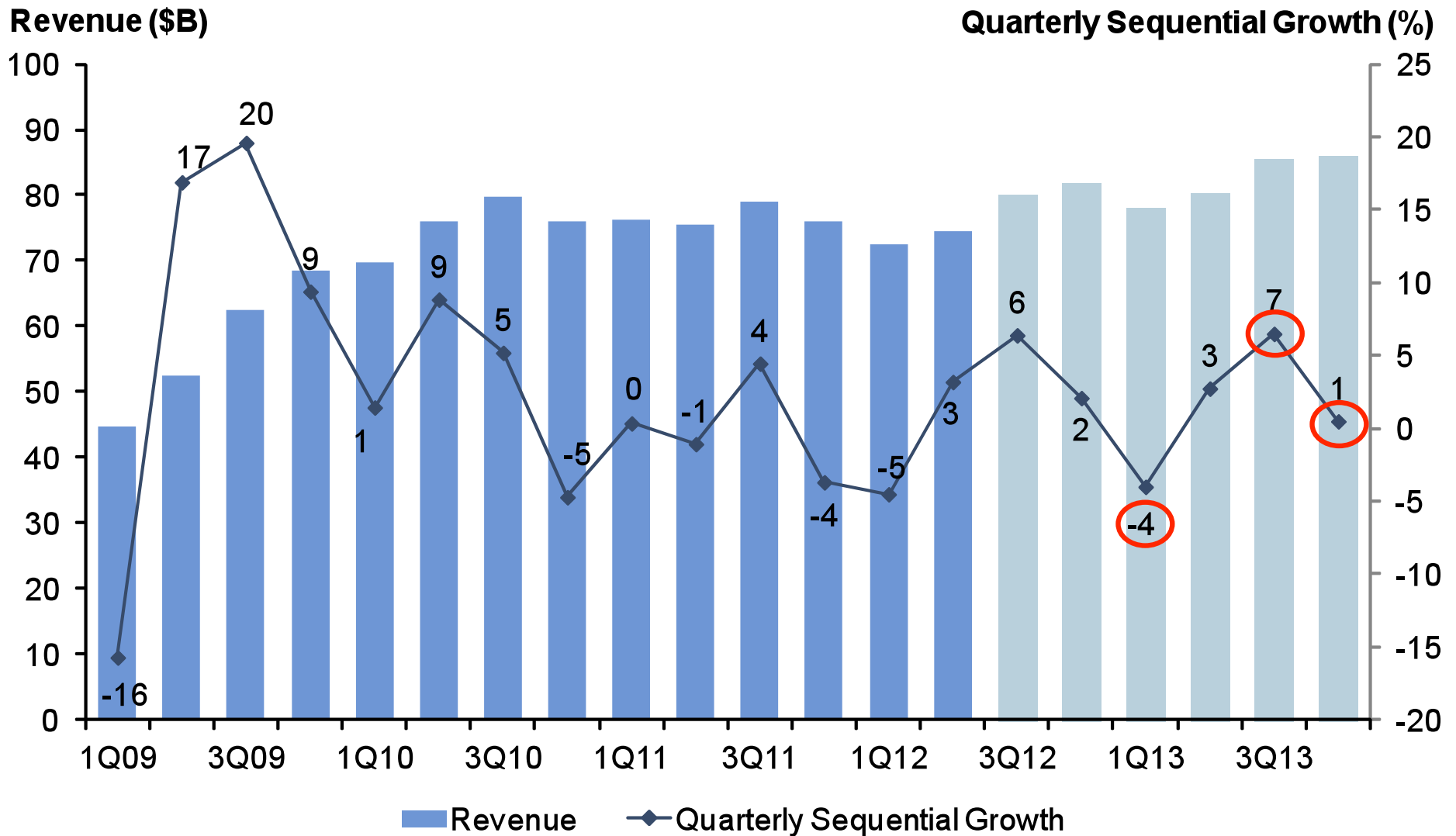
## Mobile Phone



## Automotive Light Vehicles

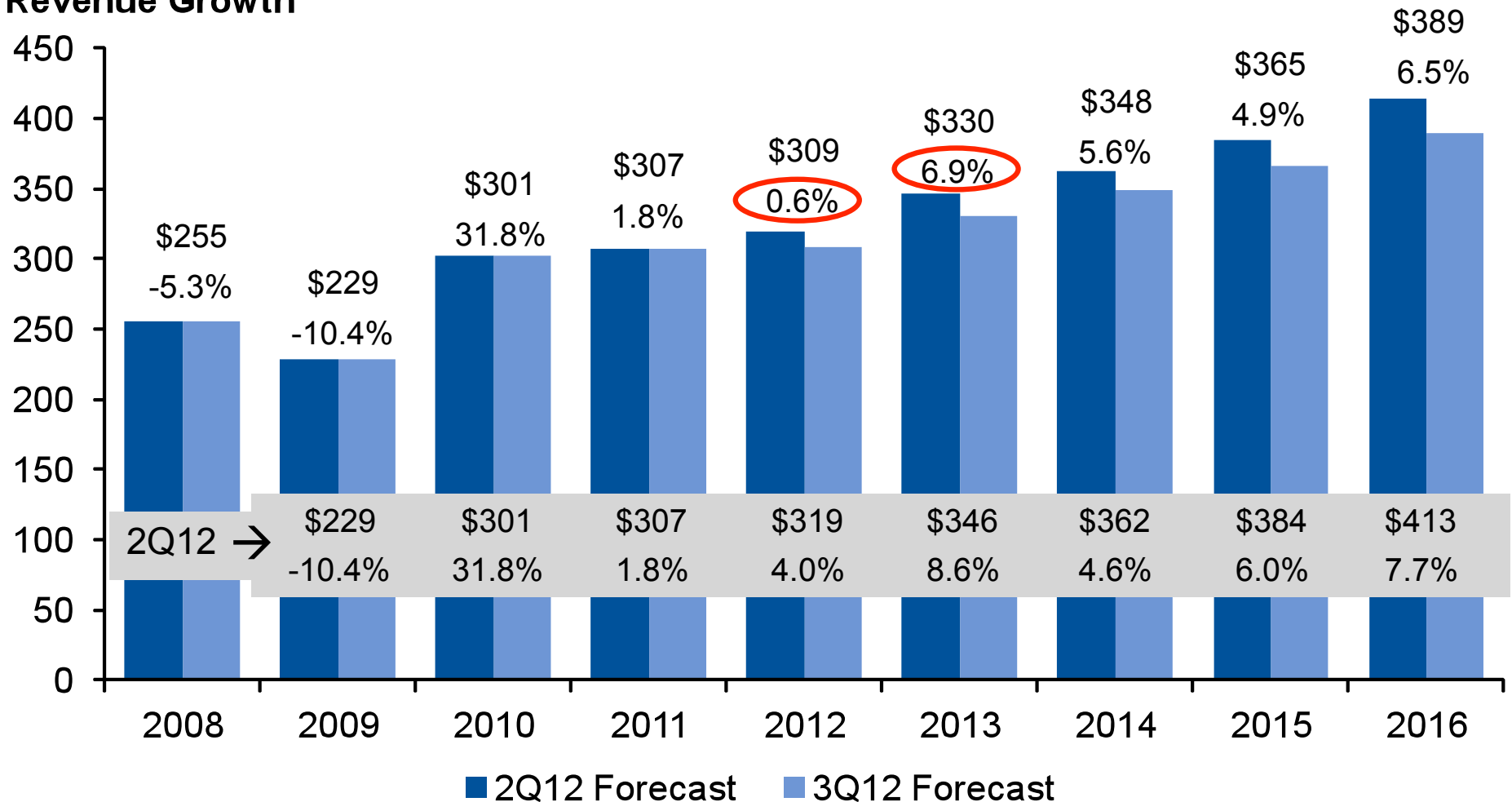


# Semiconductor Quarterly Revenue Profile: Market Softened in Q2, Q3 Below Seasonality



# Worldwide Semiconductor Revenue Forecast: Reduction in Overall CAGR

Billions of Dollars and Revenue Growth

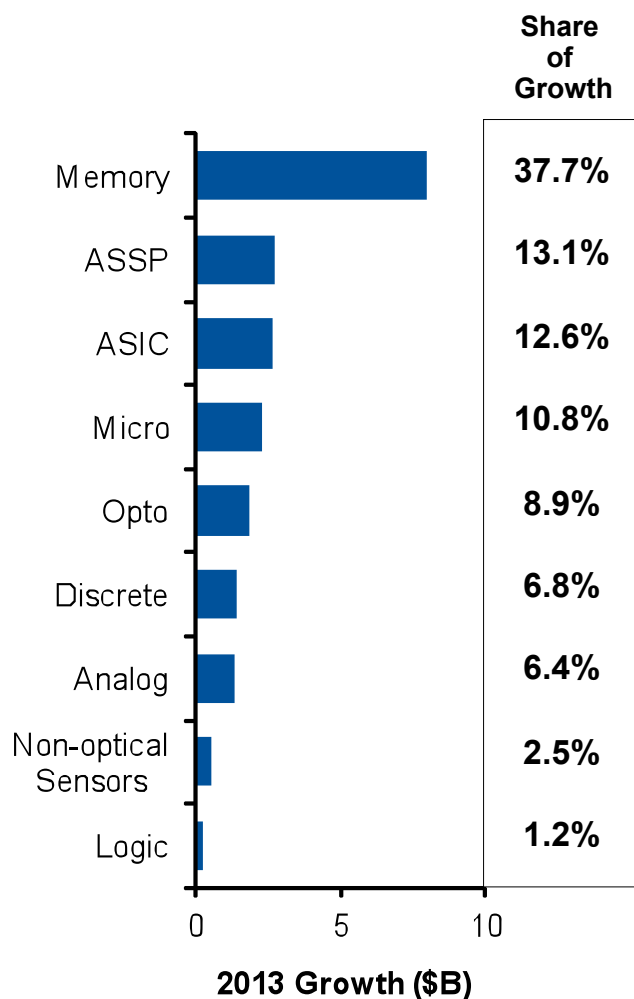


# Semiconductor Revenue, 3Q12 Update: Device Revenue and Annual Growth

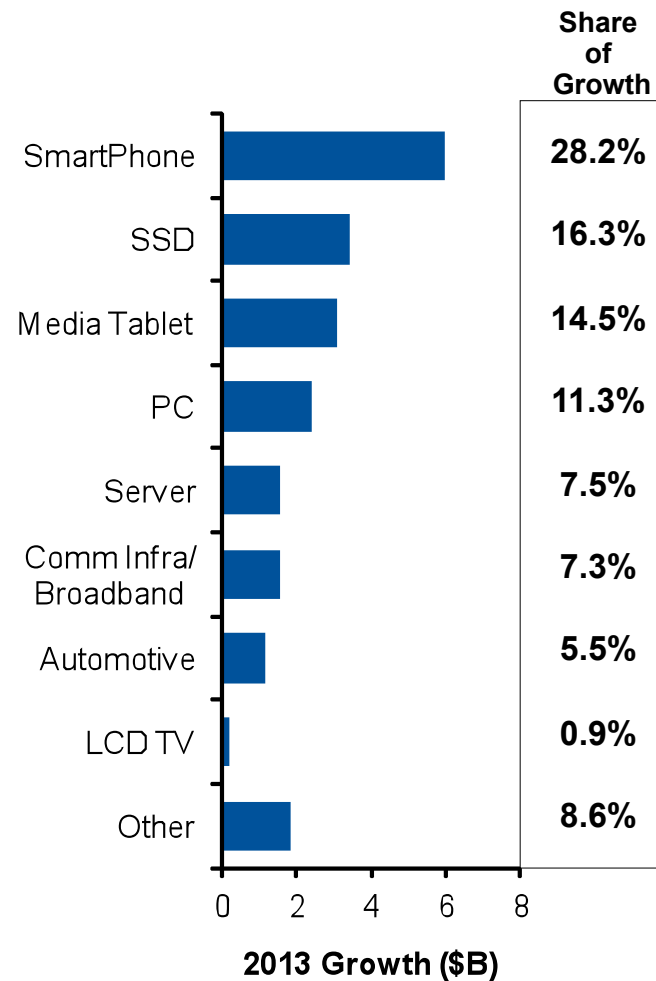
Revenue (\$B)	2011	2012	2013	2014	2015	2016	CAGR
Memory	61.1	58.9	66.8	68.7	70.6	79.8	5.5
Microcomponents	62.0	61.9	64.2	67.6	71.1	74.6	3.8
Logic	12.2	12.2	12.4	13.0	13.6	14.2	3.1
Analog	20.3	19.7	21.1	22.5	23.4	24.3	3.6
Discrete	20.4	19.5	20.9	22.1	23.1	23.8	3.1
Optoelectronics	23.5	25.6	27.5	30.5	33.5	37.0	9.5
ASIC	21.8	22.5	25.2	27.3	29.4	30.9	7.2
ASSP	80.6	82.8	85.5	89.8	93.4	96.6	3.7
Non-Optical Sensors	4.9	5.6	6.1	6.8	7.4	8.0	10.2
<b>Total Semiconductor</b>	<b>306.8</b>	<b>308.6</b>	<b>329.8</b>	<b>348.2</b>	<b>365.4</b>	<b>389.2</b>	<b>4.9</b>
Annual Growth (%)							
Memory	-10.0%	-3.7%	13.6%	2.8%	2.7%	13.0%	
Microcomponents	10.4%	-0.2%	3.7%	5.4%	5.2%	5.0%	
Logic	1.3%	0.0%	2.0%	4.4%	4.8%	4.3%	
Analog	-4.0%	-2.9%	6.9%	6.5%	4.3%	3.7%	
Discrete	4.2%	-4.7%	7.4%	5.8%	4.4%	3.2%	
Optoelectronics	7.4%	9.1%	7.4%	10.8%	9.7%	10.5%	
ASIC	0.8%	3.0%	11.9%	8.5%	7.6%	5.4%	
ASSP	5.0%	2.7%	3.3%	5.0%	4.0%	3.4%	
Non-Optical Sensors	14.3%	13.4%	9.5%	11.4%	9.0%	7.7%	
<b>Total Semiconductor</b>	<b>1.8%</b>	<b>0.6%</b>	<b>6.9%</b>	<b>5.6%</b>	<b>4.9%</b>	<b>6.5%</b>	
<b>Non-Memory</b>	<b>5.2%</b>	<b>1.6%</b>	<b>5.3%</b>	<b>6.3%</b>	<b>5.5%</b>	<b>4.9%</b>	

# Contribution to 2013 Growth

## Contribution by Device Type



## Contribution by Electronic Application



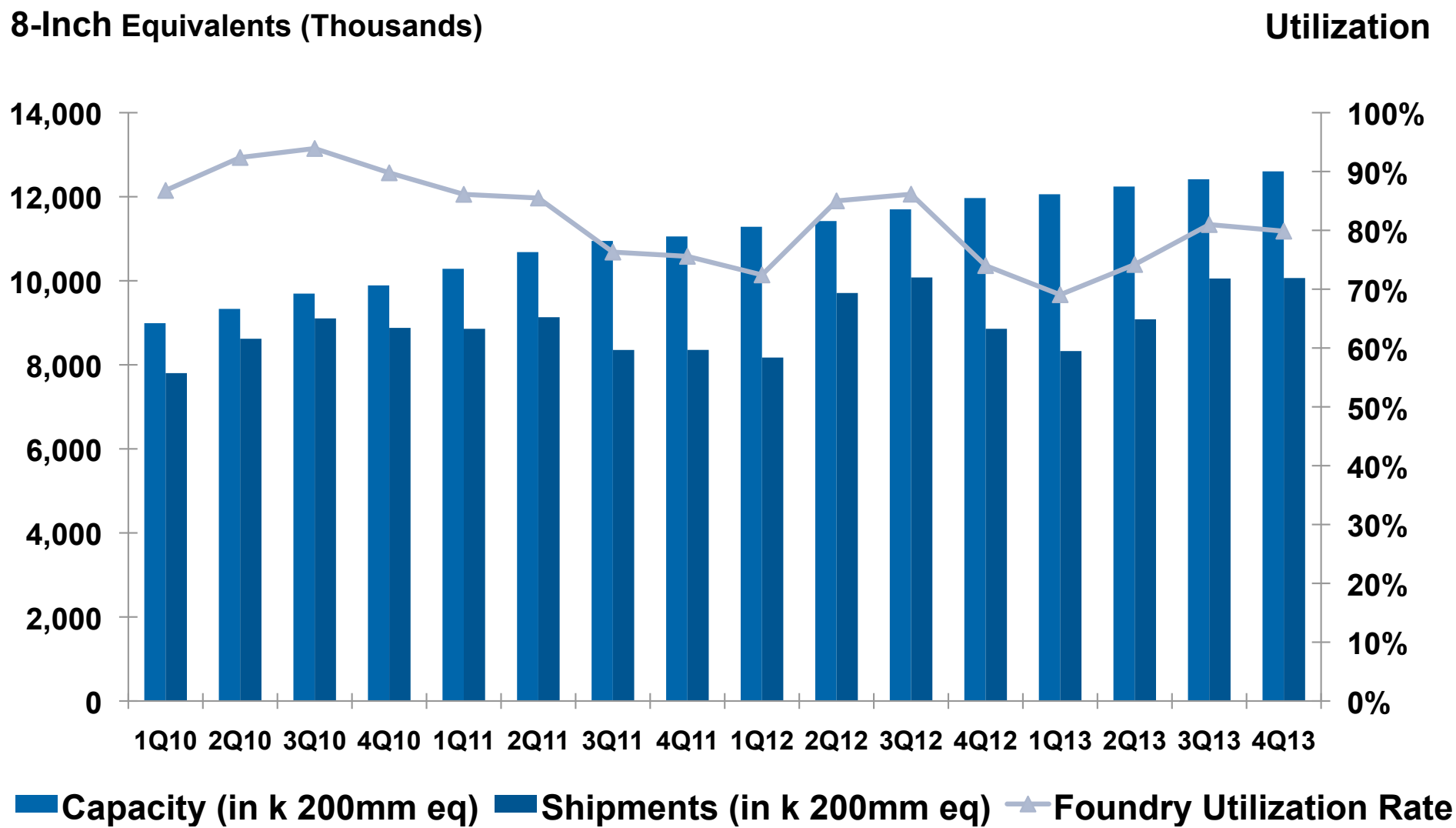


# Foundry Highlights

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- Foundry revenue will increase 9.9% to \$32.7B in 2012, 5.2% in 2013.
- The foundry sector will experience a compound annual growth rate (CAGR) of 7.8% from 2011 to 2016.
- Foundry will continue to outpace semiconductor revenue growth due to rapidly rising demand for advanced nodes, raising wafer ASP.
- Given the current economy outlook, the major year-to-date increase of demand from fabless customers will result in:
  - a rise of wafer inventory
  - a decline of foundry business over the next few quarters.
- Foundry capital spending will decline 7.3% in 2012 to \$15.5 billion, recover and rise over \$17 billion in 2015.
- Overall utilization rate of foundries will stay in the mid 80% range.

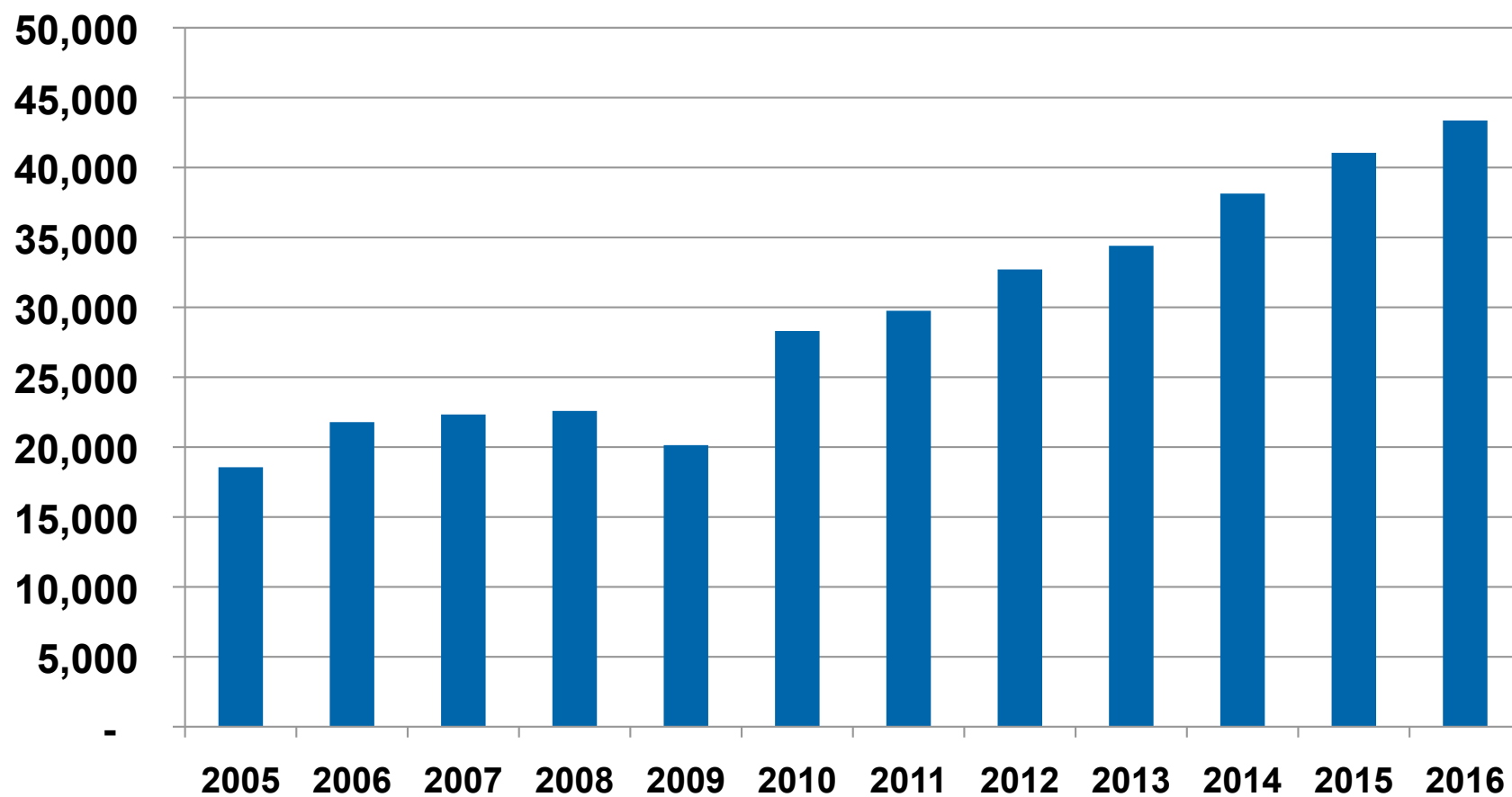
# Foundry Wafer Shipment and Fab Utilization



# Foundry Revenue

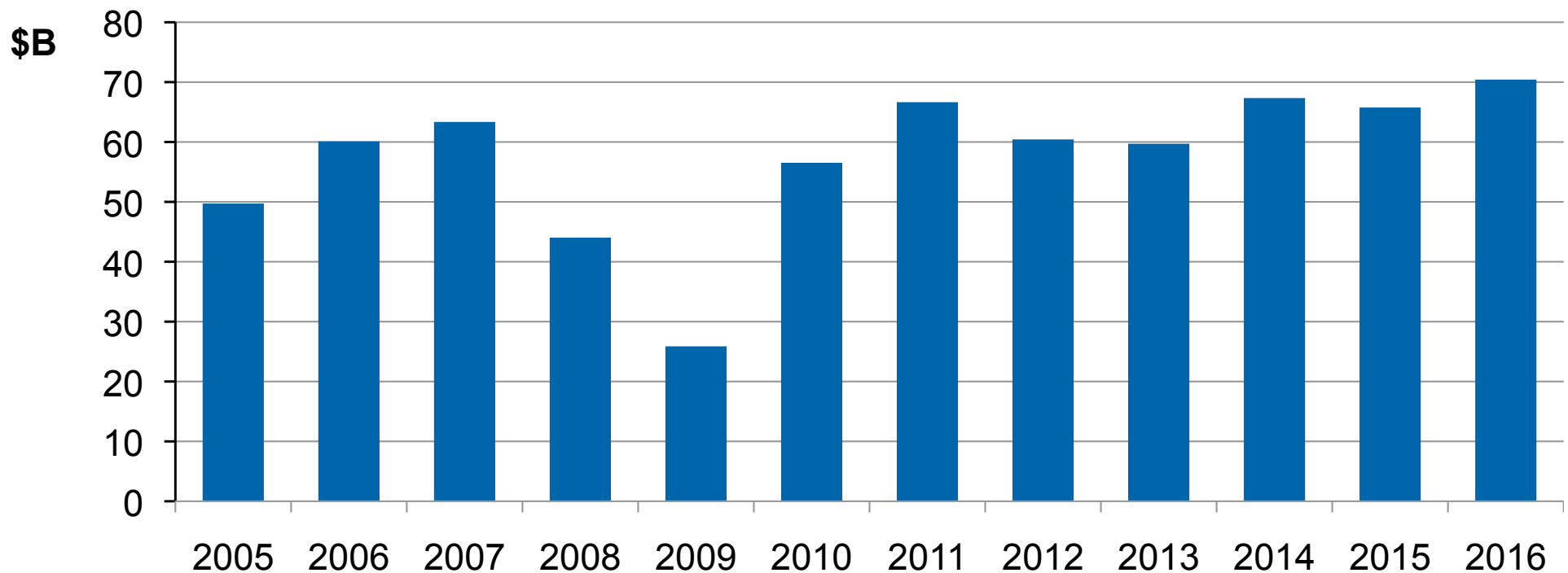
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Millions of Dollars



# Capital Spending: Slow Growth Ahead

- 2012 spending down 9.3%, driven by weak economy.
- Spending increases in second half 2013.
- 2015 softness driven by memory and logic reductions.

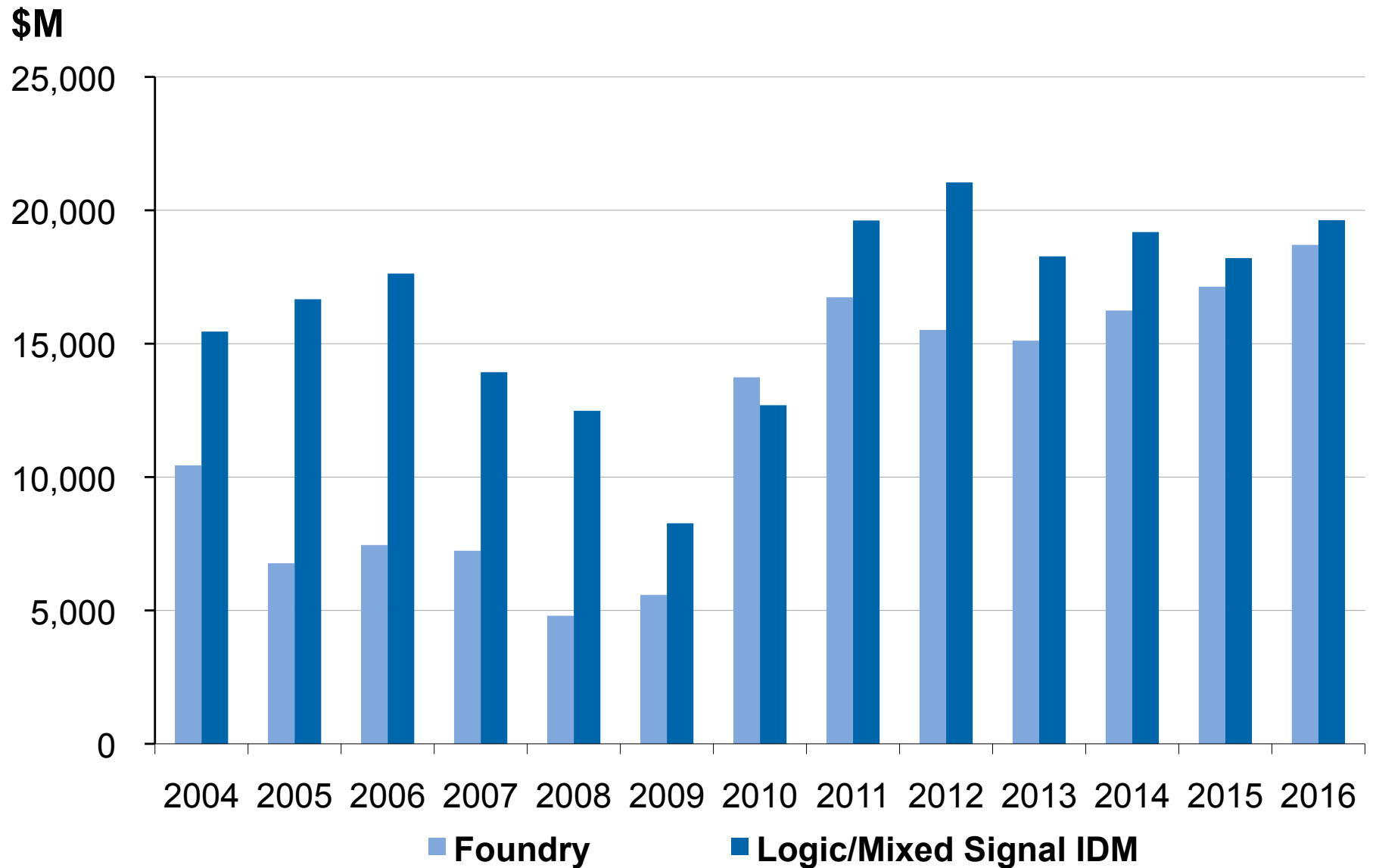


# Top Semiconductor Capital Spenders, 2011 and 2012

2012 Rank	2011 Rank	Companies	2011	2012	Growth%	Share%
1	1	Samsung	11,700	13,100	12.0%	21.7%
2	2	Intel	10,764	12,100	12.4%	20.0%
3	3	TSMC Group	7,300	7,500	2.7%	12.4%
4	4	Globalfoundries	4,900	3,000	-38.8%	5.0%
5	6	Hynix Semiconductor	3,000	2,400	-20.0%	4.0%
6	7	United Microelectronics Group	1,800	2,000	11.1%	3.3%
7	5	Micron Technology	3,000	1,750	-41.7%	2.9%
8	9	Toshiba	1,560	1,624	4.1%	2.7%
9	8	Sony	1,743	1,177	-32.5%	1.9%
10	10	SanDisk	1,368	1,100	-19.6%	1.8%
11	11	Infineon Technologies	1,350	800	-40.7%	1.3%
12	17	Advanced Semiconductor Engineering	727	800	10.0%	1.3%
13	14	Nichia Chemical	841	791	-5.9%	1.3%
14	15	Texas Instruments	816	700	-14.2%	1.2%
15	26	Siliconware Precision Company (SPIL)	374	600	60.6%	1.0%
16	12	STMicroelectronics	1,260	550	-56.3%	0.9%
17	22	Amkor Technology	467	550	17.8%	0.9%
18	20	HuaLi	500	500	0.0%	0.8%
19	16	SMIC	765	430	-43.8%	0.7%
20	29	STATS ChipPAC	304	420	38.1%	0.7%
<b>Top 20 Worldwide</b>			<b>54,539</b>	<b>51,892</b>	<b>-4.9%</b>	<b>85.9%</b>
<b>Worldwide</b>			<b>66,650</b>	<b>60,430</b>	<b>-9.3%</b>	<b>100.0%</b>
<b>% of Total</b>			<b>81.8%</b>	<b>85.9%</b>		

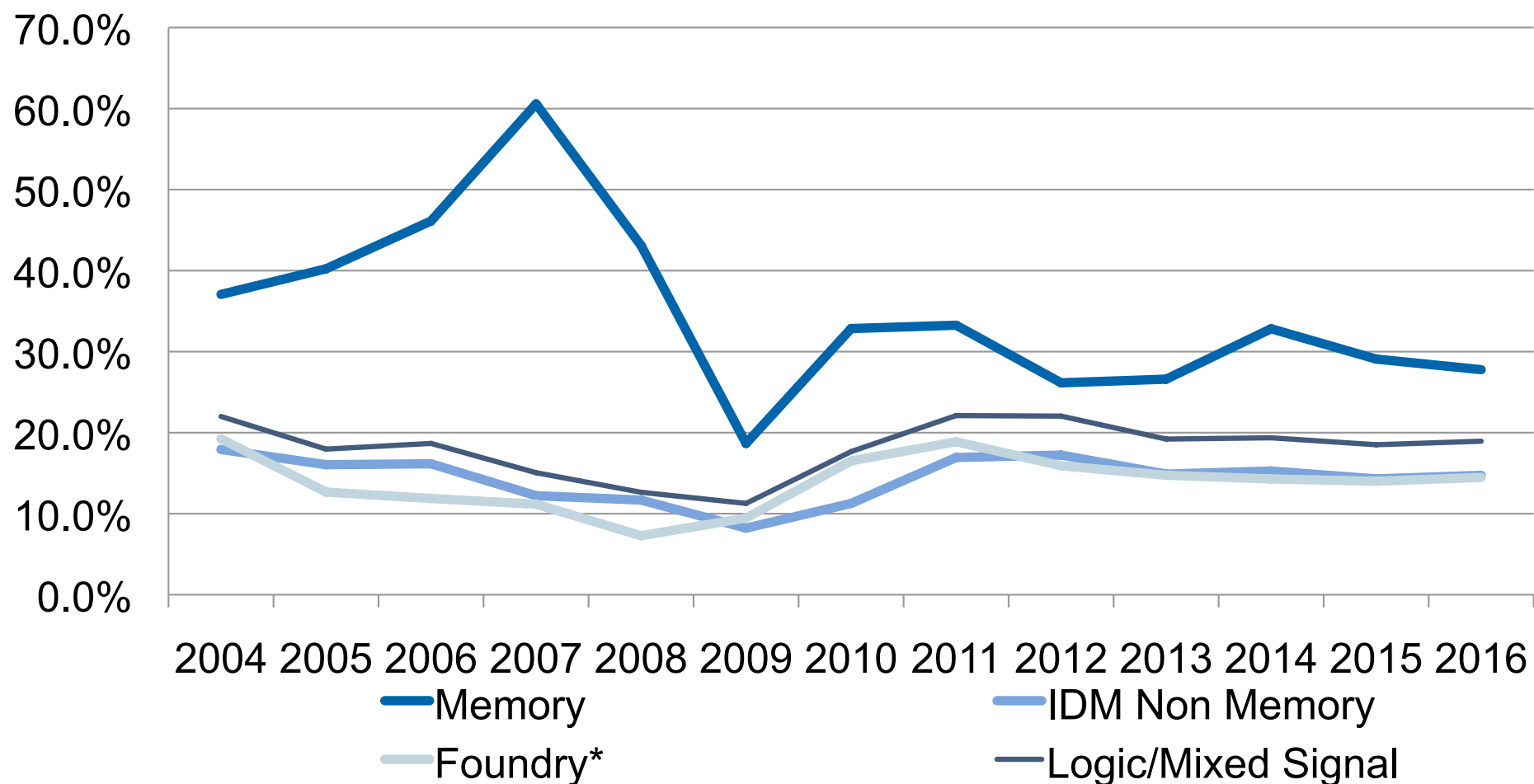
63%  
76%

# Logic/Mixed Signal Spending: Foundry Stabilizes as Intel, Samsung Surge



# Capital Intensity Stabilizing

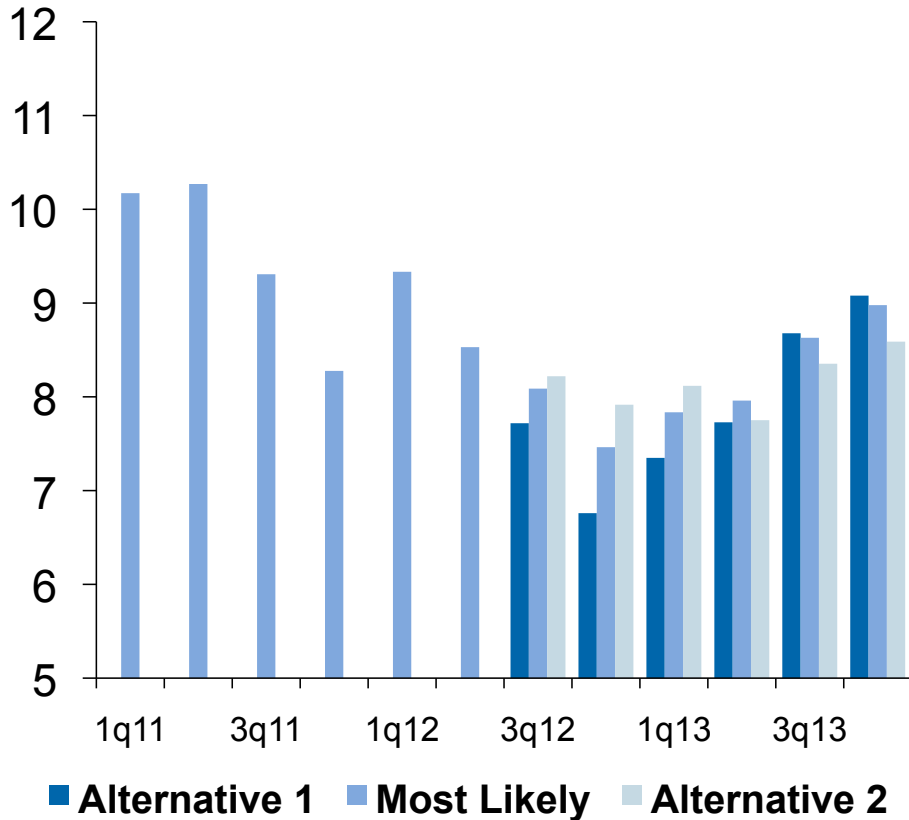
## Capex as % of Revenue



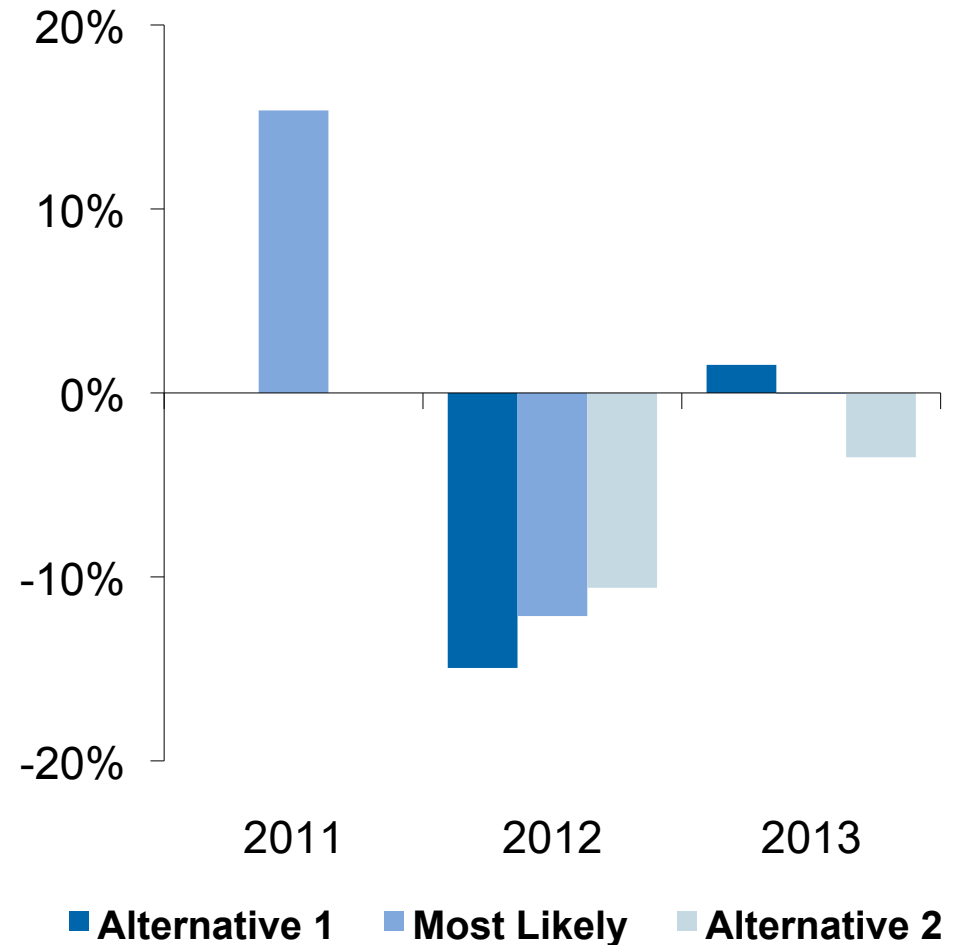
\*Foundry based on equivalent device revenue

# Capital Equipment Market: Quarterly Revenue Forecast Scenarios

Quarterly Revenue (Billions of Dollars)



Annual Growth (%)





# SATS Market Highlights

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SATS growth will increase 4.1% in 2012, followed by a 10.3% increase in 2013.

The SATS sector will experience a compound annual growth rate (CAGR) of 7.6% for the period 2011 through 2016.

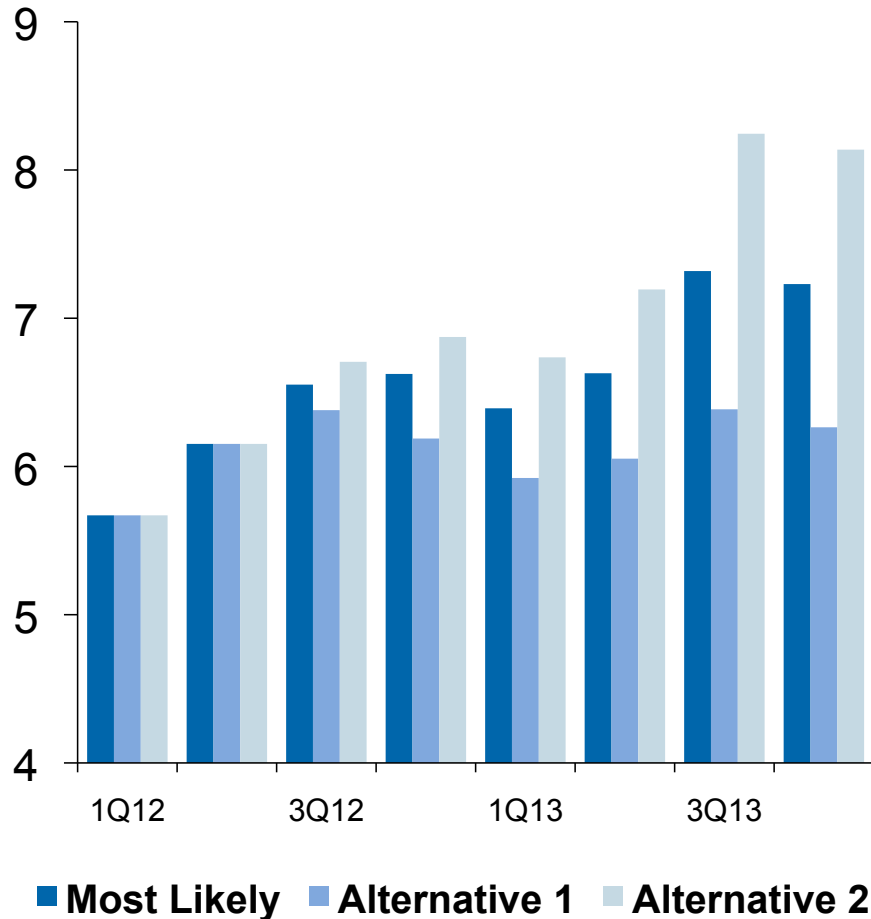
Revenue from flip chip, WLP, and MCP/3D packaging approaching near 50% of total at top tier SATS companies. The increase in 40/28 nm wafer shipments requires advanced packaging (WLP, Flip Chip and CSP) solutions.

SATS capital expenditure (capex) will increase by 5.7% in 2012 as the transition to copper wire bonding, adoption of WLP, and flip chip processes proceeds rapidly in the industry.

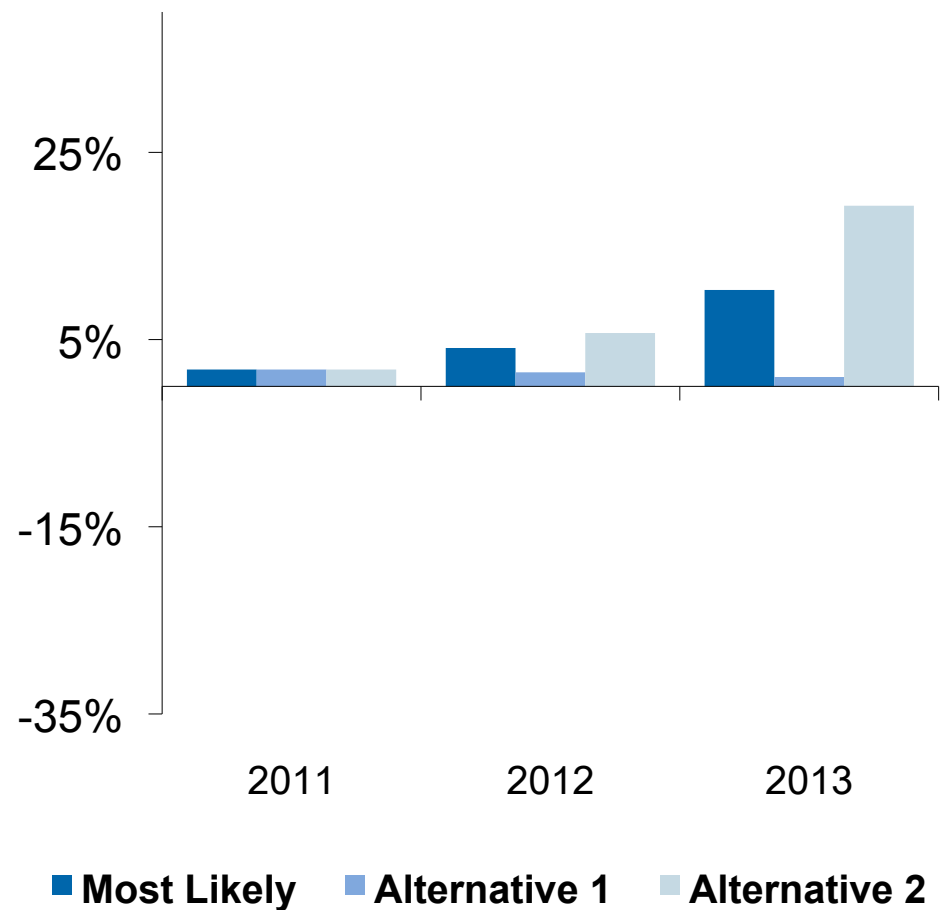
The packaging content of total semiconductor manufacturing cost continues to rise as process geometries shrink.

# SATS Market: Quarterly Revenue Forecast Scenarios

Quarterly Revenue (Billions of Dollars)

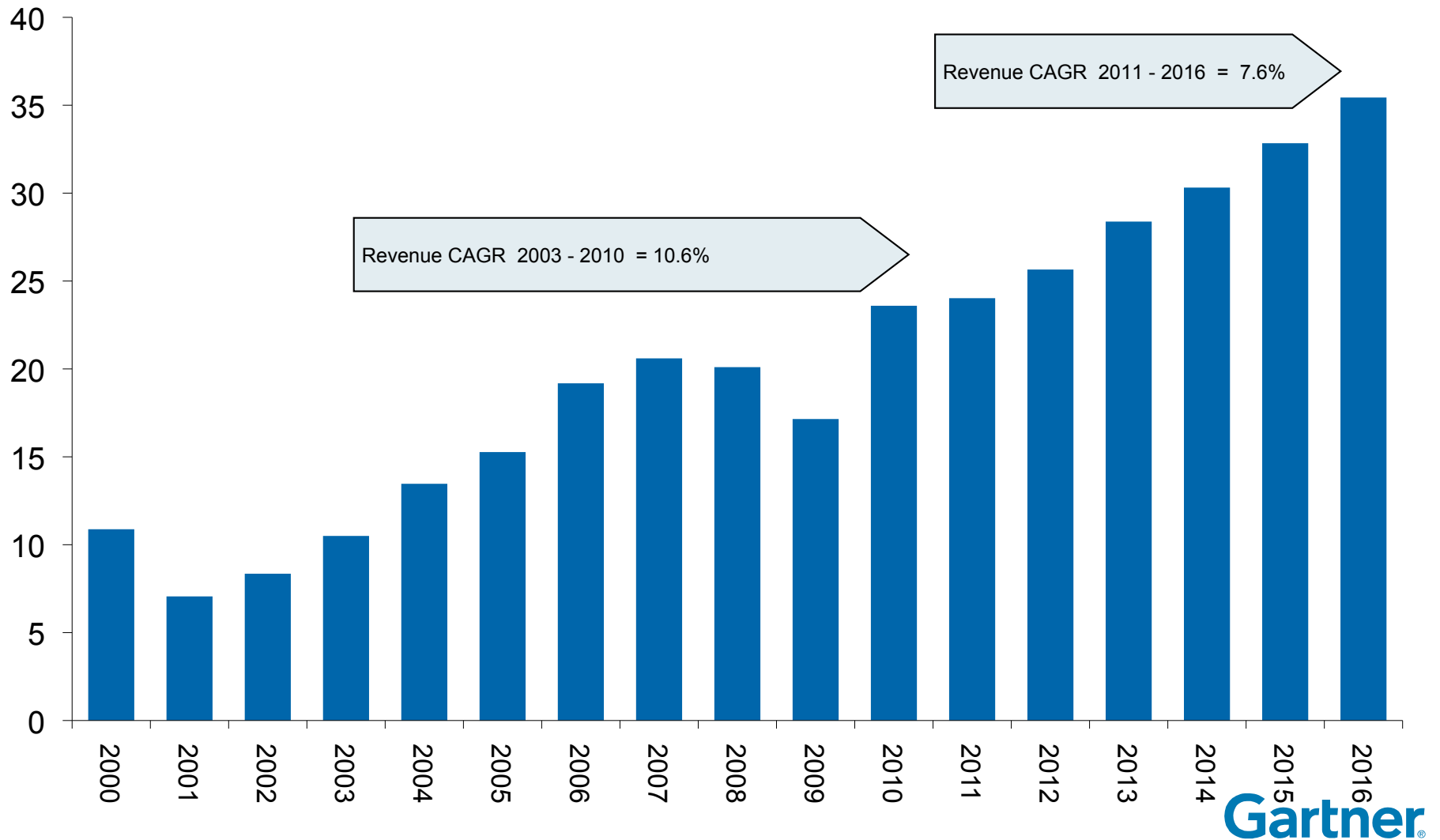


Annual Growth (%)



# SATS Revenue Growth 2000 - 2016

Billions of Dollars



Source: Gartner (September 2012)

# Packaging Revenue Forecast 2009-2016

	2009	2010	2011	2012	2013	2014	2015	2016	CAGR 2011-2016
<b>Packaging and Test Market (IDM)*</b>	<b>20,793</b>	<b>24,898</b>	<b>24,000</b>	<b>24,070</b>	<b>25,438</b>	<b>26,271</b>	<b>28,187</b>	<b>28,795</b>	<b>3.7%</b>
Packaging Revenue Only	16,368	19,621	18,930	19,085	20,198	20,860	22,380	22,863	3.8%
Test Revenue Only	4,425	5,277	5,070	4,985	5,240	5,412	5,806	5,932	3.2%
<b>Outsourcing Market (SATS)</b>	<b>17,150</b>	<b>23,593</b>	<b>24,024</b>	<b>24,999</b>	<b>27,570</b>	<b>29,839</b>	<b>32,231</b>	<b>34,637</b>	<b>7.6%</b>
Packaging Revenue Only	13,365	18,115	18,153	18,888	20,720	22,359	24,151	25,954	7.4%
Test Revenue Only	3,785	5,478	5,872	6,111	6,850	7,480	8,080	8,683	8.1%
<b>Worldwide Total Packaging and Test Market</b>	<b>37,943</b>	<b>48,491</b>	<b>48,024</b>	<b>49,069</b>	<b>53,008</b>	<b>56,111</b>	<b>60,417</b>	<b>63,432</b>	<b>5.7%</b>
Total Packaging and Test Market Growth	-16.6%	27.8%	-1.0%	2.2%	9.7%	5.9%	7.7%	5.0%	
<b>Worldwide Total Packaging Market</b>	<b>29,733</b>	<b>37,736</b>	<b>37,083</b>	<b>37,973</b>	<b>40,918</b>	<b>43,218</b>	<b>46,531</b>	<b>48,817</b>	<b>5.7%</b>
Outsourced Packaging Market	44.9%	48.0%	49.0%	49.7%	50.6%	51.7%	51.9%	53.2%	
<b>Worldwide Total Test Market</b>	<b>8,210</b>	<b>10,754</b>	<b>10,941</b>	<b>11,096</b>	<b>12,090</b>	<b>12,892</b>	<b>13,886</b>	<b>14,615</b>	<b>6.0%</b>
Outsourced Test Market	46.1%	50.9%	53.7%	55.8%	56.7%	58.0%	58.2%	59.4%	
<b>Ratio of Outsourced Market</b>	<b>45.2%</b>	<b>48.7%</b>	<b>50.0%</b>	<b>50.9%</b>	<b>52.0%</b>	<b>53.2%</b>	<b>53.3%</b>	<b>54.6%</b>	
SATS Growth Rate	-14.7%	37.6%	1.8%	4.1%	10.3%	8.2%	8.0%	7.5%	

\*Equivalent market value if 100% of IDM/OEM in-house packaging and test were outsourced

Note: Some columns do not add to totals shown because of rounding.

Source: Gartner (September 2012)

# Top 10 SATS Capital Spenders (Millions of Dollars)

2012 Rank	2011 Rank	Companies	2011	2012	Growth	Share
1	1	Advanced Semiconductor Engineering	727.0	800.0	10.0%	18.8%
2	4	SPIL	373.7	600.0	60.6%	14.1%
3	2	Amkor Technology	467.0	550.0	17.8%	13.0%
4	5	STATS ChipPAC	304.2	420.0	38.1%	9.9%
5	6	UTAC	254.7	250.0	-1.9%	5.9%
6	3	Powertech Technology	408.3	185.0	-54.7%	4.4%
7	7	Shinko	169.3	170.0	0.4%	4.0%
8	9	Jiangsu Changjiang Electronic Technology	124.9	133.3	6.7%	3.1%
9	8	King Yuan Electronics (KYEC)	135.1	95.0	-29.7%	2.2%
10	10	Tera Probe	103.5	95.0	-8.2%	2.2%
		Other Companies	949.7	947.6	-0.2%	22.3%
		<b>Total SATs Capex</b>	<b>4,017.4</b>	<b>4,245.9</b>	<b>5.7%</b>	<b>100.0%</b>

Source: Gartner (September 2012)

# Major Trends in Packaging Equipment

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- Copper bonding processes continue to be a major driver for the packaging equipment segment.
- Flip-chip processing continues to grow well above the general packaging equipment market rate.
- Wafer-level packaging tool segments are expected to continue growing much faster than the general equipment market as bump processing and TSV demand increases in 2013-14 time period.
- Larger SATS vendors have hit a growth ceiling as recent capital spending has not resulted in substantial revenue growth.

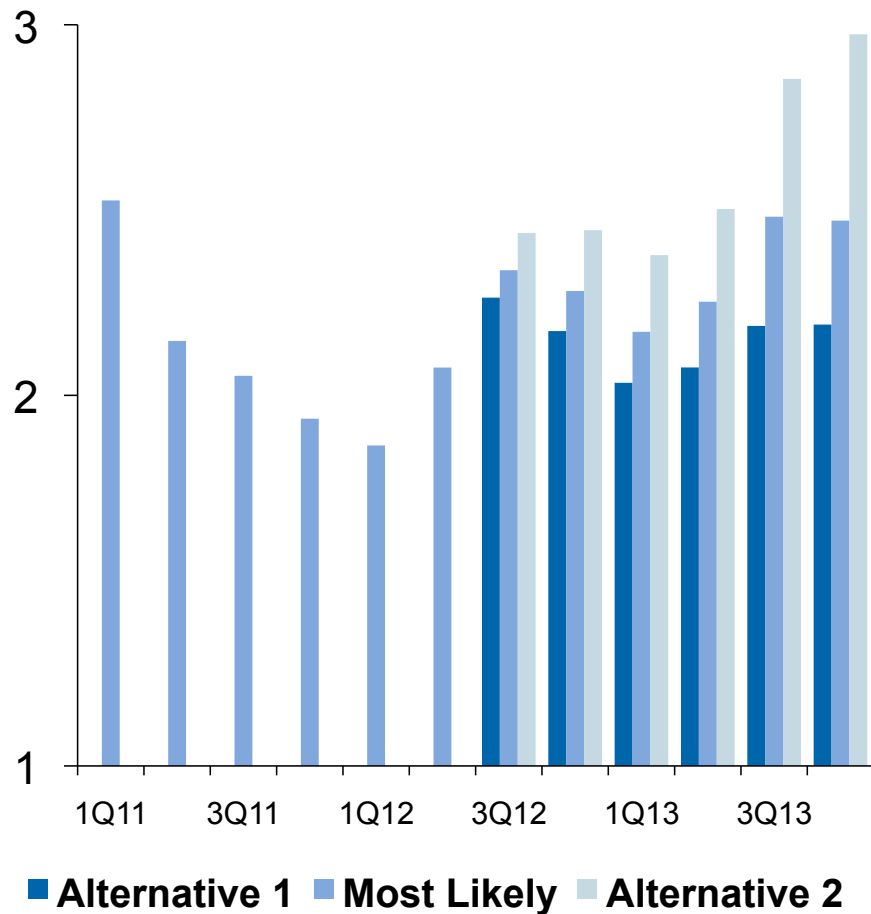
# Major Trends in the ATE Segment

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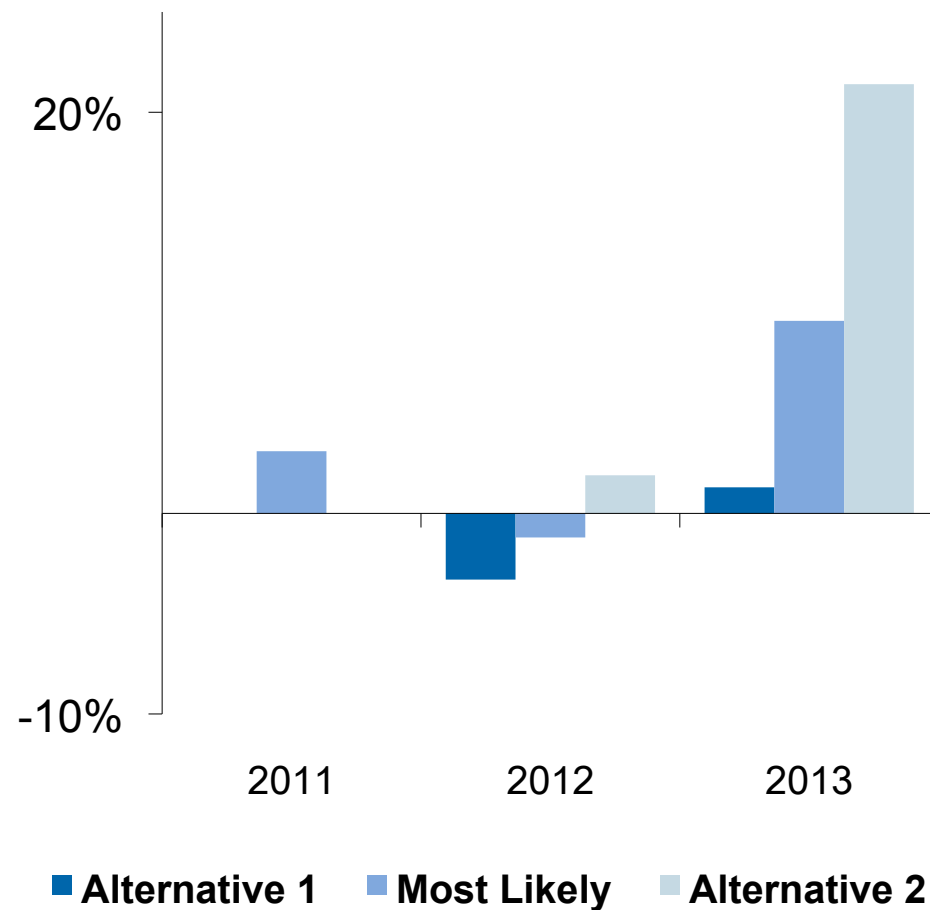
- Increased parallelism in the non-memory space has impacted demand for total system sales.
- Industry consolidation has had a major impact on the competitive environment within the test equipment space.
- The future of the ATE market will be marked by an oligopoly type situation, where the two main players (Advantest and Teradyne) should realize greater pricing power for their test platforms.

# BEE Market: Quarterly Revenue Forecast Scenarios

Quarterly Revenue (Billions of Dollars)



Annual Growth (%)





# Advanced Back-End Processing Trends

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- The fastest growing packaging segments are:
  - Bare-die
  - FBGA
  - Leadless-frame
- Adoption of TSV pushed into late 2013
  - Full production ramp for memory devices in late 2013 and into 2014.
  - The non-memory space will see industry-wide production levels in the 2014-15 timeframe if demand warrants the technology.
- SATS players are now getting a majority share of the advanced packaging revenues as IDM's continue using the outsourcing model for back-end processing.

# Q3 2012 Forecast Growth Scorecard

Revenue Growth (%)	2012			2013		
	-6 Mos	-3 Mos	Now	-6 Mos	-3 Mos	Now
Global Real GDP	+2.4	+2.6	+2.6	+3.1	+3.1	+2.7
U.S. Real GDP	+2.1	+2.2	+2.1	+2.3	+2.4	+1.8
Elec. Equipment <sup>1</sup>	+5.0	+5.6	+4.6	+5.7	+5.0	+4.4
Semiconductor <sup>2</sup>	+4.0	+4.0	+0.6	+9.4	+8.6	+6.9
Foundry	+6.1	+9.9	+9.9	+10.0	+9.0	+5.2
SATS	+5.1	+6.8	+4.1	+12.4	+10.6	+10.3
Capital Spending	-7.3	-3.6	-9.3	+3.5	+2.0	-1.2
Equip. Spending	-11.6	-7.1	-11.0	+10.5	+9.3	+1.4
WFE	-12.7	-8.9	-13.3	+7.0	+7.4	-0.8
PAE	-6.6	-0.6	-2.6	+23.3	+15.4	+9.0
ATE	-8.2	-4.4	+2.2	+29.0	+18.6	+10.8
Silicon (MSI)	-5.1	-0.3	+3.9	+14.5	+12.0	+7.2

<sup>1</sup> Production revenue

<sup>2</sup> Excluding solar