

EQUITY RESEARCH

October 25, 2023

- Semiconductor Capital Equipment
- Semiconductors
- Technology Hardware: Storage & Peripherals
- Telecom Equipment/Wireless

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INDUSTRY UPDATE

TAIWAN SEMIS MONTHLY – SEPTEMBER REMAINS DECIDEDLY MIXED ACROSS VERTICALS

THE TD COWEN INSIGHT

September results for the Taiwan supply chain came in +179 bps above typical M/M seasonal averages, +21.4% M/M & -13.8% Y/Y, following a slightly weaker August (317 bps below typical trends). Above seasonal results were driven by strength in Disty/EMS, Memory, Driver IC, offset by the softness in Foundry, Components, OSATs, PCs, and Wireless/Smartphone.

By vertical, September wireless sales decreased -9.1% M/M, ~1,406bps below seasonal averages, down a whopping 29.5% Y/Y. The Apple Supply Chain increased +27.6%, +136 bps above seasonal, and up +12.2% Y/Y following August's results that saw sales decrease -2.8% (+14.3% Y/Y), -598 bps below seasonal. For PCs and Servers, September processor component suppliers reported revenue up +12.2% M/M, -9.8% bps below seasonal, and down -11.5% Y/Y, following August's down -7.4% M/M and +3.3% Y/Y. September ODM notebook unit shipments were up +6.6% M/M (-2.9% Y/Y) to 12.5 M units as compared to August's 11.7 M units (+8.3% M/M and +1.7% Y/Y).

Consumer datapoints remain mixed to soft as PC data points align with management commentary from across our coverage of early indications of a sustainable bottom in PCs (which had been expected to occur at some point in the JunQ), and this month's data would seem to indicate sell-through is potentially beginning to pick up ahead of critical back-to-school season. Conversely, on the smartphone side, data outside the Apple ecosystem appears to be sharply negative once again following sequential improvement through the summer.

Overall, management commentary has continued to report robust auto/industrial demand despite sharp declines in many consumer markets, though some industrial verticals are beginning to see volatility in order patterns. We continue to monitor these trends, as well as broad-based cyclical concerns.

Despite the near-term relative softness, we continue to point to positive long-term secular content growth drivers across end-market applications. While we anticipate macroeconomic challenges felt during 1H23 will continue to be felt across semis now well into the 2H, we remain constructive on these long-term trends: (1) xEVs given regulatory and consumer support combined with a still under-served auto unit market; and (2) datacenter compute and power driven by resilient CapEx in cloud/HPC (though we expect share shifts and some very choppy data points near term outside of AI servers). However, we recognize that in spite of strong long-term fundamentals, the near term is going to remain challenging and choppy. We note the backward-looking Taiwan Sales results and data are provided for investors to gauge and contextualize the semiconductor supply/demand dynamics, while we fully acknowledge forward demand remains uncertain due to multiple macro and inflationary factors.

Our Top Picks Remain

- *Semiconductors (Ramsay): NVDA, AMD, MPWR*
- *Auto/Industrial Semis (Buchalter): NXPI, MBLY*
- *SemiCap Equipment (Sankar): AMAT, LRCX*

WHY THIS DATA IS IMPORTANT: We track this data because it exhibits high correlation with monthly semiconductor revenue (~0.57 on a monthly basis and ~0.55 on a quarterly basis). While we realize this data cannot be relied on completely, there is a meaningful 55% correlation between Q/Q Taiwan sales and SIA semi revenue (semiconductor revenue increased 6.4% M/M and -7% Y/Y in August according to SIA). For further details on SIA data please see our note [here](#).

Figure 1 - Taiwan Monthly Sales – September 2023

	Ticker	Company Name	September	M/M	10-Yr Average	Delta	August	M/M	10-Yr Average	Delta	July	M/M	10-Yr Average	Delta
Wireless/Smartphone														
OEMs	2498.tw	HTC	601,466	135%	8%		256,065	6%	(1%)		241,703	60%	(16%)	
Components	2454.tw	Mediatek	36,078,033	(15%)	(2%)		42,256,360	33%	11%		31,763,135	(17%)	6%	
	3008.tw	Largan	5,572,471	23%	6%		4,545,358	30%	12%		3,489,070	29%	14%	
	3406.tw	Genius Electronic Optical	3,462,646	7%	4%		3,235,256	51%	11%		2,148,218	86%	19%	
Total Wireless/Smartphone			45,714,616	(9%)	5%	(14%)	50,293,039	31.6%	4%	29.4%	37,642,126	(12%)	1%	(12%)
Memory														
DRAM	2408.tw	Nanya	2,724,287	6%	(1%)		2,574,894	6%	2%		2,437,193	(1%)	(0%)	
General Memory	2453.tw	Transcend	1,043,420	19%	11%		877,679	9%	(4%)		808,006	(12%)	5%	
	3260.tw	A-Data	3,342,305	12%	6%		2,971,146	30%	2%		2,278,446	(0%)	2%	
NAND Controllers	8299.tw	Phison	5,003,863	25.4%	0.6%		3,990,403	18%	(2%)		3,394,299	(1%)	12%	
	3555.ot	Skymed	6,409	924%	14%		626	24%	6%		506	(24%)	1%	
	8054.tw	Alcor Micro	155,542	(3%)	(1%)		159,612	7%	2%		148,902	(1%)	6%	
NOR Flash	2344.tw	Winbond	6,766,334	5%	(3%)		6,426,643	2%	1%		6,314,838	(10%)	1%	
	2337.tw	Macronix	2,501,015	(4%)	14%		2,600,299	19%	9%		2,181,288	2%	2%	
Total Memory			21,541,175	9.9%	3%	7%	19,599,802	12%	1%	10%	17,563,478	(4%)	2%	(6%)
PC Related														
PC OEM	2353.tw	Acer	28,064,739	29%	15%		21,687,117	22%	11%		17,722,949	(13%)	(27%)	
	2357.tw	Asus	48,871,582	1%	6%		48,615,792	29%	16%		37,564,502	(22%)	(6%)	
	2356.tw	Inventec	47,528,852	2%	17%		46,478,885	11%	2%		41,832,918	(12%)	(4%)	
PC ODM	2382.tw	Quanta	98,258,338	(3%)	6%		101,355,120	17%	5%		86,891,131	(4%)	(3%)	
	2324.tw	Compal	85,130,577	4%	19%		81,736,993	(4%)	4%		84,846,601	4%	(11%)	
	3231.tw	Wistron	77,882,364	7%	21%		72,891,238	8%	5%		67,719,669	(16%)	(11%)	
	4938.tw	Pegatron	132,822,701	46%	63%		89,350,065	(6%)	(8%)		93,585,467	13%	(4%)	
Total PC Related			518,564,153	12%	22%	(10%)	462,118,240	7%	4%	3%	430,163,257	(6%)	(4%)	(2%)
Distribution/EMS														
Distribution/EMS	2347.tw	Synnex	33,892,154	(1%)	7%		34,236,328	8%	5%		31,728,433	(16%)	3%	
	2317.tw	Hon Hai	660,740,414	60%	40%		412,838,898	(12%)	0%		469,234,396	11%	(0%)	
	3702.tw	WPG Holdings	70,923,189	36%	8%		51,994,846	(2%)	7%		53,195,403	(4%)	3%	
	3036.tw	WFO Microelectronics	62,892,544	25%	40%		60,372,885	(7%)	0%		53,994,572	32%	(0%)	
Total Distribution/EMS			828,448,701	51%	35%	16%	549,442,357	(9.7%)	2%	(12%)	608,152,804	9%	0%	9%
Foundry														
Foundry	2303.tw	UMC	19,052,938	1%	(1%)		18,952,011	(1%)	(3%)		19,063,918	0%	4%	
	2330.tw	TSMC	180,430,282	(4.1%)	(1.4%)		188,686,256	6%	6%		177,616,220	14%	2%	
Total Foundry			199,483,220	(4%)	(2%)	(1.9%)	207,638,267	6%	5%	1%	196,680,138	12%	1%	11%
OSATs														
OSATs	3711.tw	ASE Technology Holding	53,534,708	2%	10%		52,278,801	8%	6%		48,353,336	3%	3%	
	6147.tw	Chipbond	1,696,980	(3%)	0%		1,747,132	1%	1%		1,735,030	(7%)	5%	
	8150.tw	ChipMOS	1,912,350	4%	(2%)		1,832,982	(0%)	4%		1,836,225	3%	0%	
	2449.tw	KingYuan KYEC	2,858,905	(1%)	(1%)		2,879,079	1%	1%		2,855,724	2%	4%	
Total OSATs			60,002,943	2%	8%	(6%)	58,737,994	7%	5%	2%	54,780,315	3%	3%	0%
Display Driver ICs														
Display Driver ICs	3034.tw	Novatek	9,560,688	(1%)	1%		9,694,234	0%	5%		9,675,040	(4%)	4%	
	4966.tw	Parade	1,494,986	31%	8%		1,145,577	7%	11%		1,069,605	(10%)	(2%)	
	3545.tw	Focaltech	1,263,954	(1.2%)	(2.2%)		1,285,262	23%	3%		1,049,191	22%	(6%)	
Total Display Driver ICs			12,319,628	2%	1%	1%	12,125,073	3%	5%	(3%)	11,793,836	(3%)	4%	(7%)
Components														
Display	3673.tw	TPK	5,598,402	(9%)	8%		6,156,652	(2%)	11%		6,298,236	20%	9%	
	2409.tw	AUIO	24,568,621	1%	(0%)		24,281,667	14%	9%		21,259,538	(7%)	(2%)	
	6176.tw	Radiant (ROEC)	3,849,478	5%	9%		3,674,782	(5%)	1%		3,864,029	9%	14%	
	2448.tw	Epistar	2,126,208	4%	(1%)		2,047,849	3%	2%		1,985,633	1%	(8%)	
LED	2393.tw	Everlight	1,512,452	(5%)	0%		1,598,014	13%	8%		1,414,247	(3%)	(5%)	
	2301.tw	Lite-On Technology	14,100,034	6%	6%		13,289,503	6%	4%		12,567,821	(3%)	(0%)	
	3037.tw	Unimicron	8,758,856	(5%)	3%		9,217,841	8%	7%		8,568,959	4%	3%	
IC Packaging	3189.tw	Kinpus	1,978,409	(7%)	(3%)		2,132,605	10%	1%		1,935,157	(4%)	6%	
	3044.tw	Tripod	5,558,813	1%	2%		5,509,416	7%	4%		5,170,416	19%	7%	
	2376.tw	Gigabyte	16,271,282	36%	8%		11,937,368	37%	(1%)		8,691,762	(10%)	17%	
	2377.tw	Micro-Star	18,110,067	7%	17%		16,893,813	21%	6%		13,914,288	(3%)	(4%)	
	3515.tw	ASRock	1,973,763	21%	6%		1,636,486	26%	4%		1,303,108	(17%)	15%	
	2331.tw	Elite Group Computer Systems	1,452,628	5%	(2%)		1,381,629	(15%)	7%		1,617,835	(18%)	(10%)	
	6269.tw	Flexium Interconnect	3,030,223	15%	16%		2,640,320	13%	24%		2,338,303	(4%)	10%	
Lithium-Ion Battery Packs	6121.tw	Simple Technology	8,122,541	11%	8%		7,303,364	11%	4%		6,604,039	0%	3%	
	3211.tw	Dynapack International	1,271,503	(17%)	4%		1,532,585	2%	10%		1,507,393	(8%)	7%	
ATE	2360.tw	Chroma	1,657,291	(12%)	(1%)		1,875,290	43%	1%		1,314,570	(19%)	4%	
Metal Casings for CEs	2474.tw	Catcher	1,185,500	(16%)	11%		1,405,335	(19%)	10%		1,736,674	(18%)	2%	
	2354.tw	Foxconn Tech	6,879,714	(13%)	38%		7,893,114	4%	24%		7,560,000	25%	13%	
Peripherals for CEs	3311.tw	Siltech	200,073	8%	1%		184,773	0%	9%		183,861	8%	8%	
	2385.tw	Chicony	9,140,680	6%	11%		8,645,868	8%	10%		8,022,391	(11%)	(6%)	
Computer Peripherals	8081.tw	Global Mixed-mode Technology	715,275	(12%)	6%		814,304	14%	7%		712,720	1%	3%	
	2392.tw	Foxlink	9,434,240	23%	22%		7,642,344	(3%)	5%		7,898,761	35%	14%	
	2308.tw	Delta Electronics	35,385,748	(3%)	4%		36,435,815	1%	1%		35,973,872	3%	4%	
	2327.tw	Yageo	9,460,362	5%	1%		9,009,640	1%	2%		8,888,464	1%	3%	
Total Components			209,101,445	4%	7%	(4%)	193,998,487	8%	8%	(1%)	180,296,514	0%	2%	(2%)
Total Taiwan Sales			1,887,275,897	21%	20%	1.8%	1,553,953,259	1%	4%	(3%)	1,537,072,468	3%	(3%)	6%

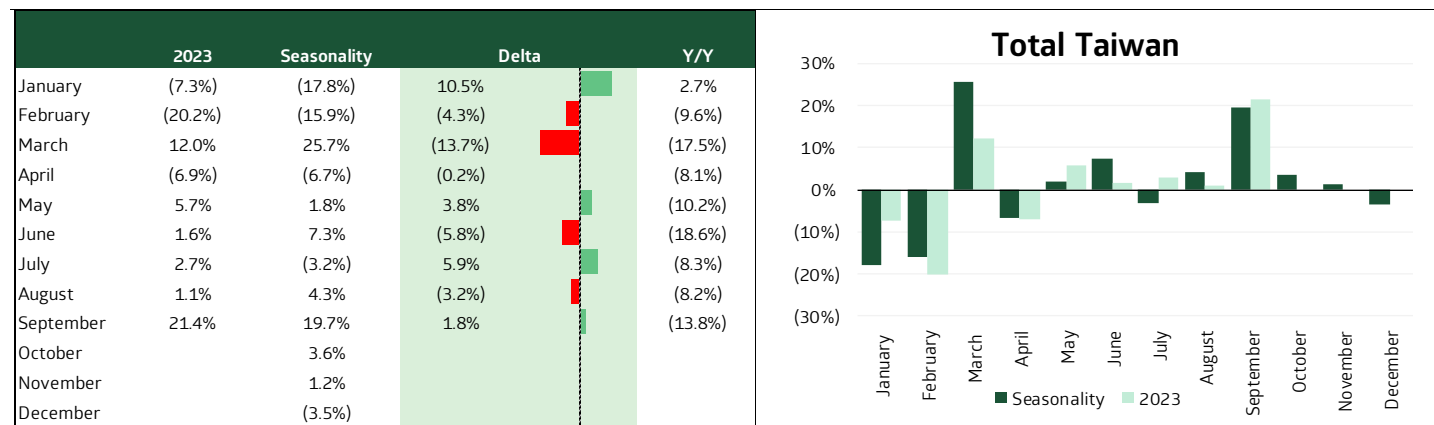
Source: TD Cowen, Company Filings

Figure 2 - Taiwan Aggregate Monthly Sales (Q/Q)

	Q4:22				Q1:23				Q2:23				Q3:23			
	Results	5-Yr Avg.	10-Yr Avg.	5-Yr Delta	Results	5-Yr Avg.	10-Yr Avg.	5-Yr Delta	Results	5-Yr Avg.	10-Yr Avg.	5-Yr Delta	Results	5-Yr Avg.	10-Yr Avg.	5-Yr Delta
AAPL Supply Chain	4.8%	24.7%	22.4%		(21.2%)	(28.1%)	(20.6%)		(5.0%)	1.7%	7.3%		0.0%	1.7%	15.6%	
Wireless/Smartphone	(20.9%)	(4.9%)	(3.4%)		(15.8%)	(23.7%)	(20.8%)		1.0%	17.5%	24.3%		21.3%	11.4%	6.8%	
Memory	(17.3%)	(5.9%)	(2.7%)		(13.6%)	(8.9%)	(7.0%)		3.7%	5.5%	5.1%		10.6%	13.2%	3.5%	
PC ODM/OEM	(6.7%)	10.3%	12.0%		(15.1%)	(21.2%)	(17.6%)		(0.7%)	1.0%	3.2%		10.2%	17.1%	13.8%	
Distribution/EMS	9.8%	24.4%	30.5%		(24.2%)	(30.1%)	(28.6%)		(8.4%)	5.7%	5.1%		19.1%	18.3%	12.7%	
Foundry	0.7%	8.4%	(0.6%)		(18.8%)	(9.1%)	0.0%		(4.6%)	0.6%	10.2%		12.4%	15.3%	9.1%	
OSATs	(0.7%)	5.3%	4.7%		(24.7%)	(13.6%)	(11.6%)		5.1%	3.8%	5.0%		11.7%	12.0%	9.3%	
Components	(2.2%)	1.1%	1.8%		(14.9%)	(18.4%)	(14.7%)		5.4%	4.9%	7.0%		10.4%	15.9%	11.9%	
Total	0.9%	14.7%	15.1%		(19.7%)	(24.7%)	(18.0%)		(3.2%)	3.6%	5.6%		14.1%	15.7%	11.3%	

Source: TD Cowen, Company Filings

Figure 3 - Taiwan Aggregate Monthly Sales (M/M)



Source: TD Cowen

Apple Supply Chain:

Apple Supply Chain: September sales increased 27.6% M/M, 136 bps above seasonal, and 12.2% Y/Y following August's results that saw sales decreased 2.8% (14.3% Y/Y), 598 bps below seasonal.

ODM/EMS sales were up 570 bps above seasonal driven by strength in Hon Hai (1,980 bps above), partially offset the softness in Wistron (1,370 bps below), Pegatron (1,410 bps below), Compal (1,440 bps below), and Inventec (1,520 bps below).

Camera Modules sales were up 1,070 bps above seasonal driven by strength in Largan Precision (1,630 bps above), and Genius Electronic Optical (270 bps above).

The **Display** sales were down 250 bps below seasonal driven by softness in TPK Holding (1,760 bps below), Radiant (ROEC) (430 bps below), and partially offset the strength in AU Optronics (150 bps above).

Foundry/OSATs sales were down 230 bps below seasonal driven by softness in ASE Tech Holding (800 bps below), and TSMC (70 bps below).

Metal Casings for CEs sales were down 4,750 bps below seasonal driven by softness in Foxconn Tech (5,120 bps below), and Catcher Technology (2,670 bps below).

Battery Packs sales were down 80 bps below seasonal driven by softness in Dynapack International (2,120 bps below), and partially offset the strength in Simplo Technology (350 bps above).

Electronic Components sales were down 430 bps below seasonal driven by softness in Unimicron (770 bps below), Delta Electronics (650 bps below), Flexium Interconnect (170 bps below), Lite-On Technology (20 bps below), and partially offset the strength in Foxlink (190 bps above).

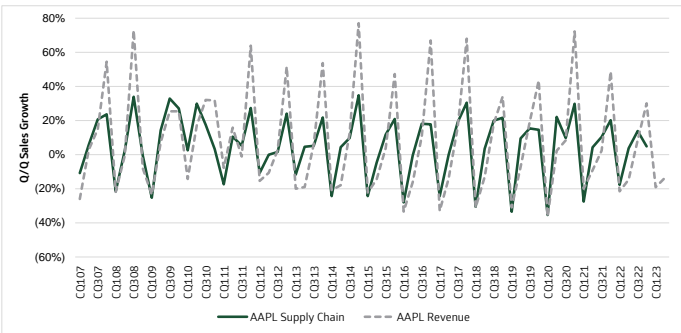
The data trends on the Apple supply chain are important as our analysis indicates robust predictive power for Apple sales based on overall Apple supply chain sales on a Q/Q basis. Over the last 22 years, Apple's revenues have had an 84% correlation and 70% R² with Apple's supply chain sales (Figures 4-6).

Figure 4 - Apple Supply Chain Performance – September 2023

Apple Supply Chain	Ticker	Company	September	M/M	10-Yr Average	Delta	Y/Y	August	M/M	10-Yr Average	Delta	Y/Y	July	M/M	10-Yr Average	Delta	Y/Y
ODM/EMS	2317.tw	Hon Hai	660,740,414	60%	40%		30%	412,838,898	(12%)	0%		25%	469,234,396	11%	(0%)		26%
	4938.tw	Pegatron	132,827,701	49%	63%		(22%)	89,353,095	(5%)	(4%)		10%	93,585,467	13%	(4%)		11%
	2324.tw	Compal	85,130,577	4%	19%		9%	81,736,993	(4%)	4%		6%	84,846,601	4%	(11%)		14%
	3231.tw	Wistron	77,882,364	7%	21%		10%	72,891,238	8%	5%		11%	67,719,669	(16%)	(10%)		1%
	2356.tw	Inventec	47,528,852	2%	17%		12%	46,478,885	11%	2%		20%	41,832,938	(12%)	(5%)		9%
Foundry/OSATs	2330.tw	TSMC	180,430,282	(4%)	(4%)		7%	188,686,256	6%	6%		(1%)	177,616,220	14%	(0%)		4%
	3711.tw	ASE Technology Holding	53,534,708	2%	10%		44%	52,278,801	8%	6%		46%	48,353,336	3%	3%		47%
Display	3673.tw	TPK	5,598,402	(9%)	8%		6%	6,156,652	(2%)	11%		13%	6,298,236	20%	10%		(3%)
	2409.tw	AUD	24,568,621	1%	(0%)		(6%)	24,281,667	14%	9%		(8%)	21,259,538	(7%)	(2%)		(8%)
	6176.tw	Radiant (ROEC)	3,849,478	5%	9%		(6%)	3,674,782	(5%)	1%		(6%)	3,864,029	9%	9%		1%
Metal Casings for CEs	2474.tw	Catcher	1,185,300	(16%)	11%		(19%)	1,405,335	(19%)	10%		(2%)	1,736,674	(18%)	3%		1%
	2354.tw	Foxconn Tech	6,879,734	(13%)	38%		(15%)	7,893,114	4%	24%		(1%)	7,560,000	25%	13%		3%
Camera Modules	3008.tw	Largan	5,572,471	23%	6%		1%	4,545,358	30%	12%		10%	3,489,070	29%	12%		20%
	3406.tw	Genius Electronic Optical	3,462,646	7%	4%		(15%)	3,235,256	51%	11%		(5%)	2,148,218	86%	25%		33%
Lithium-Ion Battery Packs	6121.tw	Simplo Technology	8,122,541	11%	8%		5%	7,303,364	11%	4%		5%	6,604,039	0%	2%		6%
	3211.tw	Dynapack International	1,271,503	(17%)	4%		27%	1,532,585	2%	10%		17%	1,507,393	(8%)	7%		(11%)
	2301.tw	Lite-On Technology	14,100,034	6%	6%		(3%)	13,289,503	6%	4%		(0%)	12,567,821	(3%)	(0%)		(11%)
Electronic Components	3037.tw	Unimicron	8,758,856	(5%)	3%		15%	9,217,841	8%	7%		29%	8,568,959	4%	5%		38%
	2392.tw	Foxlink	9,434,240	23%	22%		(22%)	7,642,344	(3%)	5%		(16%)	7,898,761	35%	14%		(13%)
	2308.tw	Delta Electronics	35,385,748	(3%)	4%		4%	36,435,815	1%	1%		8%	35,973,872	3%	4%		7%
	6269.tw	Flexium Interconnect	3,030,223	15%	16%		(5%)	2,643,320	13%	24%		16%	2,338,303	(4%)	16%		37%
Total AAPL Supply Chain Sales			1,369,294,875	28%	26%	1%	12%	1,073,521,102	(3%)	3%	(6%)	14%	1,105,003,540	7%	(1%)	8%	15%

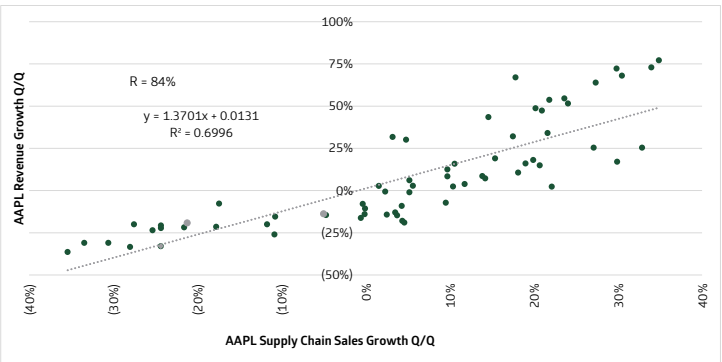
Source: Company Filings, TD Cowen

Figure 5 - Apple Supply Chain vs. AAPL Q/Q Sales Growth



Source: Company Reports, TD Cowen

Figure 6 - Apple Supply Chain vs. AAPL Regression

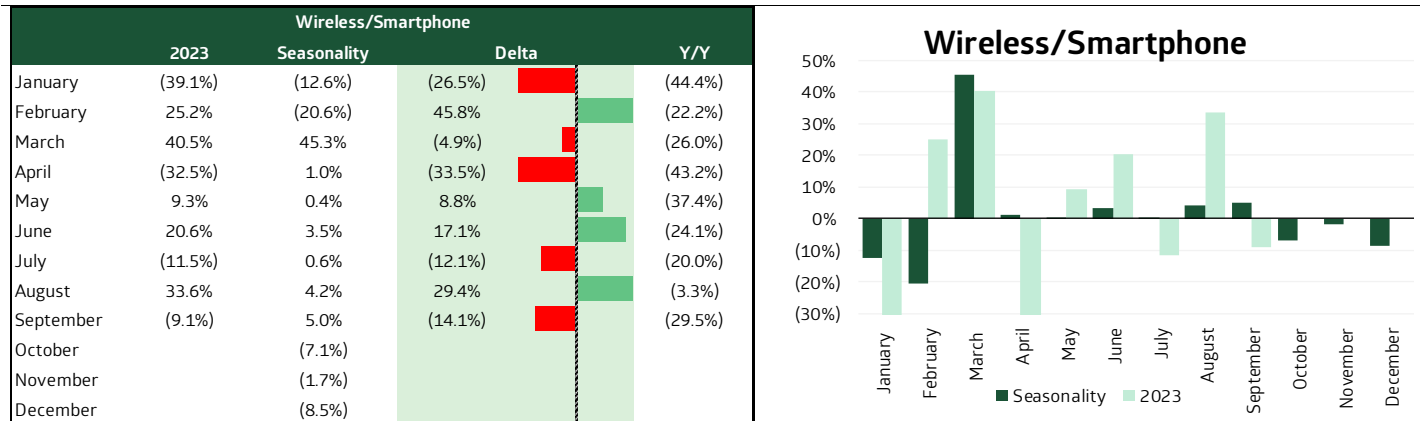


Source: Company Reports, TD Cowen

Wireless/Smartphone

Wireless: Non-Apple wireless sales decreased 9.1% M/M, ~1,406 bps below seasonal, and -29.5% Y/Y, following August's results that saw sales increased 33.6% (-3.3% Y/Y), 2,941 bps above seasonal.

Figure 7 - Wireless Communication Monthly Sales (M/M)

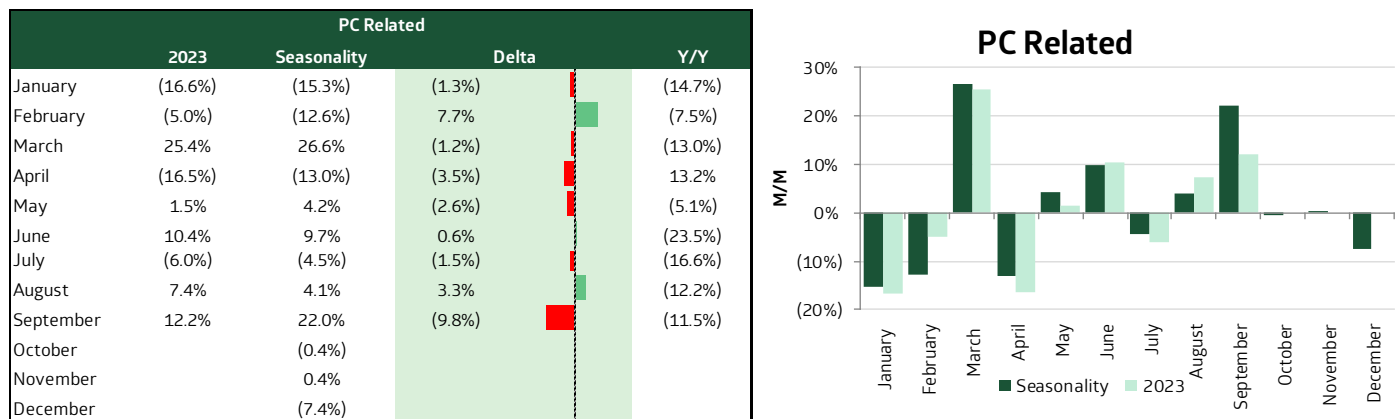


Source: Company filings, TD Cowen

PC & Server OEM/ODM Taiwan Sales

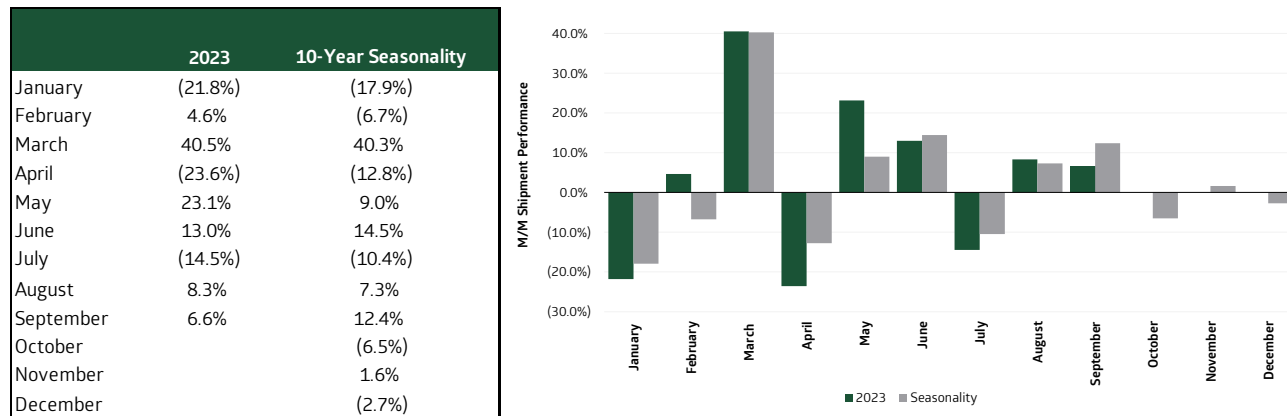
September processor component suppliers reported revenue up 12.2% M/M, -9.8% bps below seasonal, and down -11.5% Y/Y, following August's down 7.4% M/M and 3.3% Y/Y. September ODM notebook unit shipments were up 6.6% M/M (-2.9% Y/Y) to 12.5 M units as compared to August's 11.7 M units (8.3% M/M and 1.7% Y/Y).

Figure 8 - PC Related Monthly Sales (M/M)



Source: Company Filings, TD Cowen

Figure 9 - Taiwan ODM Monthly Units vs. 10-Year Seasonality



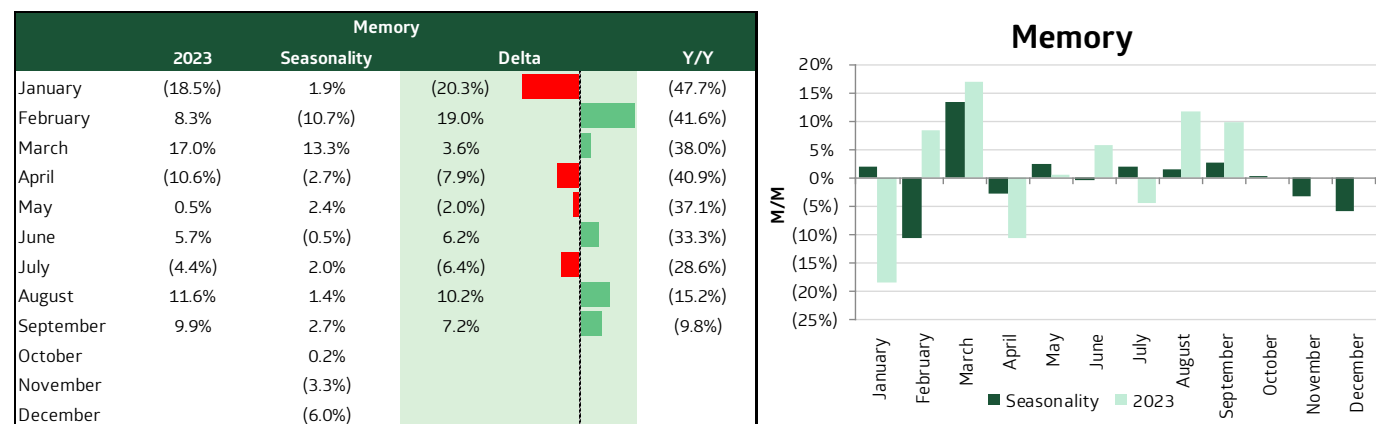
Source: Company filings, TD Cowen

Data includes shipments from Quanta, Compal, Wistron, Inventec and Pegatron

Memory: sales increased 9.9% M/M, ~720 bps above seasonal, and -9.8% Y/Y.

The strong result are driven by the strength at Skymedi (90,990 bps above), Phison (2,480 bps above), Winbond (820 bps above), Transcend (790 bps above), A-Data (690 bps above), Nanya (680 bps above), that offset the weakness at Alcor Micro (-190 bps below), Macronix (-1,740 bps below).

Figure 10 - Memory Monthly Sales (M/M)



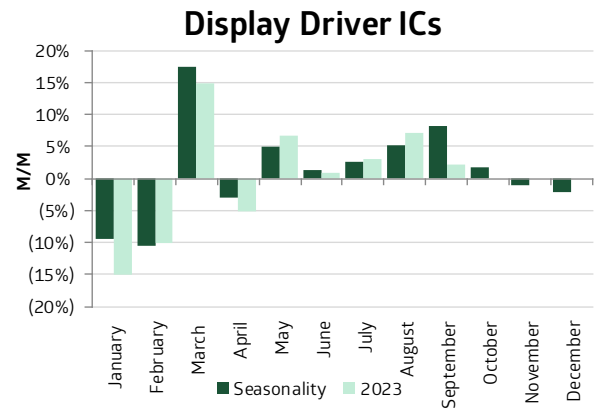
Source: Company Filings, TD Cowen

Display Driver ICs: sales increased 1.6% M/M, ~106 bps above seasonal, and 44.8% Y/Y. The above seasonal result are driven by the strength at Parade (2,210 bps above), Focaltech (100 bps above). that offset the weakness at Novatek (-228 bps below).

Figure 11 - Display Driver ICs (M/M)

Display Driver ICs				
	2023	Seasonality	Delta	Y/Y
January	(7.2%)	2.8%	(10.0%)	(41.6%)
February	4.4%	(13.9%)	18.3%	(36.0%)
March	22.1%	19.5%	2.5%	(26.1%)
April	3.2%	4.6%	(1.4%)	(22.2%)
May	3.5%	2.1%	1.4%	(13.0%)
June	(2.2%)	(3.8%)	1.6%	6.3%
July	(3.0%)	4.0%	(7.0%)	27.4%
August	2.8%	5.5%	(2.7%)	38.5%
September	1.6%	0.5%	1.1%	44.8%
October		(1.6%)		
November		(3.2%)		
December		(4.4%)		

Source: Company Filings, TD Cowen

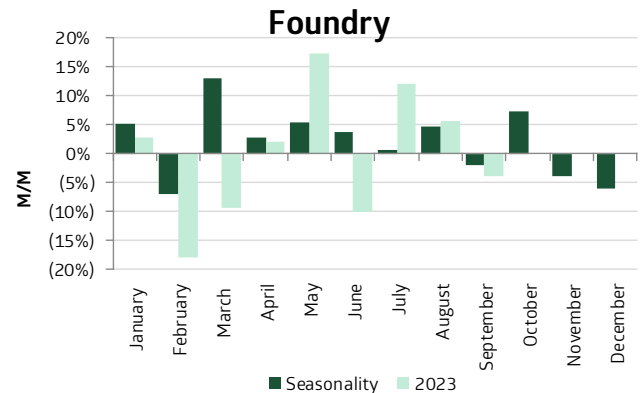


Foundry: September sales decreased 3.9% M/M, ~188 bps below seasonal, and -14.6% Y/Y. driven by the weakness at TSMC (-70 bps below), that offset the weakness at UMC (200 bps above).

Figure 12 - Foundry Monthly Sales (M/M)

Foundry				
	2023	Seasonality	Delta	Y/Y
January	2.9%	5.2%	(2.4%)	14.0%
February	(18.0%)	(7.1%)	(10.9%)	7.4%
March	(9.4%)	13.1%	(22.6%)	(16.0%)
April	2.0%	2.7%	(0.7%)	(14.8%)
May	17.4%	5.3%	12.1%	(7.1%)
June	(10.2%)	3.7%	(13.8%)	(12.6%)
July	12.1%	0.6%	11.5%	(7.0%)
August	5.6%	4.7%	0.9%	(14.7%)
September	(3.9%)	(2.0%)	(1.9%)	(14.6%)
October		7.4%		
November		(4.0%)		
December		(6.1%)		

Source: Company Filings, TD Cowen



Distribution/EMS, Components, and OSATs

Distribution/EMS sales increased 50.8% M/M, ~1569 bps above seasonal, and -16.9% Y/Y. The above seasonal result are driven by the strength at WPG Holdings (2,790 bps above), Hon Hai (1,980 bps above), that offset the weakness at Synnex (820 bps below), WT Microelectronics (1,540 bps below).

Components sales increased 3.7% M/M, ~376 bps below seasonal, and decreased 1.7% Y/Y.

September **OSATs** were up 2.2% M/M, ~596 bps below seasonal with -17.7% Y/Y.

Figure 13 - Distribution/ EMS Sales (M/M)

Distribution/EMS				
	2023	Seasonality	Delta	Y/Y
January	(0.4%)	(26.5%)	26.1%	31.1%
February	(35.3%)	(17.3%)	(18.0%)	(12.1%)
March	5.8%	25.3%	(19.5%)	(20.7%)
April	1.7%	(4.6%)	6.3%	(12.8%)
May	4.2%	(3.8%)	8.0%	(11.3%)
June	(1.8%)	4.6%	(6.4%)	(18.1%)
July	9.2%	0.0%	9.2%	(0.1%)
August	(9.7%)	1.9%	(11.5%)	(5.9%)
September	50.8%	35.1%	15.7%	(16.9%)
October		7.5%		
November		3.4%		
December		1.8%		

Source: Company Filings, TD Cowen

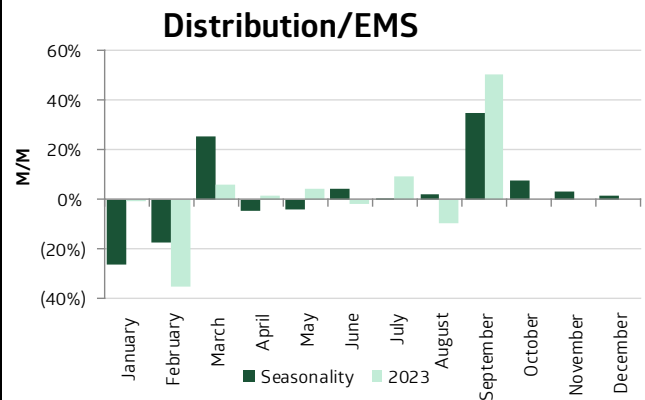


Figure 14 - Components Monthly Sales (M/M)

Components				
	2023	Seasonality	Delta	Y/Y
January	(12.4%)	(4.3%)	(8.1%)	(23.4%)
February	(3.0%)	(19.4%)	16.3%	(11.4%)
March	15.4%	27.3%	(11.9%)	(15.3%)
April	(8.6%)	(3.6%)	(5.0%)	(8.3%)
May	8.6%	3.6%	5.0%	(8.4%)
June	1.0%	1.3%	(0.2%)	(9.2%)
July	0.3%	2.4%	(2.1%)	(7.0%)
August	7.6%	8.2%	(0.6%)	(0.9%)
September	3.7%	7.5%	(3.8%)	(1.7%)
October		(3.0%)		
November		1.9%		
December		(5.0%)		

Source: Company Filings, TD Cowen

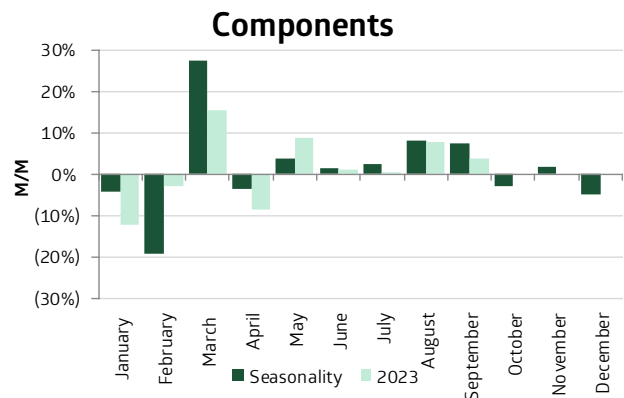


Figure 15 - OSATs Monthly Sales (M/M)

OSATs				
	2023	Seasonality	Delta	Y/Y
January	-15.1%	-9.4%	(5.7%)	(10.3%)
February	-10.2%	-10.5%	0.3%	(10.4%)
March	14.9%	17.5%	(2.6%)	(13.2%)
April	-5.1%	-3.0%	(2.1%)	(12.7%)
May	6.6%	5.1%	1.6%	(14.6%)
June	0.9%	1.3%	(0.4%)	(18.7%)
July	3.0%	2.6%	0.4%	(15.9%)
August	7.2%	5.3%	2.0%	(1.7%)
September	2.2%	8.1%	(6.0%)	(17.7%)
October		1.8%		
November		-1.0%		
December		-2.1%		

Source: Company Filings, TD Cowen

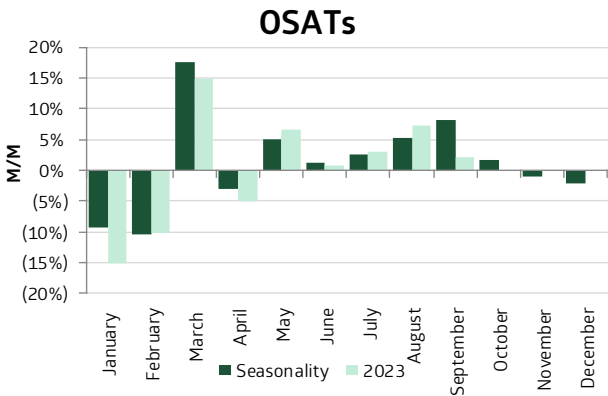
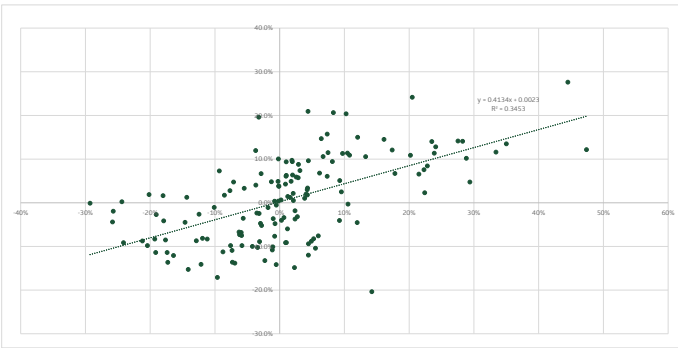


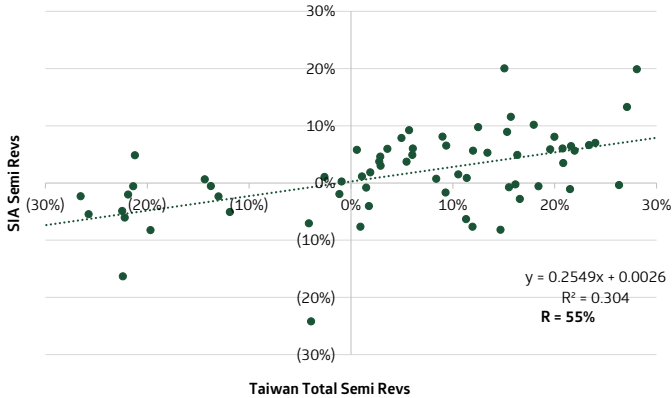
Figure 16 - Taiwan Monthly Sales to SIA Sales Regression Analysis



Source: SIA (Since 2011), TD Cowen

Note: Each data point represents monthly % change in the respective data sets

Figure 17 - Taiwan Quarterly Sales to SIA Sales Regression Analysis



Source: SIA (Since Q2:06), TD Cowen

Ticker	Rating	Price*	Price Target	Ticker	Rating	Price*	Price Target
AMD	Outperform	\$96.06	\$135.00	AVGO	Market Perform	\$849.63	\$900.00
CEVA	Outperform	\$17.11	\$25.00	CRUS	Outperform	66.92	\$100.00
MPWR	Outperform	\$399.73	\$625.00	NVDA	Outperform	417.79	\$700.00
QCOM	Outperform	\$104.78	\$135.00	AMAT	Outperform	\$130.11	\$160.00
ASML.NA	Outperform	€560.70	€700.00	ICHR	Outperform	\$24.60	\$42.00
KLIC	Market Perform	\$40.98	\$52.00	MRVL	Outperform	\$47.55	\$65.00
LRCX	Outperform	\$583.34	\$710.00	MU	Outperform	66.50	\$78.00
MKSI	Outperform	\$69.14	\$115.00	QRVO	Market Perform	\$86.20	\$110.00
TER	Outperform	\$87.91	\$135.00	WDC	Outperform	\$42.18	\$50.00
AMBA	Market Perform	\$46.07	\$65.00	SWKS	Outperform	88.57	\$125.00
AAPL	Outperform	\$171.10	\$220.00	IFX.GR	Outperform	€28.77	€40.00
VSH	Market Perform	\$22.48	\$26.00	STM	Outperform	\$38.99	\$55.00
STM.MI	Outperform	€37.13	€52.00	LSCC	Outperform	68.84	\$105.00
POWI	Market Perform	68.52	\$80.00	MTSI	Outperform	\$72.11	\$90.00
LFUS	Market Perform	\$218.78	\$260.00	ON	Outperform	81.16	\$125.00
ADI	Outperform	159.79	\$200.00	MBLY	Outperform	\$33.96	\$45.00
ALGM	Outperform	\$27.67	\$40.00	NXPI	Outperform	\$175.94	\$260.00

*As of 10/25/2023

VALUATION METHODOLOGY AND RISKS

Valuation Methodology

Semiconductor Capital Equipment:

Our valuation methodology is primarily based on a P/E multiple applied to our out year EPS forecast. In some cases we employ a sum-of-the-parts (SOTP) calculation where an appropriate P/E multiple is applied to forward earnings projections for the different business segments, plus estimated excess net cash per share.

We make investment recommendations on certain early stage, pre-revenue companies based upon an assessment of their business model, technology, probability of market success, and the potential market opportunity, balanced by an assessment of applicable risks. Such companies may not be assigned a price target.

Semiconductors:

Our valuation methodology is primarily based on forward P/E multiples plus cash followed by EV/EBITDA. In many cases, we use EV/sales as a third methodology.

We make investment recommendations on certain early stage, pre-revenue companies based upon an assessment of their business model, technology, probability of market success, and the potential market opportunity, balanced by an assessment of applicable risks. Such companies may not be assigned a price target.

Storage & Peripherals:

Our valuation methodology is primarily based on EV/EBITDA followed by forward P/E multiples. In many cases we use EV/FCF as a third methodology.

We make investment recommendations on certain early stage, pre-revenue companies based upon an assessment of their business model, technology, probability of market success, and the potential market opportunity, balanced by an assessment of applicable risks. Such companies may not be assigned a price target.

Telecom Equipment/Wireless:

Our core valuation methodology is the analysis of a company's prospects to change its cash flow in future periods. Our primary tool to measure that expected change in cash flow – and the value of it today – is the 10-year DCF. Since earnings are typically a solid proxy for cash flow and are often more easily compared across companies and sectors, we also use Price-to-Earnings (P/E) ratios to value companies. P/E ratios compared to historical ranges and competitive companies can help to determine whether there is incremental value to be found in company shares.

We make investment recommendations on certain early stage, pre-revenue companies based upon an assessment of their business model, technology, probability of market success, and the potential market opportunity, balanced by an assessment of applicable risks. Such companies may not be assigned a price target.

Investment Risks

Semiconductor Capital Equipment:

The semiconductor capital equipment (SPE) industry has a strong correlation to semiconductor industry capex and global GDP trends. We expect SPE industry revenues to be less cyclical in nature going forward given consolidation in the WFE customer base. However, the occurrence of chip supply-demand imbalances, the timing of process node transitions and the yields from WFE customer production lines, and chip technology design trends can have a meaningful impact on equipment demand from time to time.

Semiconductors:

The semiconductor industry is cyclical and has strong correlation to global GDP. If global growth slows, consumer demand and IT spending could impact our forecasts. Additionally, pricing pressure is severe in certain parts of the market, particular those that are consumer focused.

Storage & Peripherals:

The HDD industry is highly levered to global PC shipments (>50% of units) and IT spending. If global growth slows, consumer demand and IT spending could wane and negatively impact our forecasts. Additionally, solid state drives (SSDs) are encroaching on the notebook PC and mission-critical enterprise HDD market. While HDD makers also develop enterprise SSDs, greater than expected SSD cannibalization in notebooks could result in volume and margin deleverage for HDD players.

Telecom Equipment/Wireless:

High subsidies on mobile smartphones are the result of high end-user ARPUs; if ARPU declines, we would expect mobile phone ASPs to decline, pressuring OEM profitability. Mobile voice has driven wireless ARPU for two-plus decades; if the industry cannot convince end-users to increase dramatically data and Internet application consumption then revenue (ARPU) would be impacted. CAPEX to support the roll-out of LTE, LTE-A, and other 4G networks must stay available for our forecasts to be maintained; if a decline in global GDP occurs, CAPEX likely would be impacted negatively.

ADDENDUM

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