April Semiconductor Retreat Tempers its Magnitude

Memories, China and Huawei Whack the Sector

Semiconductor industry statistics for April released yesterday continued its pattern of sequential declines, albeit at a much more tempered magnitude. Specifically, the industry was down by -0.4% compared to the average gain of +1.2%, but this decline was much improved over the declines from the prior three months. The 1Q sequential decline of -15.5% was the third worst in the last 28 years.

The 1Q earnings season is nearly complete and the outlook for the 2Q seasonal recovery is anemically-mixed. The weighted sequential revenue gain across my Universe based on guidance so far reflects a gain of +2.1% which pales in comparison to the +3.8% average, although nearly half the reporting companies have met or exceeded 2Q expectations, and the growth rate accelerates to +7.3% if I exclude Intel and Micron from the calculation. In the meantime, chip sector share prices were disproportionately clobbered last month due to China.

Clearly the semiconductor sector has risk at this juncture: business weakness from memory products, the lack of growth from PCs and smartphones, and Chinese tariffs. Nevertheless, opportunities persist—especially amid weak share prices. See my latest Semiconductor Investment Ideas piece offering specific potential opportunities.

Memories Whack Growth: DRAM and NAND memories drove semiconductor industry growth last year, but are expected to drag the industry into a ditch this year. According to market researcher IC Insights, 2018 total industry sales of $469B was primarily driven by memory product growth of +26%, accounting for six points of +13.7% total growth. DRAM was the largest product category that accounted for 21% of total industry sales while NAND accounted for 12.7%. For 2019, memories are expected to *drop* by -24%, thereby dragging otherwise flat-ish non-memory revenue down to an overall industry decline of -13% (recently lowered from -9%). The SIA lowered its industry forecast yesterday to a decline of -12.1% from +2.6% previously, aggravated by a memory drop of -30.6%.

However, DRAM and NAND are very different products. I believe DRAM will continue to deliver bit-growth and largely maintain its profitability over the next few years due to its limited supplier base, fragmented end-markets, and technological complexity below 20nm line-widths. NAND, on the other hand, will probably experience much more volatility as short-term supply dynamics risk adverse market price erosion. Compared to DRAMs, NAND has twice as many suppliers supporting a market almost half the size that is less fragmented by application—with twice the expected bit growth rate.

China Whacks The Sector: My opinion of the tariff-related trade war with China is that it might cut around 10% out of worldwide semiconductor industry sales. The pain to Chinese-based businesses will be significant and possibly catastrophic, while it will be significant but manageable to businesses outside of China. The supply side of the semiconductor equation in China is limited, while Chinese consumption is significant but mitigated by domestic consumption and the export of final assemblies. Nevertheless, semiconductor sector share prices got killed last month, with the SOX index plummeting -16.7% and significantly underperforming broader equity market declines.

Huawei Whacks Stocks: Huawei is the third largest consumer of semiconductors and accounted for 4.4% of total industry sales last year. But HiSilicon, its in-house fabless chip operation, accounted for as much as 38% (or 1.7%) of that 4.4%, according to TrendForce. So far we have seen a number of semiconductor companies offer lower 2Q guidance due to the US trade ban on customer Huawei, including: ADI, where Huawei is mid-single digit or less percent of total sales and the shares traded down by -16.9% last month; IPHI, at 14% of sales last year and shares were down by -3.9%; LSCC, an under-10% customer that hit the stock by –1.2%; NPTN, where Huawei was 46% of sales in 2018 and shares cratered by -43.0%; and SMTC, at around 7% and hit by -26.1%. Weakness declared so far this month include: SWKS, where Huawei accounted for 12% of sales in the last six months; and MXL, where it has been immaterial in the past but was expected to be a source of growth this year. Huawei claims it has built some months of inventory as a contingency, and Chinese competitor ZTE could replace some of Huawei's chip business.

Chinese Consumption Gets Crushed: China is a huge consumer of semiconductors, but a very limited supplier. However, both of these factors get complicated quickly: most of what it consumes is ultimately exported as finished product, and even though it manufactures few chips, it is deeply integrated in the world-wide supply chain. Semiconductor businesses in China include fabless design, wafer manufacturing, and package and assembly operations. Electronics supply chain operations include printed circuit board, sub-system and final system assembly.

Apple is an instructive example as the world's second largest consumer of semiconductors, accounting for 8.8% of total consumption last year, according to Gartner. Greater China accounted for 17.6% of Apple's total sales last quarter. Eventually, Chinese tariffs would result in a tax on pretty much all of that business whether it comes

from components (semiconductors) or finished products (iPhones). It won't destroy all the business, but probably more than half. Let's use 75% for argument sake. Poof! There goes 13% of Apple's total sales. Foxconn builds the vast majority of Apple's products. Foxconn is based in Taiwan but operates mostly in China. The Apple product it sells in China is stuck with a tariff, so Foxconn can still build Apple product for China in China. However, the rest of Apple's non-China sales will get stuck with a tariff if it's built in China. So Taiwanese-based Foxconn moves a bunch of its operations either back to Taiwan or to other locations in Southeast Asia (in this case India) to avoid tariffs on Apple sales to non-China customers. In theory, Foxconn could move all its business outside of China given enough time. In practice, it will move as much as it can as fast as it can. Let's call it several months for what it has to move. So. Apple loses 13% of its business, while the discontinuity of Foxconn moving its operations hurts more of Apple's business for a few months before it recovers. While Apple is a good example, there are many Taiwanese-based electronics assembly firms with operations in China that have been building inventory and relocating those operations over the last few months—specifically to avoid expected Chinese tariff costs.

Last year China was the largest sales region accounting for 33.8% of total semiconductor industry sales—and the fastest growing at +20.5%, according to the Semiconductor Industry Association. According to Gartner, China-based Huawei was the third largest consumer of semiconductors world-wide behind Samsung and Apple, accounting for $21.1B or 4.4%. Other major Chinese-based consumers included Lenovo at 3.7%, Xiaomi at 1.5% and BBK Electronics at 2.9% (for Vivo and OPPO). Huawei is the world's largest telecom equipment supplier and the second largest smartphone supplier, albeit with little participation in the US market. Lenovo is the former IBM personal computer business, and Xiaomi, Vivo and OPPO are all world-wide top-6 smartphone makers.

These chip customers will get hurt the most from tariffs. They can't build competitive smartphones without state-of-the-art chips from international-based suppliers—mostly the US. While they might be able to supply some portion of the China domestic market with inferior smartphones, all of that business will be equally saddled with tariff costs, which would very likely shrink total demand for smartphones in China. For these companies' exports beyond China, they have a very serious problem. Those customers are highly unlikely to buy inferior smartphones, so Samsung, LG and other non-Chinese smartphone suppliers would be happy to take that business. If those Chinese companies want to salvage exports, they would need to establish supply chains outside of China in order to remain competitive. Chinese consumers and makers of smartphones—and other electronics that depend on semiconductors—would be adversely impacted at least significantly, if not catastrophically, by tariffs.

But Chinese Supply is Tiny: Fabless chip companies accounted for $109.4B or 23.3% of total semiconductor industry sales last year, according to IC Insights. And China accounted for 13% of fabless sales from companies such as BitMain, ISSI and Allwinner, although it drops to 7% when excluding in-house operations at ZTE, Datang and Huawei's HiSilicon which sells 90% internally and is the largest fabless supplier in China. Hence, China only accounts for some 1.6% of non-Chinese semiconductor sales from a supplier perspective—and 3% of the total.

Wafer fabs include SMIC at 4.5% of 1Q worldwide foundry business and Hua Hong Semiconductor at 1.5%, according to TrendForce—although this does not include China-based operations from foreign-based companies such as Samsung, TSMC and UMC, nor does it include a number of facilities under development. As an example: over half of SMIC sales go to Chinese customers and less than one-third to the US. Again, this is a less than 5% problem for the semiconductor industry—and very much an opportunity for non-Chinese wafer fabs.

China accounts for over 20% of worldwide semiconductor package assembly and test according to DigiTimes, including Jiangsu Changjiang Electronics Technology at 13% and Tongfu Microelectronics and Tianshui Huatian Technology also in the top 10. However, this is the lowest value-add in the supply chain with lots of aggressive Taiwanese and other competitors that are already relocating Chinese operations to other locations around Southeast Asia.

As I noted last year, there is *NO WAY* the Chinese can become self-sufficient in semiconductors anytime soon given technological and market challenges, despite committing some $150 billion to the effort—in my opinion.

Structural Differences: Recall that my US-equity-based Tokeneke Universe does *not* include some three-quarters of industry DRAM and NAND business from Samsung, Hynix and Toshiba. While my Universe does include Micron, it will more closely track flat-ish growth this year rather than -12% or -13%. Other structural differences in my Universe include the lack of very large international players (Samsung, Hynix, Toshiba, MediaTek, Infineon), although it does include wafer foundries (TSMC, UMC, SMIC, TowerJazz) and IP companies (Rambus, Xperi (formerly Tessera), Ceva, and InterDigital) that, technically anyway, don't count as semiconductor industry revenues, but rather costs associated with manufacturing. I also normalize fiscal quarters to the best fitting two out of three months. Unreported stub-periods from acquisitions can also be a difference.

The bigger problem is that most US-based investors in the semiconductor sector experience the industry from the Tokeneke Universe perspective. The Philadelphia Semiconductor Index Option (SOX) is similarly under-represented in memories, although this is mitigated by the inclusion of equipment firms supplying to memory firms.

Tempering April Retreat: Worldwide semiconductor industry revenues for April declined by -0.4% sequentially on a three-month rolling average basis, according to statistics released by the Semiconductor Industry Association (SIA) yesterday. The industry's monthly performance has been below-average since July of last year and declined since December, but the April drop tempered compared to March's -1.8% and the prior two months at or below -7%. April has averaged a gain of +1.2% with a high of +7.6%, a low of -4.7%, and 10 declines in the last 29 years—including seven of the last 14 years. Japan led this time with a gain of +2.5% followed by another gain from China at +1.8%. The rest of the world lagged with declines of -1.2% from Europe, -2.0% from Asia-Pacific and The Americas bringing up the rear once again at -3.0%.

Next month's release of May metrics will probably be below-average as well, given weak weighted company guidance for 2Q and Huawei-related negative preannoucements. May has averaged a gain of +1.6% with a high of +6.5%, a low of -7.5%, and five declines in the last 29 years—including only one in the last 14.

Near-Record 1Q Decline: Chip industry 1Q revenue weakness was below expectations and pretty extreme—in fact, the third worst in the last 28 years. Industry statistics reported a drop of -15.5%, well below the average 1Q sequential revenue decline of -2.2% with a high of +8.8%, a low of -19.4%, and 19 declines in the last 28 years—including 12 of the last 14. The Americas were the weakest with a crash of -29.2%, followed by China at -14.5%, Japan at -13.8% and Asia-Pacific with -10.4%. Europe led the pack with a decline of only -3.1%.

1Q seasonality is the weakest. The weighted average sales across my Tokeneke Universe reflects a sequential quarterly decline of -13.6% after 58 of 59 companies reporting, which underperforms compared to company guidance centered at -12.9% ranging from -14.9% to -10.9% after five mostly negative preannouncements.

Anemically-Mixed 2Q Recovery: The 2Q revenue outlook based on management guidance across my Tokeneke Universe remains weak and a mixed bag compared to expectations. Of the 58 companies reporting so far, 24 have missed expectations and 23 have met or exceeded them (with 11 n/a's). Also note that Intel and Micron are adversely affecting an otherwise above-average 2Q rebound weighted at +7.3%. The specific weighted average guidance for revenue, including Intel and Micron as well as five negative preannouncements related to Huawei, calls for a gain of +2.1% ranging from -0.2% to +4.4%. The 2Q typically recovers after the 1Q trough: the chip industry has averaged 2Q sequential revenue growth of +3.8% with a high of +20.0%, a low of -19.9%, and only five declines in the last 29 years—including only one in the last 11, according to industry statistics.

M&A Back in Vogue: Pending deals include: Infineon out of Germany to acquire CY for $23.85 per share in cash; MRVL to acquire AQ for $13.25/share in cash; NVDA to acquire MLNX for $125/share in cash; and ON to acquire QTNA for $24.50/share in cash. Renesas out of Japan recently closed its deal to acquire IDTI for $49.00/share in cash, and SMI has announced its intention to delist its ADS' from the NYSE. Other deals include NXPI taking over MRVL's wireless business, MRVL getting IBM's former in-house chip design operation from GlobalFoundries, and Dialog Semiconductor out of the UK getting SIMO's mobile communication product line.

Sector Shares Crash: Chip sector share prices reversed their rally and underperformed declining broader market indices last month. During May the Philadelphia Semiconductor Index Option (SOX) dropped -16.7% while 52 out of 59 stocks in my Universe declined by an average of -12.3% compared to the NASDAQ, S&P500 and DOW at -7.9%, -6.6%, and -6.7%, respectively. Year-to-date the chip sector maintains its gains, per the tables below.

May

Winners *(7/59)*		Losers	
AQ	38.2%	NPTN	-43.0%
IOTS	18.2%	PXLW	-35.4%
SMI	11.8%	AOSL	-31.1%
HIMX	4.0%	INFN	-28.3%
CY	3.7%	SMTC	-26.1%
average stock -12.3%		*SOX -16.7%*	

QTD *(2Q)*

Winners *(19/59)*		Losers	
PI	48.0%	NPTN	-38.2%
AQ	45.0%	INFN	-28.3%
IOTS	24.5%	AOSL	-25.8%
CY	19.4%	NLST	-25.2%
SMI	17.8%	NVDA	-24.6%
average stock -4.7%		*SOX -7.1%*	

YTD

Winners *(45/59)*		Losers	
LSCC	85.0%	NPTN	-40.0%
IOTS	71.1%	INFN	-22.1%
PI	70.4%	AOSL	-16.2%
QTNA	69.1%	VSH	-15.4%
GSIT	61.9%	SMTC	-13.2%
average stock +15.2%		*SOX +12.2%*	

Indices

	May	*QTD*	*YTD*
SOX	-16.7%	-7.1%	12.2%
SMH	-15.5%	-7.6%	12.5%
NASDAQ	-7.9%	-3.6%	12.3%
S&P500	-6.6%	-2.9%	9.8%
DOW	-6.7%	-4.3%	6.4%

Sector Volatility—Its Complicated: Volatility measured by daily cycles of advances and declines increased a bit during May compared to a tempered April, however the magnitude and duration of the advances were very limited: a view of a chart of daily closes exhibits a steady downward trend during the month. The SOX index crashed during May and cycled over five times: -0.8%, +1.8%, -6.0%, +0.1%, -4.7%, +3.2%, -7.5%, +2.1%, -5.4%, +1.2% then -1.5% to finish with a net decline of -16.7% at a value of 1,296.2.

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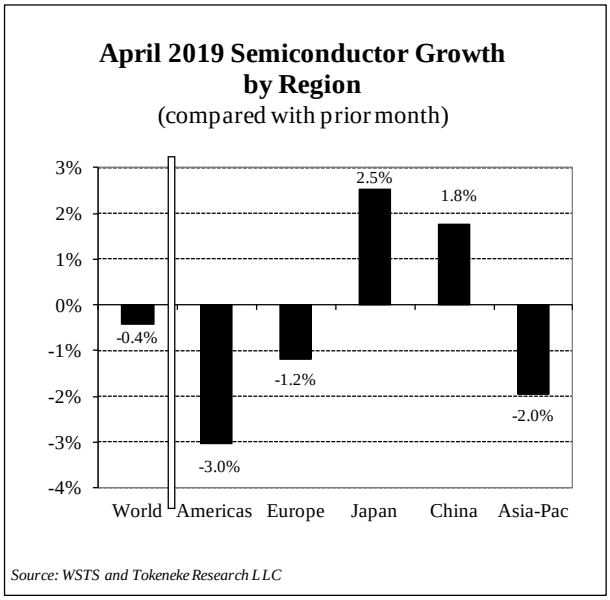

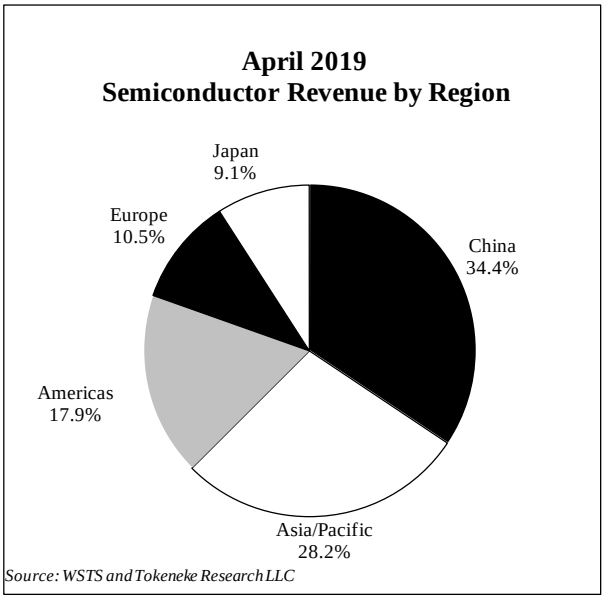

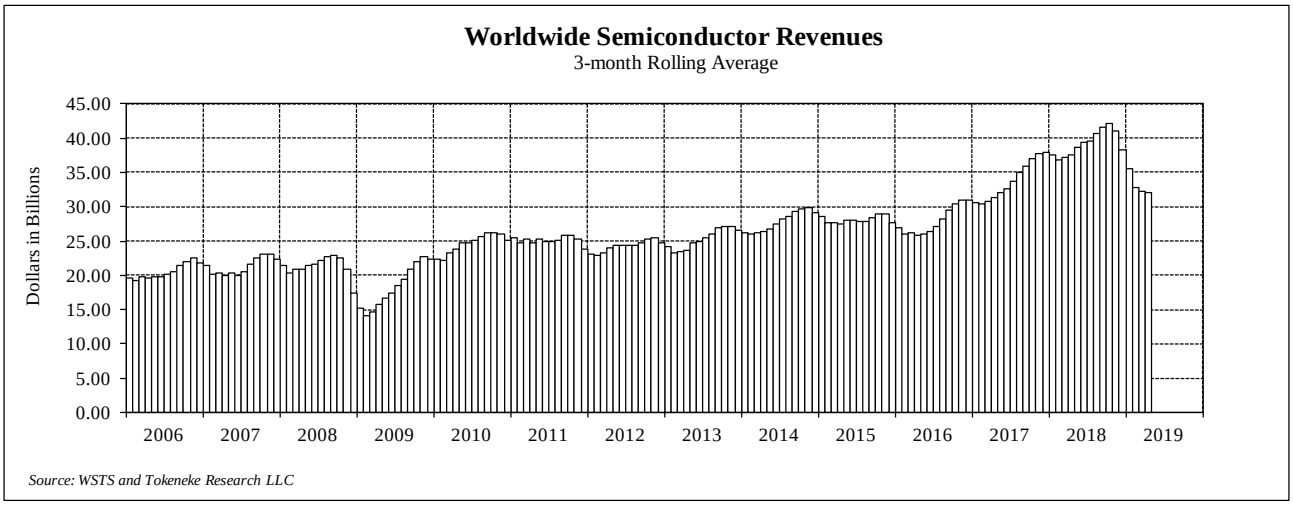

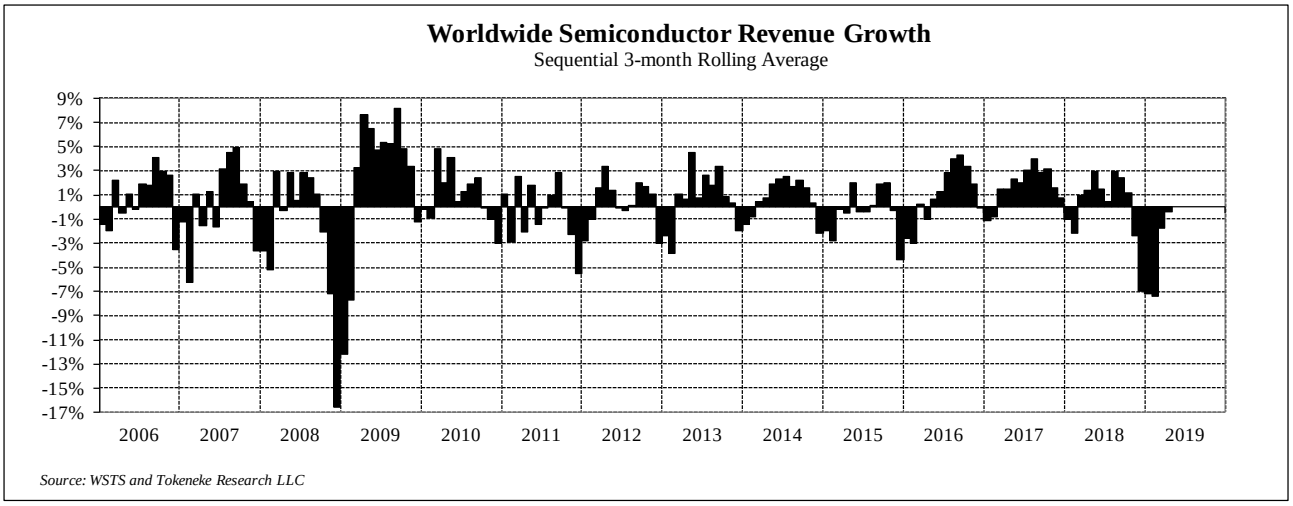

Weekly Philadelphia Semiconductor Index Option (SOX) vs. S&P 500

Source: Tokeneke Research LLC

**S&P 500 normalized to the SOX*

Tokeneke Research LLC — *Company Overview*

Semiconductor Industry Analysis and Insight

The Company

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- *Monthly Newsletter:* A summarized review of noteworthy industry business developments, sales statistics, and sector equity market performance, as well as a near-term and annual outlook for sector business fundamentals and share prices. This report typically includes two pages of text and a handful of recurring charts and tables. It is intended for relatively broad-based distribution.
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My Background

I have an electrical engineering background, nearly 12 years of semiconductor industry experience, and was on Wall Street for nearly eight years where I was selected as the Best On The Street semiconductor analyst for 2002 by The Wall Street Journal, and third-rated Best of the Best across all sectors.

I obtained my undergraduate BS degree in electrical engineering from the University of Washington, and my MBA from Santa Clara University. My industry experience consists of nearly 12 years in various technical sales and marketing roles at four different semiconductor firms located in Silicon Valley beginning with Advanced Micro Devices in 1984, followed by two small start-up companies, and ending at Cirrus Logic where I supported the firm's Japanese market development. I joined Fahnestock & Co. as a senior semiconductor analyst in 1996 and was recruited by Needham & Co. in April 2000.

My formal coverage list as a sell-side analyst included the following equities: AMD, ALSC, ALTR, ARTI, ATML, CUBE, CY, ESST, GNSS, INTC, ISSI, LSI, MOSY, MU, OIIM, OVTI, RMTR, SIII, SMSC, STEC, SVTG, TDFX, TSRA, TXN, and ZRAN.

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