

ANCHOR REPORT

Global Markets Research

27 June 2022



APAC Technology: Heading into downturn, cautious on stocks

Macro headwinds create 2023 uncertainty

We think that rising macroeconomic headwinds have undermined the growth prospects for most technology sectors in 2H22F and 2023F. We now expect global smartphone unit shipments to decline 7.6% and global notebook unit shipments to fall 11.5% in 2022F. We believe that the semiconductor cycle peak is now here, and sector-wide downward earnings adjustments are likely to emerge in July/August. We expect global semiconductor sales to fall in 2023F.

Our concerns about near-term technology weakness may, to some extent, already be reflected in stock prices and valuations. However, given our expectation of technology softness through 2023F, we are in general cautious on technology stocks.

On the positive side, we think the server market might be one of the better technology markets over the next two years, with potential 10% y-y sales growth in both 2022F and 2023F, although we recognize macroeconomic uncertainty creates downside risk for our server projections. We believe memory suppliers are prioritizing profitability and stable earnings, which will help reduce operating profit volatility. We believe that wafer fab equipment (WFE) might surprise investors by showing countercyclical behavior over the next 18 months, with sales likely to grow 14.1% in 2022F and 6.9% in 2023F.

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EQUITY: TECHNOLOGY

Heading into downturn, cautious on stocks

Over the past five months, several developments, including the Russia/Ukraine conflict, lockdowns in China, rising inflation and central bank action to raise interest rates, have created considerable macroeconomic uncertainty. In addition to broader macroeconomic and geopolitical headwinds, technology-specific factors likely to affect global demand for technology hardware over the next 18 months include a shift in spending from goods to services as pandemic restrictions ease and the elimination of shortages in electronics supply chains. Given these considerations, over the past month we have cut our projections for smartphones, notebooks, and semiconductors. We expect:

- Global semiconductor sales growth to decelerate sharply through 2022F and decline 0.5% in 2023F. We think there could be meaningful downside to our 2023F projections if global economic conditions deteriorate. In a “hard landing” scenario, which we are not assuming at the moment, we believe that semiconductor growth in 2023 could drop to as bad as a mid- to-high single digit percent decline in 2023F.
- Global smartphone shipments to decline 7.6% in 2022F, with particular weakness in Android smartphones in China.
- Global unit notebook shipments to decline 11.5% in 2022F and 5.3% in 2023F.

We think the server market might be one of the better technology markets over the next two years with 10% y-y sales growth in USD terms in both 2022F and 2023F. Nevertheless, uncertainty in the global macroeconomic environment creates downside risk to our server expectations.

We believe that wafer fab equipment (WFE) might surprise investors by showing counter-cyclical behaviour in the next 18 months, with potential growth of 14.1% in 2022F and 6.9% in 2023F.

Our concerns about near-term technology weakness may, to some extent, already reflected in stock prices and valuations. However, given our expectation of technology softness through 2023F, we are in general cautious on technology stocks. There are some specific technology themes, however, which we think may create some investment opportunities in specific stocks.

- We reaffirm our Buy ratings on server-related stocks Lotes (3533 TT), Aspeed (5274 TT), Wiwynn (6669 TT) and Montage (688008 CH).
- We believe memory suppliers are prioritizing profitability and that the memory sector is relatively undervalued. Highlighted Buy-rated memory stocks are Samsung Electronics (005930 KS), SK Hynix (000660 KS) and Soulbrain (357780 KS).
- While cautious on smartphones in general, we like selected Apple plays, with Buy ratings on Hon Hai (2317 TT; also an EV play) and Luxshare (002475 CH).
- Our other highlighted Buy-rated stocks are: TSMC (2330 TT; a leading-edge chip foundry), Unimicron (3037 TT; ABF substrates), Parade (4966 TT) and ASMedia (5269 TT; a high-speed interface chip vendor), and Aixtron (AIXA GY; SiC/GaN technology).

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Rising macroeconomic headwinds, lower tech growth projections

Over the past five months, several developments, including the Russia/Ukraine conflict, lockdowns in China, rising inflation and central bank action to raise interest rates, have created considerable macroeconomic uncertainty. Nomura's economics team has steadily reduced its expectations for global real GDP growth, to 2.7% for 2022F and 2.5% for 2023F (*The Economy Next Week - US and China growth momentum trading places*, 24 June 2022) from 4.0% for 2022F and 3.4% for 2023F (*Global Economic Outlook Monthly - Delayed but not derailed*, Jan 11, 2022).

In addition to broader macroeconomic and geopolitical headwinds, technology-specific factors likely to affect global demand for technology hardware over the next 18 months include:

- A shift in spending from goods to services as pandemic restrictions ease. In a strong overall economic environment, there might still have been solid growth in demand for technology goods. However, given softening economic fundamentals, we now expect declines in many technology markets.
- Supply catching up with demand. In a softer overall demand environment, we now expect that most shortages will be eliminated in 2022F. We see a heightened risk that there could be a need for inventory adjustments as supply increases. Also, we think upward mix shifts as well as generally higher prices for components and systems that were in short supply likely contributed to technology sales growth witnessed in 2021 and early 2022. We think there is a possibility that these positive mix and pricing effects might reverse over the next 18 months.

Given these considerations, over the last month we have cut our expectations for:

- *Smartphones (Asia Handsets - No recovery for the remainder of the year?)*
 - Global unit smartphone shipment growth:
 - Now: -7.6% in 2022F, 3.4% in 2023F
 - Previous: 2.7% growth 2022F, 2.6% growth in 2023F
- *Notebooks (Asia PC - NB back to below-2020 level?)*
 - Global unit notebook shipment growth:
 - Now: -11.5% in 2022F, -5.3% in 2023F
 - Previous: -4.8% 2022F, -3.6% 2023F
 - Total global PC shipments (notebooks+desktops)
 - Now: -10.0% 2022F, -4.7% 2023F
 - Previous: -4.6% 2022F, -4.0% 2023F
- *Servers (Global Technology - Lower 2022F/2023F expectations)*
 - Total global server sales growth in USD
 - Now: 10% in 2022F, 10% in 2023F
 - Previous: 12% in 2022F, 10% in 2023F
 - We think the server market might be one of the better technology markets over the next two years, although macroeconomic uncertainty creates downside risk to our server expectations.
- *Semiconductors (Global Technology - Lower 2022F/2023F expectations)*
 - Global semiconductor sales growth in USD
 - Now: 10.1% in 2022F, -0.5% in 2023F
 - Previous: 8.8% in 2022F, 3.2% in 2023F
 - We think there could be meaningful downside to our 2023F projections if global economic conditions deteriorate.
- *Semiconductor production equipment (SPE) (Global chip equip. shipments - Impact of China lockdowns)*
 - We have not made any recent changes to our wafer fab equipment (WFE) expectations of 14.1% growth in 2022F and 6.9% in 2023F. However, we recently reduced our growth projections for the assembly equipment and test

equipment sub-segments of SPE.

- We believe that wafer fab equipment (WFE) might surprise investors by showing counter-cyclical behaviour in the next 18 months, strengthening while the semiconductor cycle goes into a downturn.

Fig. 1 shows recent growth and our projections for major technology markets and **Fig. 2** details of the changes mentioned above.

Fig. 1: Market size and growth of major technology markets

Global growth in major technology markets							Market Size
	2018	2019	2020	2021	2022F	2023F	2022F
Global GDP	3.9%	3.1%	-3.2%	6.2%	2.7%	2.5%	
Semiconductors (USD)	13.7%	-12.1%	6.8%	24.6%	10.1%	-0.5%	USD612bn
PCs (units)	-0.2%	2.8%	14.0%	14.5%	-10.0%	-4.7%	308mn units
Smartphones (units)	-4.1%	-2.0%	-6.7%	5.0%	-7.6%	3.4%	1.25bn units
Chip Equip. [WFE] (USD)	13.8%	-8.0%	19.9%	43.5%	14.1%	6.9%	USD95bn
Servers (USD)	34.2%	-1.3%	5.6%	5.5%	10.0%	10.0%	USD104bn

Source: IDC, SIA/WSTS, SEMI, Nomura estimates

Fig. 2: Recent changes to our projections

	2022F		2023F		Change date
	Current	Previous	Current	Previous	
Smartphones (SPs)					
Total Global unit SP shipment growth	-7.6%	2.7%	3.4%	2.6%	26 May 22
Global 5G unit SP shipment growth	31.1%	40.5%	17.3%	22.4%	
Apple 5G unit SP shipment growth	25.9%	29.4%	4.2%	0.0%	
Samsung 5G unit SP shipment growth	85.7%	104.2%	42.3%	37.9%	
China brands 5G unit SP shipment growth	18.9%	29.6%	15.9%	28.6%	
PCs					
Total global PC shipment growth (NB&DT)	-10.0%	-4.6%	-4.7%	-4.0%	1 June 22
Global unit notebook (NB) shipment growth	-11.5%	-4.8%	-5.3%	-3.6%	
Global unit desktop (DT) shipment growth	-5.2%	-4.0%	-2.9%	-5.0%	
Servers					
Total global server sales growth in USD	10.0%	12.0%	10.0%	10.0%	2 June 22
Total global server unit growth	6.5%	8.0%	6.0%	7.0%	
Global semiconductor sales growth in USD	10.1%	8.8%	-0.5%	3.2%	2 June 22
Semiconductor production equipments (SPE)					
Total SPE sales growth in USD	12.7%	12.9%	7.0%	7.0%	13 June 22
Wafer fab equipment (WFE) growth in USD	14.1%	14.1%	6.9%	6.9%	
Test equipment sales growth in USD	9.7%	11.8%	7.0%	7.0%	
Assembly equipment sales growth in USD	3.8%	6.0%	7.0%	7.0%	

Source: Nomura estimates

As discussed extensively in Nomura equity strategy commentary, stock markets around the world have corrected substantially in recent months (e.g. *Asia-ex-Japan Equity Strategy - 2H22 outlook*). Our concerns about near-term technology weakness may already, at least to some extent, be reflected in stock prices and valuations. However, given our expectation of technology softness through 2023, we are in general cautious on technology stocks. Nevertheless, there are some specific technology themes, which may create investment opportunities in specific stocks:

- We think that the secular growth drivers for the server market may well support near-term growth in this market, and we are projecting 10% server sales growth in USD terms, in both 2022F and 2023F. Some server-related investments highlighted by our Downstream Technology and Greater China Semiconductor teams include:
 - Lotes (3533 TT, Buy)
 - Aspeed (5274 TT, Buy)
 - Wiyynn (6669 TT, Buy)
 - Montage (688008 CH, Buy)

- While projecting a large decline in the overall smartphone market in 2022F, our Downstream Technology team thinks that demand for iPhone will likely be more resilient than for Chinese Android smartphones. The team likes selective Apple plays:
 - Hon Hai (2317 TT, Buy; also an EV play)
 - Luxshare (002475 CH, Buy)
- Our Semiconductor Memory team believes that memory suppliers are prioritizing profitability and stable earnings, which will help reduce operating profit volatility. The team believes that the memory sector is relatively undervalued and highlights its memory Buy ratings:
 - Samsung Electronics (005930 KS, Buy)
 - SK Hynix (000660 KS, Buy)
 - Soulbrain (357780 KS, Buy)
- Some other Buy rate stocks include:
 - Leading edge chip foundry – TSMC (2330 TT, Buy)
 - ABF substrates – Unimicron (3037 TT, Buy)
 - High-speed interface chip vendors – Parade (4966 TT, Buy), ASMedia (5269 TT, Buy)
 - SiC/GaN technology – Aixtron (AIXA GY, Buy)

Our Greater China Semiconductor team expects downside to fundamentals will accelerate over the next few months. It believes most semiconductor names should be avoided, with its highlighted Buy-rated stocks accumulated on weakness. In addition, it believes that the risk of inventory depletion through supply cuts is a reason for caution on upstream semiconductor segments.

Our Downstream Technology team is cautious on notebook and Android smartphone stock plays.

Fig. 3: Stocks for action

Company	Ticker	Rating	Mkt Cap (USDmn)	Target Price	Share price 22 Jun 22	Upside (%)
TSMC	2330 TT	Buy	430,244	850.0	494.50	72%
Samsung	005930 KS	Buy	264,473	84,000.0	57,600.00	46%
Hynix	000660 KS	Buy	51,625	160,000.0	92,200.00	74%
Hon Hai	2317 TT	Buy	50,934	152.0	109.50	39%
Luxshare	002475 CH	Buy	33,869	51.4	32.13	60%
Montage	688008 CH	Buy	9,392	100.0	55.72	79%
Unimicron	3037 TT	Buy	7,821	332.0	158.00	110%
Wiwynn	6669 TT	Buy	4,376	1,285.0	746.00	72%
Parade	4966 TT	Buy	3,337	1,850.0	1,225.00	51%
ASMedia	5269 TT	Buy	2,613	1,700.0	1,125.00	51%
Aixtron	AIXA GY	Buy	2,797	34.0	23.36	46%
Lotes	3533 TT	Buy	2,581	1,191.0	725.00	64%
Aspeed	5274 TT	Buy	2,507	3,300.0	2,175.00	52%
Soulbrain	357780 KS	Buy	1,353	310,000.0	226,100.00	37%

Source: Company data, Nomura research

Risks to our expectations

Some downside risks:

- Some issues that have already occurred, such as, for example, the falling value of cryptocurrencies and lockdowns in China, could have a bigger impact on technology demand in the coming months than we have assumed.
- An inventory correction or deterioration in macroeconomic conditions beyond what we are assuming could create a “hard landing”, resulting in a larger decline in semiconductors than we are projecting for 2023F.
- The cyclical softening in semiconductors we are expecting could pull demand for semiconductor test and assembly equipment below what we are projecting for 2023F.

- If there were a severe US recession in 2023, this could undermine hyperscale server capex, resulting in a shortfall to our 2023F server growth projections.

Some upside risks:

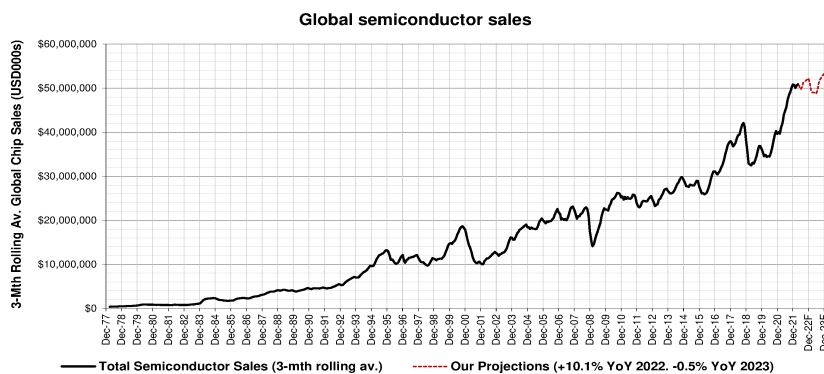
- A rebound in economic growth in China, following the lockdowns of recent months, could have a bigger positive effect on the overall global markets than we are assuming.
- Investors could choose to look through the technology growth headwinds of the next 18 months and drive a broad rally in technology stock prices sooner than we expect.

Semiconductors

Fig. 4 shows our global semiconductor sales projections. Following a very strong ramp-up through 2021, (about 26% growth for full-year 2021 and 28% growth in 4Q21), growth in 1Q22 remained solid, supported, we believe, by business pushed from 2021 into 2022F by chip shortages. Our projections for 2Q22F and 2H22F assume sharp deceleration in growth, to almost 0% y-y by the end of the year, but still result in an estimate of about 10% growth for full-year 2022F because of the high starting base.

Far more important to the business and stock performance of chip companies will, in our view, be the growth trend 2023F. Our projection of a 0.5% decline for global semiconductor sales in 2023F assumes weakness through 2023, but a relatively "Soft landing". We think there could be meaningful downside to our 2023 projections if global economic conditions deteriorate. In a "hard landing" scenario, which we are not assuming at the moment, we believe that semiconductor growth in 2023F could drop to as bad as a mid to high single digit percent decline.

Fig. 4: Global semiconductor sales



Source: Semiconductor Industry Association/WSTS, Nomura estimates

In addition to the effect of weakening demand in major semiconductor end markets such as PCs and smartphones that we discuss in this report and elsewhere, two additional semiconductor specific factors that we think will undermine overall chip industry growth through the rest of 2022F and in 2023F are the end of chip shortages and cyclical softening.

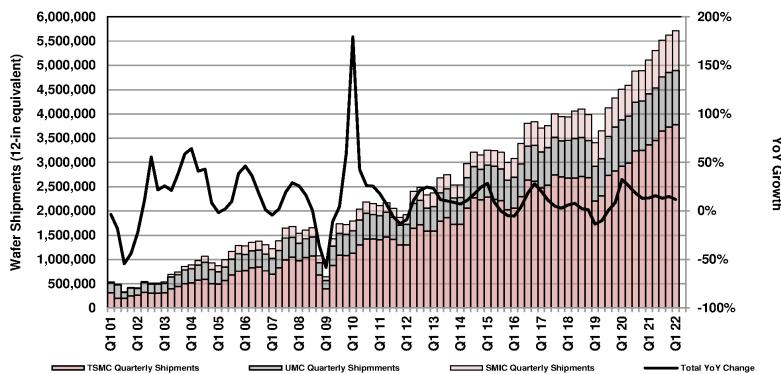
Through 2021 a broad range of electronic end markets were affected by chip shortages, as we discussed in our *January 2022 Tech Anchor report*. **Fig. 5** illustrates how semiconductor supply has consistently paced upward over the last two years. The tight supply and other factors such as rising raw material costs resulted in higher prices which rippled through the electronics supply chain. **Fig. 6** shows how foundry wafer prices moved up in 2020 and 2021, and **Fig. 7** shows how prices have lifted for finished systems like PCs. Commentary from companies like HP Inc. (HPQ US, Not rated) and Dell (DELL US, Not rated) on quarterly earnings calls suggests that the higher systems prices were driven in part by the pass-through of higher component costs, and in part by an upward mix shift (allocation of the limited supply of components to higher end systems).

In **Fig. 8** and **Fig. 9** we provide a sampling of recent comments by technology companies on chip/component shortages. Many technology companies expect the supply/demand balance to improve through this year, although some continue to think that supply constraints might continue into next year and beyond. We think that rising supply coupled with softening demand will result in chip shortages being resolved in most parts of the technology supply chain this year.

Our "soft landing" expectation assumes that the supply chain will be able to manage inventory sufficiently well to avoid a severe inventory correction as supply rises to match demand. A meaningful inventory correction when shortages are eliminated is one potential downside risk to our chip projections. Graphs showing elevated inventory levels are presented in later sections of this report in which our Greater China semiconductor team lays out its concerns about the semiconductor cycle and its thoughts on analog chip inventory. The team also points out that efforts to reduce inventory could result in supply cuts that affect some upstream chip segments such as companies that sell blank silicon wafers to chip manufacturers.

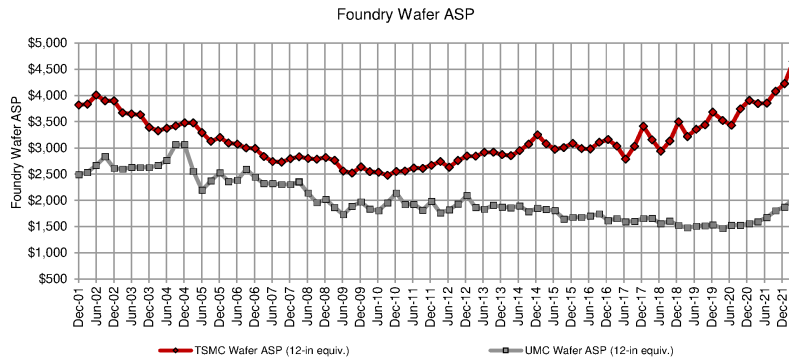
The chip shortages have been mostly of chips manufactured on trailing edge technology (e.g. see Dell management comments in [Fig. 9](#)), rather than chips made on leading edge technology. As shortages end, we think there could be a drift down in pricing of a broad range of chips for which pricing is difficult to track.

Fig. 5: Semiconductor foundry wafer shipments



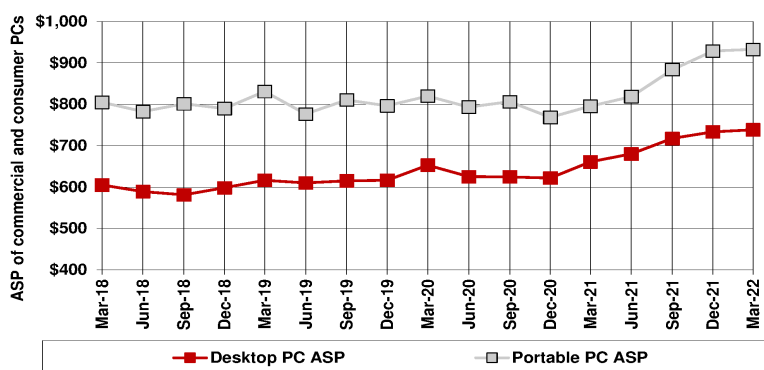
Source: Company data, Nomura research

Fig. 6: Foundry wafer ASP



Source: Company data, Nomura research

Fig. 7: ASP of commercial and consumer PCs



Source: IDC, Nomura research

Fig. 8: Recent comments related to supply shortages – chip companies

Recent comments related to supply shortages – chip and subsystem companies	
Nvidia 25 May 22	Earnings material and management comments in connection with earnings <ul style="list-style-type: none"> Nvidia's networking products are still supply constrained, though management expects continued improvement throughout the rest of the year.
NXP 3 May 22	Earnings material and management comments in connection with earnings <ul style="list-style-type: none"> NXP management expects the company's work on improving supply will lead to gradual q-q growth through the remainder of 2022, with sales still well short of demand. Management expects its supply will remain constrained throughout 2022. The supply/demand imbalance is in all four of NXP's revenue segments, though it is worst in the industrial and automotive segments. Management expects that the semiconductor industry will continue to be capacity constrained for some time in the trailing edge technology nodes, especially 28nm, 40nm and 90nm.
ON Semiconductor 2 May 22	Earnings material and management comments in connection with earnings <ul style="list-style-type: none"> Management believes that demand will continue to outpace supply through much of 2023.
Intel 29 Apr 22	Earnings material and management comments in connection with earnings <ul style="list-style-type: none"> Intel management expects the chip industry will continue to see challenges until at least 2024 in supply factors like foundry capacity and semiconductor production equipment availability.
Qualcomm 28 Apr 22	Earnings material and management comments in connection with earnings <ul style="list-style-type: none"> Supply is much as planned and has improved, though Qualcomm still has more demand than supply across all businesses.
UMC 27 Apr 22	Earnings material and management comments in connection with earnings <ul style="list-style-type: none"> UMC still cannot supply sufficiently for aggregate 2022 customer demand
Texas Instruments 27 Apr 22	Earnings material and management comments in connection with earnings <ul style="list-style-type: none"> TI's customers continue to be selective in their requests for expedited delivery, focusing on parts needed to complete matched sets. TI has been able to meet many of these expedite requests.
Lite-On 19 Apr 22	Earnings material and management comments in connection with earnings <ul style="list-style-type: none"> Management expects the IC shortages to last into early 2023, resulting in higher IC costs.
TSMC 14 Apr 22	Earnings material and management comments in connection with earnings <ul style="list-style-type: none"> Management expects capacity to remain tight throughout 2022 and insufficient to support all demand.

Source: Company reports and management comments, Nomura research

Fig. 9: Recent comments related to supply shortages – OEMs

Recent comments related to supply shortages – OEMs	
Dell 26 May 22	Earnings material and management comments in connection with earnings <ul style="list-style-type: none"> Backlog levels were elevated in both the infrastructure and the client groups exiting the quarter and management expects backlog to remain elevated through at least the July quarter due to ongoing supply chain challenges and demand strength. Areas where chip supply is most stressed is on the trailing nodes – 40nm, 55nm, 60nm, and 8inch wafers.
AMAT 19 May 22	Earnings material and management comments in connection with earnings <ul style="list-style-type: none"> Supply shortages continued in the April 2022 quarter, especially in silicon components and certain other parts that go into the subsystems of Applied's tools. Management anticipates its ability to fulfill demand will remain constrained by ongoing supply chain challenges in the near term, with incremental improvements beginning in the company's October 22 quarter.
Apple 29 Apr 22	Earnings material and management comments in connection with earnings <ul style="list-style-type: none"> Apple management said it expects the effect of supply constraints caused by COVID-related disruptions and industrywide silicon shortages to be in the range of USD4-8bn, substantially larger than what the company experienced in the March quarter
Lam Research 20 Apr 22	Earnings material and management comments in connection with earnings <ul style="list-style-type: none"> Management said continued component shortages and new challenges including Covid-related lockdowns impacted its sales in the quarter. The component shortages were both in integrated circuits (ICs) and also fabricated parts and subsystems used in the tools. Management expects ongoing supply chain constraints.
Lite-On Technology 19 Apr 22	Earnings material and management comments in connection with earnings <ul style="list-style-type: none"> Management expects the IC shortage to last into early 2023, six months longer than its earlier expectation of easing in 3Q22, resulting in higher IC costs for LOT, YTD. But, management does not expect the situation to deteriorate further (2Q similar to 1Q, and 2H could be better than 1H, as consumer/NB demand is weakening)
Xiaomi 22 Mar 22	Earnings material and management comments in connection with earnings <ul style="list-style-type: none"> Management said that in general, and especially for chipsets, it expects supply will improve and get back to normal in 2022. Supply remained a very big challenge in 1Q22 but management expects a large improvement in 2Q22 and that there will be a lot of supply in 3Q22 and 4Q22.

Source: Company reports and management comments, Nomura research

Memory

While we have toned down our view on the memory sector, we still believe the sector is relatively undervalued.

We continue to believe that in the upcoming market downturn, memory suppliers will likely adjust supply factors (shipment growth and capex) rather than aggressively shipping out memory chips by cutting prices.

Given our PC and smartphone shipment forecasts, we think memory suppliers' year-end inventory may increase from the current one-two weeks level to four-five weeks, as we believe memory suppliers will be willing to increase inventory rather than ship memory chips through aggressive ASP cuts. While we believe there is downside to shipments, we see limited downside to the ASP forecast as memory suppliers are further prioritizing on profitability and stable earnings.

For DRAM, we expect the decline in DRAM prices in 2022/2023F will be 5%/16% y-y, less than in previous DRAM downturns. We forecast DRAM operating margin will be 40% in 2022F and 33% in 2023F, better than in previous downturns.

The NAND market is less consolidated than the DRAM market, and hence we think risks are higher. We believe NAND demand growth will likely be at low-20% y-y in 2022. However, we think technology challenges might hold back NAND production growth in 2023F.

Greater China semiconductors – the cycle peak

In our view, a slower-than-expected order adjustment has helped semiconductor companies deliver a better-than-feared April/May earnings season. We believe that the semiconductor cycle peak is now here, and think there are likely to sector-wide downward earnings adjustments that emerge in the July/August time frame.

Rising inventory is exerting pressure on the downstream portions of the electronics supply chain, leading to digestion risks. Slower end-demand for consumer electronics could result in further inventory issues as 2022 progresses.

Greater China semiconductors – depleting inventory through supply cuts

In the US, consumer spending has been leaning toward “non-durable goods”, such as services, since 2Q20. In contrast, the demand for consumer electronics, IT equipment, automotive, and household equipment all slowed significantly in 1Q22. In China, due to the “Zero COVID-19 policy”, the country's consumer spending normalized in late 2021. Although the lockdowns in Shanghai in 2Q22 have dampened consumer spending and may sequentially recover, we expect the trend, after reopening, to lean toward services, similar to that in the US.

Wafer bank inventory is increasing, while end-demand is turning weak; thus, it is more realistic for the semiconductor supply chain to actively adjust inventory from the supply side. We believe upstream manufacturing is likely to see more order cuts.

China analog IC

Analog IC has been one of our favourite sub-sectors in the China Semi market, where Chinese companies continue to expand their market share particularly in the domestic market. However, we think analog and discrete IC companies might see an inventory correction later than digital IC companies. We think that supply issues for analog IC companies might ease faster than expected.

Downstream Technology – Smartphones, PCs, Servers

We think supply chain disruptions due to the lockdown in China and the eroding consumer purchasing power due to the rising inflation globally are making the likelihood of a smartphone (SP) seasonal recovery low for 2022F.

We think the demand for iPhones will likely be more resilient than that for Chinese Android SPs. Therefore, we project iPhone shipment volume to grow 2% y-y to 237.5mn units in 2022F, while we estimate most Chinese SP brand shipments to decline by double-digit % y-y for the same year.

We forecast global PC unit shipments in 2022F to be 308mn, representing a 10% y-y decline (NB: -11.5%, DT: -5.2%), and to be 204mn in 2023F, representing a 4.7% y-y decline (NB: -5.3%, DT: -2.9%). We think the demand for DT PC has been more stable,

likely due to the back-to-office demand from enterprises and the slower growth compared with NB PC during 2020-21.

We forecast global server unit shipment growth of 6.5% in 2022F and 6% in 2023F, with likely revenue growth of 10% in both the years. In 2022 so far, we note server makers continue to suffer IC/component shortages, but we have not seen demand weakness for top US CSPs yet. We now expect the new platforms, i.e., Intel's Eaglestream and AMD's Genoa, to see small ramp-ups in 4Q22F, with more volumes in 2023F. On the other hand, we expect the Whitley platform to ramp up rapidly in 2022F, and likely become a longer-life mainstream platform for server in 2022-23F.

Semiconductor Production Equipment (SPE)

We believe that wafer fab equipment (WFE) might surprise investors by showing counter-cyclical behaviour in the next 18 months, remaining strong while the semiconductor cycle goes into a downturn.

- We are projecting 14.1% growth for WFE in 2022F followed by 7% growth in 2023F (*Fig. 10*).

We think that semiconductor back-end equipment (test equipment and assembly equipment) is at risk of being impacted by the semiconductor cyclical correction we are projecting. In 13 June we reduced our 2022F growth projections for back-end equipment. We left our 2023F growth projections unchanged but think that if the economic and chip downturn in 2023 turns out to be worse than we are assuming, there may be downside risk to our 2023F back-end semiconductor equipment projections.

- We reduced our 2022F growth projection for test equipment to 9.7% (previously 11.8%) while leaving our 2023F growth projection of 7% unchanged, off a lower 2022F base.
- We reduced our 2022F growth projection for assembly equipment to 3.8% (previously 6%) while leaving our 2023F growth projection of 7% unchanged, off a lower 2022F base.

We think that two factors might drive the WFE meaningfully above growth of global semiconductors sales over the next few years:

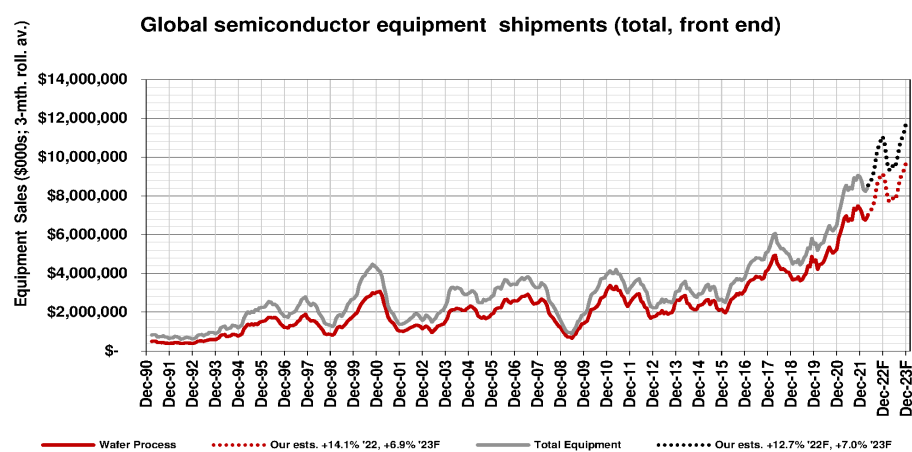
- Technology difficulties in both leading-edge logic and memory manufacturing, driving higher capital intensity of leading-edge chip manufacturing.
- Deglobalization, leading to high investment in semiconductor manufacturing in China, and likely, in the future, incremental semiconductor manufacturing investment in the US and possibly Europe.
 - However, one risk for international WFE companies is that trade tensions between the US and China could result in export constraints in the future. We remain hopeful that this will not occur, and have not assumed any escalation in SPE export restrictions in our projections.

Fig. 12 shows how the ratio of global WFE sales to semiconductor IC (integrated circuit) sales has been rising in recent years. We think that this trend will continue in the future.

- We believe that the decline in this ratio in the past few months (down m-m each month from December 2021 to April 2022) has been driven by supply and logistics issues impacting WFE more than overall IC sales.
 - On its earnings call in April, Lam Research (LRCX US, Not rated) management said that the company shipped some systems to customers that were not recognized in March quarter sales due to a lack of some critical components and that it expected deferred revenue would rise again in the June quarter. Lam management reiterated its expectation of USD100bn or more WFE industry sales in 2022, as did AMAT (AMAT US, Not rated) management on its earnings call in May (*SPE note with AMAT comments*). We expect a sharp rise in recognized WFE equipment shipments in 2H22.

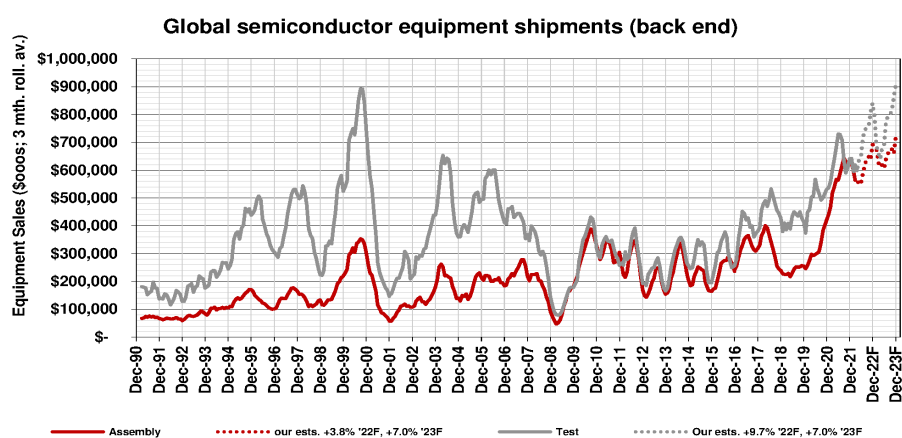
Fig. 13 shows how in recent years China has become the largest geographic destination for WFE/wafer processing equipment. We think that a continuing push to expand domestic chip manufacturing capability in China will drive demand for WFE in China, and that government subsidies to spur chip manufacturing in the US and Europe could drive up demand for WFE in those regions.

Fig. 10: Global semiconductor equipment shipments (total, front end)



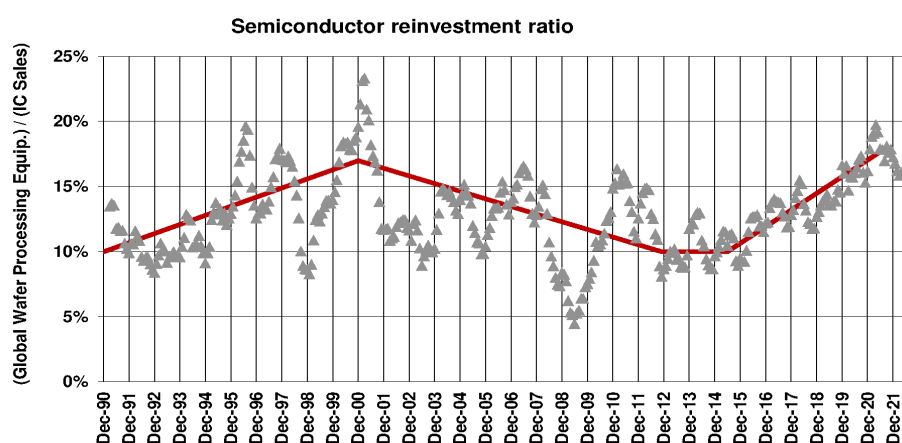
Source: SEMI, Nomura estimates

Fig. 11: Global semiconductor equipment shipments (back end)



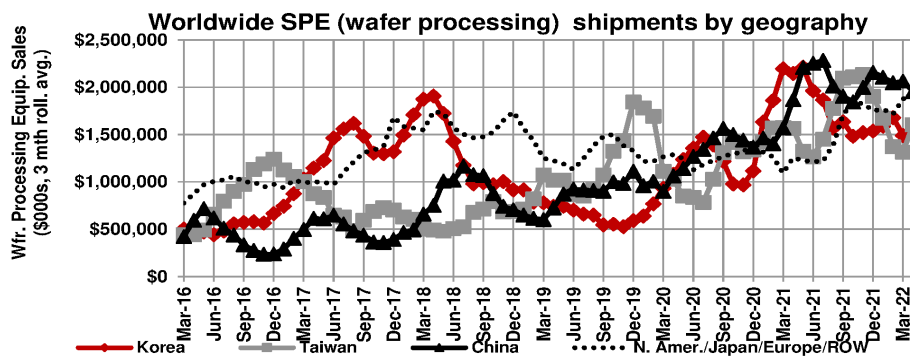
Source: SEMI, Nomura research

Fig. 12: Semiconductor reinvestment ratio



Source: SEMI, SIA/WSTS, Nomura Research

Fig. 13: Worldwide SPE (wafer processing) shipments by geography



Source: SEMI, Nomura research

Sector outlooks

Memory

EQUITY: MEMORY

Harsher headwinds ahead; will history repeat?

Looking forward to different strategies by memory suppliers

We now need to brace not just for an economic slowdown, but also recession risk due to macro headwinds

We have been highlighting macroeconomic headwind concerns since the end of 2021, but the latest inflation figures and the speed of rate hikes by central banks have exceeded our previous expectations. In order to cool down heated inflation expectations, we believe the US Fed will likely take a hawkish policy stance for a while. In addition to rising energy, food and service prices, we believe consumers will lower spending on IT devices due to changes in consumer behavior after re-openings (WFH demand waning). Thus, we expect IT applications demand to be significantly dragged down. Notably, with weak EM currencies due to a stronger USD, we believe demand from EM countries will likely weaken further, in particular. We also expect the current slowdown in demand for mid-to-low-end IT applications to spread to mid-to-high-end IT applications, which comprises most IT electronics companies' earnings, once we see accelerated deterioration of the macro environment. Since May, we have witnessed concerns on macro headwinds materializing and have lowered our forecasts on the demand outlook for major IT applications and memory demand accordingly. If macro uncertainties further exacerbate, we believe major IT applications demand will likely turn more close to our worst-case demand scenario.

Memory suppliers will likely respond to slowing demand by adjusting down shipments while increasing inventory first and then capex, rather than cutting memory prices rapidly

In our report ([link](#)) published on 30 March 2022, we highlighted our view that once there is a slowdown in demand, memory suppliers would respond by adjusting shipments and capex rather than aggressively cutting memory prices. Although memory suppliers have guided DRAM/NAND shipments growth of mid-high teens percentage / c. 30% in 2022, we believe there is increased downside risk to their shipments guidance due to weakened demand. In the previous memory market cycles, memory suppliers would panic once there were signs of a slowdown in demand and would try to dispose of inventory by cutting ASPs aggressively; however, currently we are not witnessing such a trend in the market. Rather, we are seeing memory suppliers responding to the changes in memory demand by accepting higher inventory for the short term and considering capex adjustments for the mid-to-long term. We believe 3Q22 to be the 'stress test' for memory suppliers, as it will test how suppliers respond to demand cuts from customers as well as downside price pressure.

Memory names undervalued despite the changing memory market environment; maintain our relatively positive outlook

Although rising macro headwinds could impact the earnings of companies overall, including memory companies, we believe the possibility of a significant swing in earnings, as seen in previous memory cycles, is low. However, we are still seeing a wide gap in the valuation multiples between memory and logic chipmakers, suggesting the market remains concerned over the high earnings volatility of memory names. We note the changes in the memory market environment and strategies of memory suppliers, and maintain our positive outlook for memory names that are relatively undervalued, even after considering the market's wariness on the macro front. Recently, many investors have been taking note of these changes, and we believe memory companies can witness a relief rally once memory companies decide to adjust capex instead of competing on prices, and achieve favorable results from memory price negotiations for 2H22. We believe these would be the key factors to rerate memory companies. We believe that memory companies' share prices are more correlated to capex adjustment, which has been 2-3 quarters ahead of a memory price rebound.

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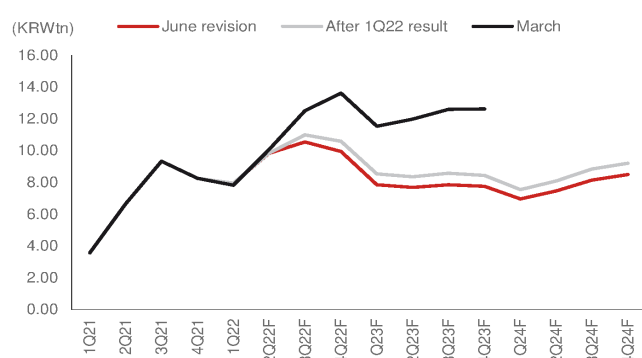
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We now need to embrace not just for an economic slowdown, but for recession risk due to macro headwinds as well

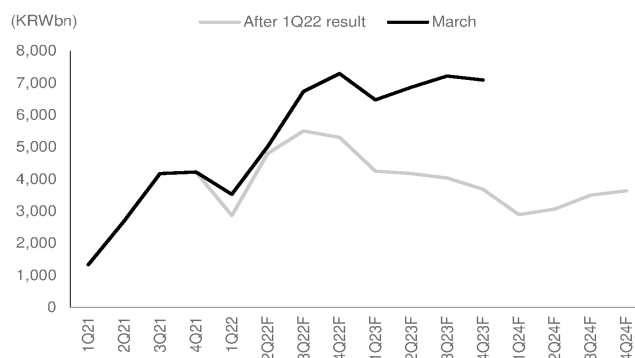
We have been highlighting macroeconomic headwind concerns since the end of 2021, but the latest inflation figures and the speed of rate hikes by central banks have exceeded our previous expectations. In order to cool down heated inflation expectations, we believe the US Fed will likely take a hawkish stance for a while. In addition to rising energy, food and service prices, we believe consumers will cut spending for IT devices due to changes in consumer behavior after re-openings (WFH demand waning). Thus, we expect IT applications demand to be significantly dragged down. Notably, with weak EM currencies due to a strong USD, we believe demand from EM countries will likely weaken further, in particular. We also expect the current slowdown in demand for mid-to-low-end IT applications to spread to mid-to-high-end IT applications, which comprises most IT electronics companies' earnings, once we see accelerated deterioration of the macro-environment. Since May, we have witnessed market concerns on macro-headwinds materializing and have lowered our forecasts on the demand outlook for major IT applications and memory demand accordingly. If macro uncertainties further exacerbate, we believe the major IT applications demand scenario will likely turn more close to our worst-case demand scenario.

Fig. 14: SEC – memory OP revisions chart



Source: Company data, Nomura estimates

Fig. 15: Hynix – memory OP revisions chart



Source: Company data, Nomura estimates

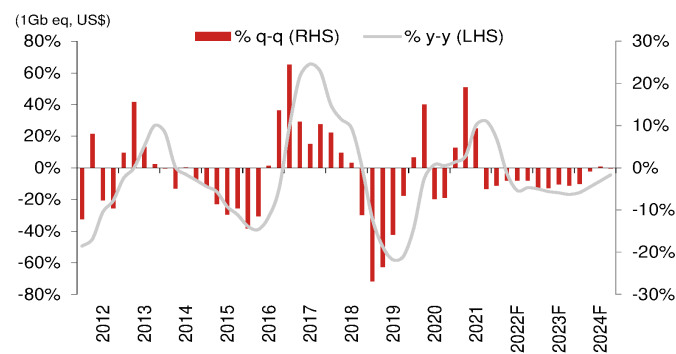
Fig. 16: Samsung Electronics - memory price assumption changes

DRAM ASP	1Q22	2Q22F	3Q22F	4Q22F	1Q23F	2Q23F	3Q23F	4Q23F
Price change assumption (March)								
% q-q	-4%	0%	3%	0%	-3%	-2%	-2%	-2%
% y-y	16%	-1%	-7%	-1%	0%	-2%	-8%	-10%
Price change assumption (June 8)								
% q-q	-3%	-2%	-3%	-4%	-5%	-5%	-3%	-3%
% y-y	17%	-3%	-13%	-12%	-14%	-16%	-16%	-16%
NAND ASP	1Q22	2Q22F	3Q22F	4Q22F	1Q23F	2Q23F	3Q23F	4Q23F
Price change assumption (March)								
% q-q	-3%	9%	2%	0%	-6%	-6%	-5%	-5%
% y-y	10%	13%	5%	8%	5%	-10%	-16%	-20%
Price change assumption (June 8)								
% q-q	-4%	7%	-2%	-5%	-6%	-6%	-5%	-5%
% y-y	8%	9%	-2%	-4%	-6%	-18%	-20%	-20%

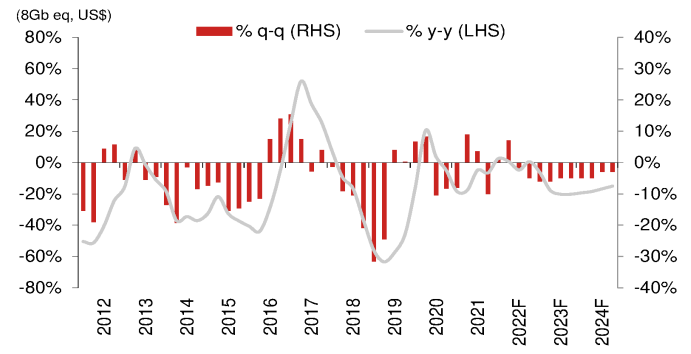
Source: Company data, Nomura estimates

We estimate DRAM prices will decline only by a low-single-digit percentage in 2Q22F, but mixed ASPs could be slightly better due to a higher mix of premium products such as server DRAM (15% premium over mobile DRAM) and DDR 5 (40% premium over DDR4). While there has been a significant decline in consumer IT demand, it has been offset by the relatively strong demand from enterprise demand and memory suppliers' efforts to defend DRAM prices. We estimate NAND prices will increase 5-9% q-q in 2Q22, due to production disruption from Kioxia (unlisted) despite a weakening demand environment.

However, the aforementioned risks have started to materialize since mid-May, and we see a higher possibility of such risks getting escalated from 2H22F into 2023F due to stronger macro headwinds. The key question will be how memory suppliers will respond once demand turns meaningfully weaker due to a slowing macro economy.

Fig. 17: Hynix – DRAM ASP change (q-q%, y-y %)

Source: Company data, Nomura estimates

Fig. 18: Hynix – NAND ASP change (q-q%, y-y %)

Source: Company data, Nomura estimates

Memory suppliers will likely respond to slowing demand by reducing shipments while increasing inventory first and then capex, rather than cutting memory prices rapidly

In our report ([link](#)) published on 30 March 2022, we highlighted our view that once there is a slowdown in demand, memory suppliers would respond by adjusting shipments and capex rather than aggressively cutting memory prices. Although memory suppliers have guided DRAM/NAND shipments growth of mid-high teens percentage/ c.30% in 2022, we believe there is increased downside risk to the shipments guidance due to the weakened demand. In the previous memory market cycles, memory suppliers would panic once there were signs of a slowdown in demand and would try to dispose of inventory by cutting ASPs aggressively; however, currently we are not witnessing such a trend in the market. Rather, we are seeing memory suppliers responding to the changes in memory demand by accepting higher inventory for the short term and considering capex adjustments for the mid-to-long term.

We believe demand in 3Q22 will likely turn weak, and we are starting to see more uncertainties for hyper-scale server memory demand (which accounts for 35% of total memory demand and has been relatively solid up until now). Although we still expect hyper-scale server memory demand to remain strong for the mid-long term, led by the mega trend of cloud and AI tech, the price bargaining of server customers will likely strengthen given that other applications demand is significantly weakening. We believe 3Q22 will be a 'stress test' for memory suppliers, a test on how suppliers respond to demand cuts from customers and price downside pressure.

DRAM demand growth can slow to 10-13 % y-y in 2022F vs companies' guidance of 18% due to weak macro

In early 2022, we forecast [link](#) PC shipments to decline 5% y-y and smartphone shipments to grow 3% y-y; however, due to multiple headwinds, the market is likely to be close to our worst-case scenario as discussed in the 30 March 2022 memory note. As shown in the Table below, we estimate DRAM demand growth may fall from our previous estimate of 18% y-y to 10% y-y (worse case) – 12% y-y (new base) in 2022. In such a case, we think memory suppliers' year-end inventory may increase from the current one-two weeks level to four-five weeks as we believe memory suppliers will be willing to increase inventory rather than ship memory chips through aggressive ASP cuts. At the same time, we think memory suppliers will likely cut capex and the rising inventory will stabilize after 6-9 months, once the impact of capex cuts materializes.

Fig. 19: DRAM demand outlook – 2022F

DRAM demand		Set unit growth	2022F - base case			Set unit growth	2022F - worse case		
			Contents growth	Bit growth	Weight		Contents growth	Bit growth	Weight
Nomura	PC	-10%	8%	-2%	13%	-12%	8%	-5%	13%
	Mobile	-7%	9%	2%	29%	-10%	9%	-2%	29%
	Severs	5%	23%	29%	35%	2%	23%	26%	35%
	others			8%	23%			7%	23%
	total			12%	100%			10%	100%

Source: Company data, Nomura estimates

Fig. 20: DRAM demand outlook – 2023F

DRAM demand		Set unit growth	2023F - base case			Set unit growth	2023F - worse case		
			Contents growth	Bit growth	Weight		Contents growth	Bit growth	Weight
Nomura	PC	-5%	9%	4%	11%	-8%	9%	1%	11%
	Mobile	3%	10%	13%	27%	-3%	10%	6%	27%
	Severs	6%	22%	29%	38%	3%	22%	26%	38%
	others			8%	23%			7%	23%
	total			16%	100%			13%	100%

Source: Company data, Nomura estimate

Fig. 21: DRAM supply outlook

Supply						Base	Worse
		2019	2020	2021	2022F	2023F	2023F
production (mn GB)		15,334	18,138	22,183	26,729	30,563	30,563
y-y		21%	18%	22%	20%	14%	14%
wafer year-end (k/wpm)		1,316	1,401	1,564	1,656	1,761	1,761
wafer year-average (k/wpm)		1,304	1,341	1,464	1,575	1,638	1,638
wafer y-y		3%	3%	9%	8%	4%	4%
bit/wafer y-y		17%	15%	12%	12%	10%	10%
shipment (mn GB)		15,199	18,995	23,200	26,060	30,348	29,488
y-y		18%	25%	22%	12%	16%	13%
Inventory (mn GB)		2,800	1,943	926	1,595	1,811	2,671
Inventory weeks		9.6	5.3	2.1	3.2	3.1	4.7

Source: Company data, Nomura estimate

If DRAM demand growth remains at a low-teens percentage in 2023 due to the impact of macroeconomic factors, and if DRAM companies do not downwardly adjust their capex plans, we believe inventory levels could further rise in 2023. However, at this point we believe memory suppliers are highly likely to adjust capex and production growth. In other words, there can be downside to our previous shipments projections, but we see relatively limited downside risk to our memory ASP forecast than in the past down cycle (see [Fig. 16](#), low-mid single digit percentage decline on a q-q basis). Micron's CEO Sanjay Mehrotra communicated at the company's latest analyst day ([link](#) – refer to page 12) that memory companies' strategies have changed due to changes in the memory market environment, and their earnings sensitivity to the macro environment is likely lessening vs logic chip companies' levels. Thus, we believe that if memory market forecast adjustments are related more to shipment forecasts rather than bigger ASP forecast changes, volatility in memory suppliers' OP forecasts would be similar to that of shipment volatility with much lower operating leverage. We expect DRAM prices to decline 5%/16% y-y in 2022F/2023F, milder than those in previous DRAM market downturns. We believe memory prices will likely decline by mid-low single digit percentage on a q-q basis. Thus, we forecast DRAM OPM at 40% in 2022 and 33% in 2023, and the decline should be much milder than in the previous downturns.

Fig. 22: SK Hynix - Total operating profit sensitivity analysis

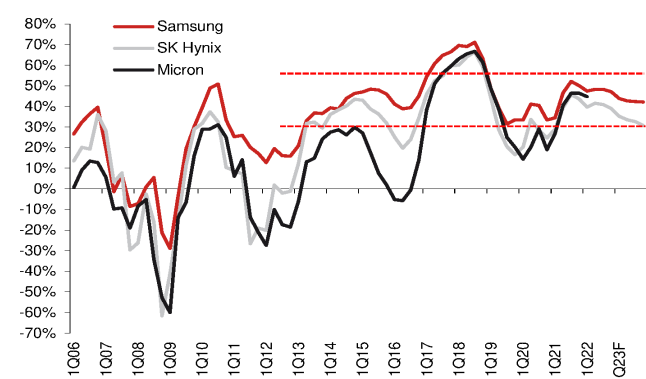
Highlighted is our base case figure; top chart: operating profit (KRWtn) bottom chart: changes in operating profit

			Shipment (y-y %)						
			10%	12%	14%	16%	18%	20%	22%
DRAM ASP (1Gb eq USD, y-y%)	-25%	0.37	10.0	10.3	10.7	10.9	11.3	11.6	11.9
	-20%	0.39	11.8	12.2	12.5	12.8	13.2	13.5	13.9
	-15%	0.42	13.6	14.0	14.4	14.7	15.1	15.5	15.8
	-10%	0.44	15.4	15.8	16.2	16.6	17.0	17.4	17.8
	-5%	0.47	17.2	17.7	18.1	18.5	19.0	19.4	19.8
	0%	0.49	19.0	19.5	19.9	20.3	20.9	21.3	21.8

			Shipment (y-y %)						
			10%	12%	14%	16%	18%	20%	22%
DRAM ASP (1Gb eq USD, y-y%)	-25%	0.37	-46%	-44%	-42%	-41%	-39%	-37%	-36%
	-20%	0.39	-36%	-34%	-32%	-31%	-29%	-27%	-25%
	-15%	0.42	-26%	-24%	-22%	-20%	-18%	-16%	-14%
	-10%	0.44	-17%	-14%	-12%	-10%	-8%	-6%	-3%
	-5%	0.47	-7%	-4%	-2%	0%	3%	5%	7%
	0%	0.49	3%	5%	8%	10%	13%	16%	18%

Source: Company data, Nomura estimates

Fig. 23: DRAM supplier OPM: less volatile and stable around 30-50%; narrowed OPM gap among the players



Source: Company data, Nomura estimates

Fig. 24: Micron - Investor Day comment

Industry supply discipline

Slowing of Moore's law

decelerating supply growth, reduced cost declines
improved pricing trendlines and ability to hold higher levels of inventory

ROIC focus

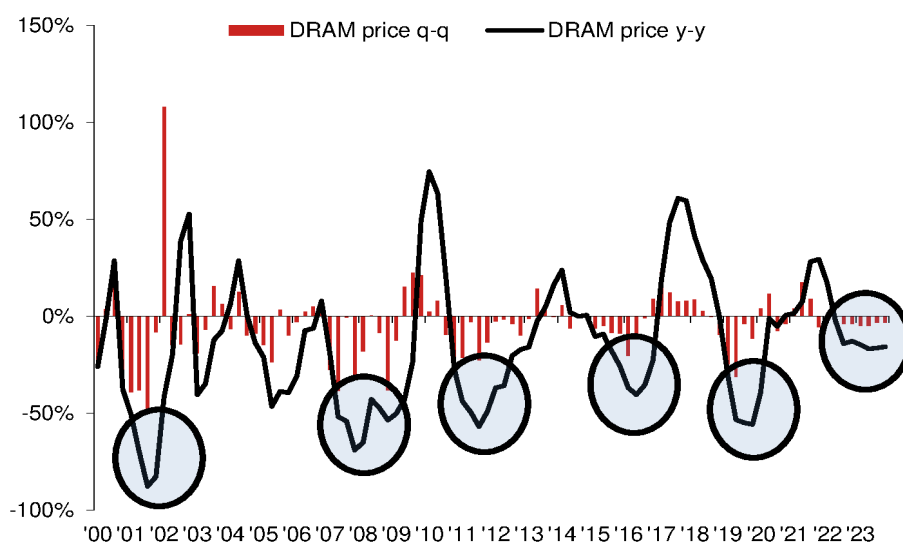
requires disciplined industry capex

Capital return

dividends paid by all leading DRAM suppliers

Source: Micron, Nomura research

Fig. 25: DRAM price q-q vs. y-y trend



Source: WSTS, Nomura estimates

NAND demand at low-20% y-y in 2022F due to weakened demand. Price decline can be faster than that for DRAM

The NAND market is less consolidated than the DRAM market due to the entry of Chinese supplier YMTC (unlisted) that prioritizes gaining market share than profitability. Thus, we see more risks to the NAND market compared with the DRAM market. At the start of 2022, we expected NAND demand to grow 30% y-y with low industrywide NAND inventory easing by 2022F. But due to production disruption from Kioxia that led to low production growth, NAND prices have increased in 2Q22. Yet, given the weak demand and high prices, we believe NAND demand growth will likely be at low-20% y-y in 2022F. As well, given that Kioxia has normalized production, we expect industrywide NAND inventory to grow from 2H22F. Chinese suppliers, including YMTC, are gaining market share through aggressive capacity addition and tech migration although they are not competitive vs. first-tiers. We expect NAND prices to decline by mid-single digit percentage by 2023F on a quarterly basis. While this decline is higher than that for DRAM, it is much milder than the previous NAND market downturn.

Fig. 26: NAND demand outlook – 2022F

Demand		Set unit growth	2022F base case Contents growth	Bit growth	Weight	Set unit growth	2022F worse case Contents growth	Bit growth	Weight
Demand	SSD	6%	25%	32%	47%	2%	25%	27%	47%
	Smartphone	-7%	14%	6%	29%	-10%	14%	3%	29%
	Tablet	-6%	24%	16%	3%	-6%	24%	16%	3%
	Others			26%	21%			23%	21%
	Total			23%	100%			19%	100%

Source: Company data, Nomura estimates

Fig. 27: NAND demand outlook - 2023F

Demand		Set unit growth	2023F base case Contents growth	Bit growth	Weight	Set unit growth	2023F worse case Contents growth	Bit growth	Weight
Demand	SSD	3%	25%	28%	48%	0%	25%	25%	48%
	Smartphone	3%	18%	21%	28%	-3%	18%	14%	28%
	Tablet	-3%	24%	20%	3%	-4%	24%	19%	3%
	Others			26%	21%			26%	21%
	Total			26%	100%			22%	100%

Source: Company data, Nomura estimates

Fig. 28: NAND supply outlook

	2019	2020	2021	2022F	Base 2023F	Worse 2023F
production	344	475	680	882	1101	1101
y-y	34%	38%	43%	30%	25%	25%
wafer year-end (k/wpm)	1,515	1,590	1,835	1,911	1,972	1,972
wafer year-average (k/wpm)	1,452	1,530	1,725	1,776	1,847	1,847
wafer y-y	-7%	5%	13%	3%	4%	4%
bit/wafer y-y	44%	31%	27%	26%	20%	20%
shipment	385	502	700	859	1080	1047
y-y	42%	30%	38%	23%	26%	22%
Inventory	91	64	45	68	89	122
Inventory weeks	12.3	6.6	3.3	4.1	4.3	6.1

Source: Company data, Nomura estimates

For 2022-2023F, we expect the NAND industry to introduce new technologies such as CUP (cell under peripheral – by Samsung [005930 KS, Buy] and Kioxia) and double stacking (by Samsung), and production growth to slow relative to 2021. We believe NAND suppliers (excluding Samsung) in 2023F will face challenges in processing single etching of more than 100 layers for 3D NAND in order to migrate to over 200L with double etching. This will further pressure production growth in 2023F. If the aforementioned industry challenges are addressed, we view that production growth will likely increase from 2024.

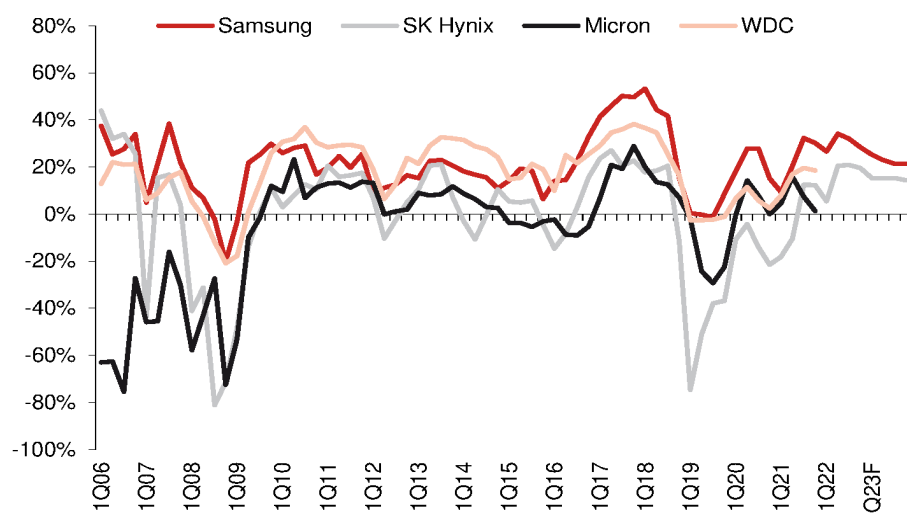
However, as the NAND industry's capex intensity is surging (faster than that of the DRAM industry) and has difficulties raising production growth due to the complexity of getting the needed technology, we believe NAND suppliers are entering an environment where they have to be more disciplined than before. However, the entry of Chinese suppliers such as YMTC into the NAND market is raising the risk of NAND market oversupply. We are witnessing the allies of the US (Japan, Korea and Taiwan) attempting to deter the entry of Chinese semiconductor companies through various restrictions led by the US. If the US were to ban exports of semiconductor production equipment to Chinese chip makers (similar to the restrictions imposed on SMIC [981 HK, Neutral]), it would be significantly difficult for YMTC to survive in the NAND market.

Fig. 29: 3D NAND migration – effective bit growth per fab

3D NAND Migration	4Q13	4Q14	4Q15	4Q16	2Q18	2Q20	4Q21	3Q22F
Time (quarters) needed for next migration	4 Qs	4 Qs	4 Qs	4.5 Qs	6 Qs	8 Qs	6 Qs	4 Qs
Layer	24	32	48	64	96	128	176	236
Etching	Single	Single	Single	Single	Single	Single	Double	Double
Cell on Peri	X	X	X	X	X	X	Additional 15% bit/wafer growth	
Layer # increase rate		33%	50%	33%	50%	33%	38%	34%
bit density (Gb/mm2)	1.2	1.9	2.8	4.0	5.6	8.5	12.8	17.6
change (%)		50%	50%	42%	40%	53%	50%	38%
process step	320	349	384	418	460	501	702	758
capex requirement for new 10K/mon capa	800	850	920	1000	1100	1300	1850	2035
wafer capacity per area (24L =100) or Fab	100	92	83	77	70	64	46	42
change (%)		-8%	-9%	-8%	-9%	-8%	-29%	-7%
Effective bit increase per fab		38%	36%	30%	27%	40%	7%	28%

Source: Company data, Nomura estimates

Fig. 30: NAND suppliers' OPM



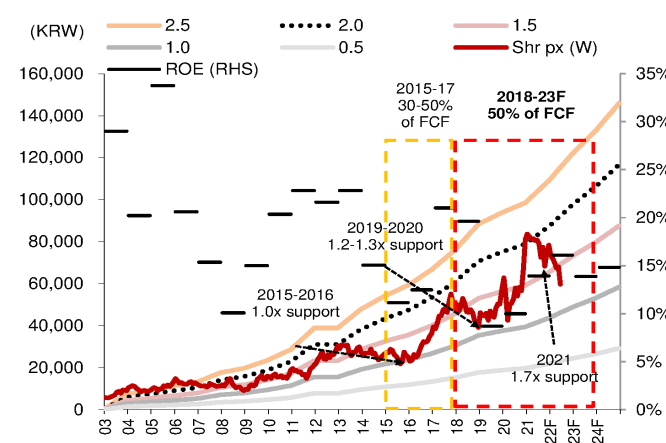
Source: Company data, Nomura estimates

Memory names undervalued despite the changing memory market environment; maintain our relatively positive outlook

Although rising macro headwinds could impact earnings of companies including memory companies, we believe the possibility of a significant swing in earnings, as seen in previous memory cycles, is low. However, we are still seeing a wide gap in valuation multiples between memory and logic chipmakers, suggesting the market remains concerned over the high earnings volatility of memory names. We note the changes in the memory market environment and strategies of memory suppliers and thus, we maintain our positive outlook on memory names that are relatively undervalued, even after considering the market is getting cautious on the macro front. Recently, many investors have highlighted such changes, and we believe memory companies could experience a relief rally so long they adjust their capex rather than to compete on pricing, and should achieve favorable results from memory price negotiations for 2H22. In our view, these are the key factors for rerating a memory company. We believe that memory company share

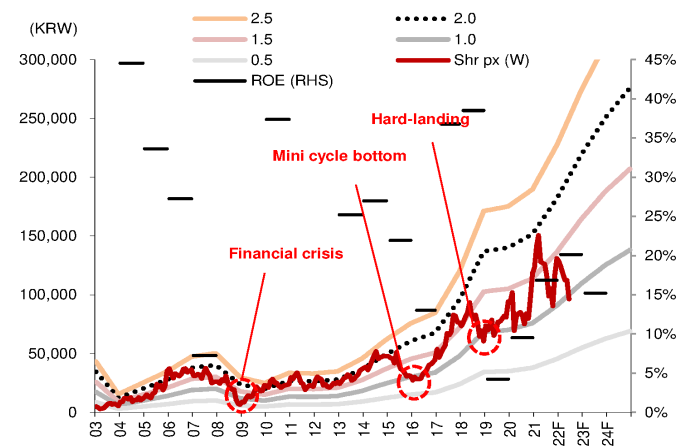
prices are more correlated to capex adjustments, which is usually 2-3 quarters ahead of a memory price rebound.

Fig. 31: SEC - trailing P/B vs ROE and shareholder returns policy



Source: Company data, Nomura estimates

Fig. 32: Hynix - trailing P/B vs ROE



Source: Bloomberg Finance L.P., Nomura estimates

Fig. 33: Global semiconductor peer company comparison

Company	Code	Rating	Mkt Cap (USDmn)	Price 22-Jun	PER (x)		PBR (x)		EPS growth		ROE (%)		Div yield (%)	
					FY22F	FY23F	FY22F	FY23F	FY22F	FY23F	FY22F	FY23F	FY22F	FY23F
Memory														
Samsung Electronics	005930 KS	Buy	265,906	57,800	7.9	8.3	1.2	1.1	27%	-5%	15.9%	13.6%	4.2%	4.2%
Micron	MU US	Not rated	63,427	56.80	9.5	6.0	1.5	1.2	114%	57%	16.5%	21.3%	0.0%	0.7%
SK Hynix	000660 KS	Buy	51,894	92,500	4.9	5.5	0.8	0.7	45%	-11%	20.3%	15.4%	2.1%	2.1%
Western digital	WDC US	Not rated	14,562	46.50	12.0	5.7	1.4	1.2	50%	81%	12.1%	22.7%	0.1%	0.0%
Non-memory														
TSMC	2330 TT	Buy	430,996	494.50	14.7	13.3	4.6	3.7	47%	10%	35.4%	31.0%	2.2%	2.2%
UMC	2303 TT	Neutral	18,502	44.10	6.9	7.9	1.7	1.6	39%	-12%	26.6%	21.3%	7.9%	8.0%
Intel	INTC US	Not rated	154,278	37.73	10.9	10.7	1.4	1.4	-37%	2%	14.0%	13.7%	3.8%	4.0%
Qualcomm	QCOM US	Not rated	139,317	124.39	9.9	9.4	8.3	5.5	47%	5%	97.6%	62.9%	2.3%	2.4%
Nvidia	NVDA US	Not rated	414,150	165.66	38.1	30.3	15.7	12.9	78%	23%	47.7%	41.4%	0.1%	0.1%
AMD	AMD US	Not rated	135,782	83.79	19.3	16.9	2.7	2.4	56%	14%	20.6%	15.3%	0.0%	0.0%

Note: Bloomberg estimates for Not rated stocks.

Source: Company data, Nomura estimates, Bloomberg Finance LP

Greater China Semi

EQUITY: TECHNOLOGY

Cycle peaked in 1H22

Fundamentals downside to accelerate over the next few months

Reiterate our cautious sector view; the next few months likely challenging

In our April strategy report *Cycle peak is here*: 1) we changed from positive (which we kept throughout 2021) to a cautious view on the sector outlook, reaffirming our view that the peak was in 1H22F (we projected the cycle to peak in 1H22 in our *2022 strategy note*); 2) we believed inflation would be a new and major concern for tech demand, and would increase the probability of a 'hard-landing'. However, we noted there was upside to consensus' bearish expectation into April/May earnings season, given that order adjustment in this downturn could be slower and longer than market expectations; and 3) we expected real challenges to the Semi supply chain to start from May/June, as corporates would need to cut orders/wafers by mid-2022F if expectations of peak season demand in 2H fail to materialize. **We expect 2022 to be like 2008, 2011 and 2015—years when there was no 2H peak season.**

That said, although fundamentals have come in-line with our expectations, i.e., Semi earnings and outlook beats into April/May (*Fig. 53 - Fig. 54*), Semi share prices have not recovered much (*Fig. 34 - Fig. 39*), likely due to further depressed valuations driven by surging Fed fund rate hike concerns (e.g. 10y US bond yield continued to rise; *Fig. 40*). Also, we think China's unexpected city lockdowns in April-May further dampened the strength of a rebound (as China lockdowns would directly hit the tech supply chain in terms of logistics issues, apart from the impact on demand).

YTD, the Semi index has fallen 33%, 20%, 23% in the US (SOX), China (Wind Chip) and Taiwan (TWSE-listed semi excluding TSMC), respectively. No single stock delivered positive returns (*Fig. 85*). With our view of likely further downside to sector-wide earnings and share prices heading into July/Aug, we think it is hard to expect a positive return for most semi stocks before earnings can bottom. We downgraded Novatek (3034 TT, Neutral) to Neutral on 2 Jun (*report*) and lowered our TP for Phison (8299 TT, Buy, *report*) on 24 May to align with our cycle peak view and factor in weakened consumer products demand. However, we upgraded ASPEED (5274 TT) on 2 June to Buy considering its structural upside potential, given its likely rising TAM (total addressable market) in the HPC (high performance computing) space until 2024-25F, which should outweigh any cyclical swing into 2023F (*report*). **We advise avoiding most Semi names, but would use near-term fundamentals/share price weakness to accumulate TSMC (2330 TT, Buy), server/cloud chip vendors ASPEED and Montage (688008 CH, Buy), high-speed interface chip vendors Parade (4966 TT, Buy) and ASMedia (5269 TT, Buy), China analog IC supplier SG Micro (300661 CH, Buy), and SiC/GaN beneficiary Aixtron (AIXA GY, Buy) (see report).**

Share prices would not bottom out before earnings stabilization and/or Fed's policy support. We might not see the trough before July/Aug earnings

It remains uncertain whether it would be a soft landing or hard landing after the 1H21F cycle peak, but we believe **we are at the order/earnings adjustment period and there is more downside ahead for share prices into July/Aug earnings** (as suggested in our *strategy* note in April). In our previous *sector report*, we noted inflation was a true concern to tech demand, and we recently noticed a growing number of headcount freeze news globally in the tech space (e.g. Meta [FB US, Not rated], Nvidia [NVDA US, Not rated], and Twitter [TWTR US, Not rated]). However, long-term agreements (LTAs) and slower-than-planned 2023 capacity expansions (e.g. comments from TSMC, GlobalFoundries [GFS US, not rated], UMC [2303 TT, Neutral], KLA [KLAC US, Not rated], AMAT [AMAT US, Not rated]) would still slow down the order cuts tempo than expected, in our view.

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Good news: In 2008, 2011, and 2015, the years without 2H peak season, we note share prices bottomed out in 2H even though consensus continued to revise downward earnings estimates heading into the following year (e.g. OTC semi share price in 2011, 2015 and 2018), which we attribute to: 1) a bear market correction, which is usually sharper and faster than the bull market rally; 2) investors started to accelerate the growth outlook of year N+2 from year N+1 and an unfavourable year N; and 3) the equity market found liquidity support from the Fed's Quantitative Easing (QE), including QE1 from Dec-2008, and Operation Twist (OT) from Sep-2011. *Fig. 46 - Fig. 51* compare share prices with consensus' earnings revisions over 2008, 2011, and 2015.

Bad news: 1) the earliest share prices bottom out is usually after July/Aug earnings; and 2) the scale of correction can be significant. As we expect July/Aug earnings (apart from April/May earnings) to disappoint, we remain wary over further share price downside into July/Aug earnings calls. Mainboard Semi in 2008, 2011, 2015 corrected by a respective 57%, 30% and 33% from a year-high to a year-low, while that of OTC Semi corrected more by 77%, 56% and 43%. We highlight major earnings and share price corrections took place in Jun-Aug of 2008, 2011 and 2015 (*Fig. 46 - Fig. 52*). YTD, mainboard semi and OTC semi have corrected by 23% and 38%, respectively. **It appears that OTC Semi (including more smaller-cap Semi companies vs. mainboard Semi) names have more downside pressure during years of 'no 2H peak season'.**

For this cycle, the slower-than-expected order adjustment has helped Semi companies deliver a better-than-expected April/May earnings season, but **we believe there would be more "misses" into July/Aug earnings.** The "misses" would start from consumer application-driven companies (smartphone, NB, TV, etc). Server/cloud and auto semi are still mired in a 'component supply mismatch' cycle (with most chips in shortages from IDMs, rather than from foundries). But we think they will still drive logic semi supply chain order fluctuations by the time when supply and demand sync, in our view. Inflation, weakening consumption power, and corporates' slower spending are risks to these names. **However, on a positive note, we still believe supply chain inventory will not retreat to pre-COVID levels,** as the 'inefficient' global semi supply chain (*2021 strategy report*) is unlikely to change. This could help Semi names to bottom out earlier than expected. **China's Zero-Covid policy is a 'blessing in disguise',** in our view, as while it has a severe short-term impact on earnings, it indirectly forces the supply chain to stop building more chips inventory.

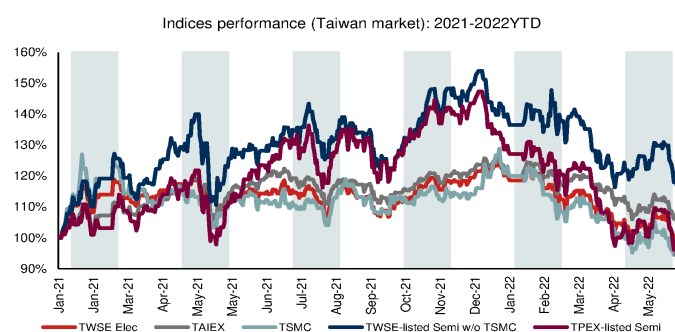
DOI update: Fabless DOI breaking records going into 1H22F

Fabless' inventory level and DOI are hitting record levels again, approaching the 100-day level. We expect the inventories of Chinese design houses to rise significantly more than that of Taiwan and US peers, with a much higher DOI (e.g. 137 days for Gigadevice [603986 CH, Not rated] and 263 days for Will Semi [603501 CH, Neutral], see *report*), factoring in the China lockdowns (*Fig. 65 - Fig. 66*).

IDMs' DOI also rose in 1Q22, albeit still lower than the peak level of 2018/2020. Texas Instruments (TI; TXN US, Not rated) reiterated its intent to increase DOI, and commented that it would not be uncomfortable even if the levels were to exceed the target range of 130-190 days (vs 127 days in 1Q22, see *TXN note*). ST Micro (STM US, Not rated), NXP (NXPI US, Not rated), Microchip (MCHP US, Not rated) and ADI (ADI US, Not rated) consider current DOI levels as lean or lower than both their own and distributors' targets, while ON Semi (ON US, Not rated) plans to reduce its DOI in 2H22. Supply chains (with less exposure to consumer applications) are preparing more inventory in an environment of unstable macro economy and chip supply shortages, especially when they have less order/demand visibility (*Fig. 67 - Fig. 68*).

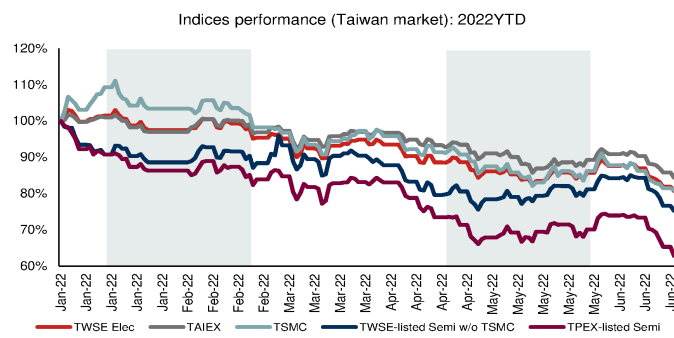
Rising inventories are exerting pressure on the downstream. ODMs/OEMs and EMS's revenue declined in 1Q22 while inventories trended higher, leading to digestion risks and surging DOI. Slower end-demand for consumer electronics is likely to further deteriorate the inventories issue for the remainder year (*Fig. 71 - Fig. 84*).

Fig. 34: Indices' performance (Taiwan market): 2021-2022, YTD



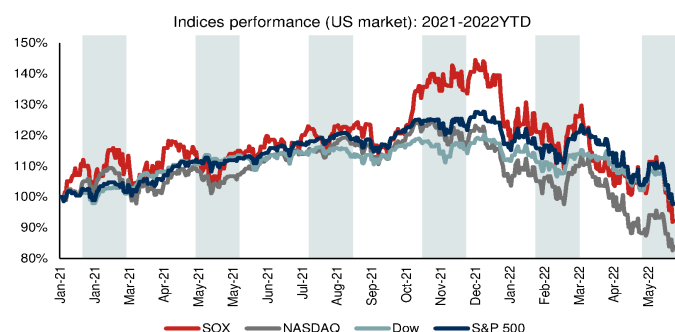
Note: Shadowed area indicates earnings period.
Source: Bloomberg Finance LP., Nomura research

Fig. 35: Indices performance (Taiwan market): 2022, YTD



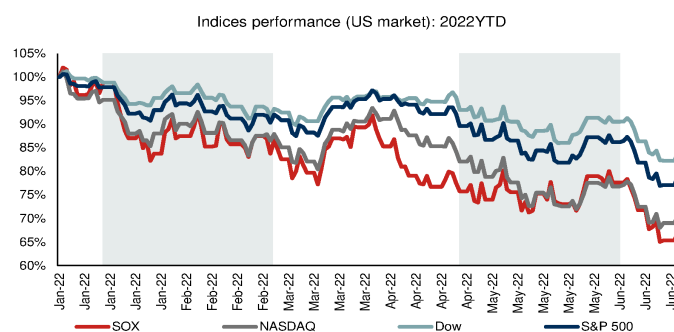
Note: Shadowed area indicates earnings period.
Source: Bloomberg Finance L.P., Nomura research

Fig. 36: Indices' performance (US market): 2021-2022, YTD



Note: Shadowed area indicates earnings period.
Source: Bloomberg Finance L.P., Wind, Nomura research

Fig. 37: Indices' performance (US market): 2022, YTD



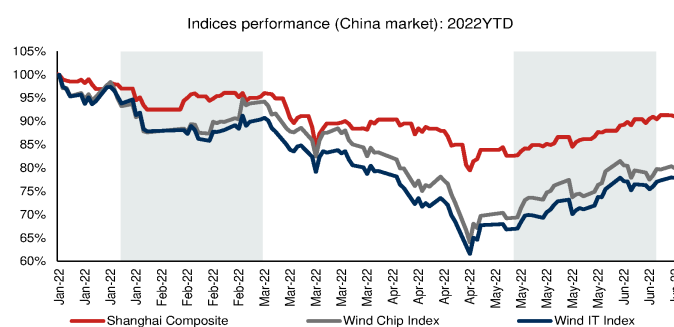
Note: Shadowed area indicates earnings period.
Source: Bloomberg Finance L.P., Wind, Nomura research

Fig. 38: Indices' performance (China market): 2021-2022, YTD



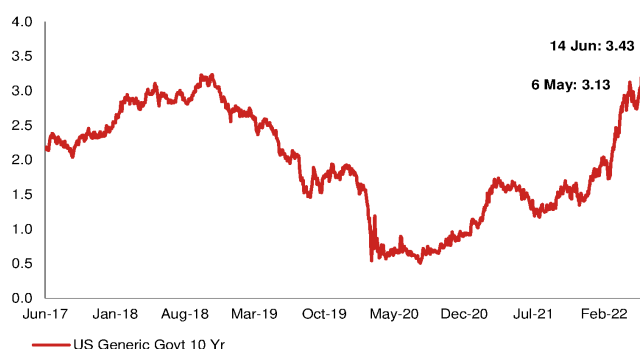
Note: Shadowed area indicates earnings period.
Source: Bloomberg Finance L.P., Wind, Nomura research

Fig. 39: Indices' performance (China market): 2022, YTD



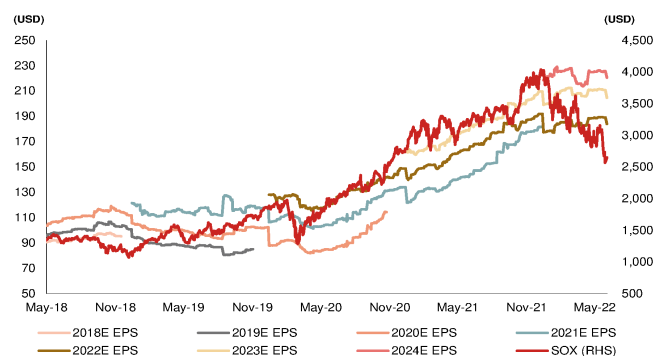
Note: Shadowed area indicates earnings period.
Source: Bloomberg Finance L.P., Wind, Nomura research

Fig. 40: U.S. 10-Year Bond Index



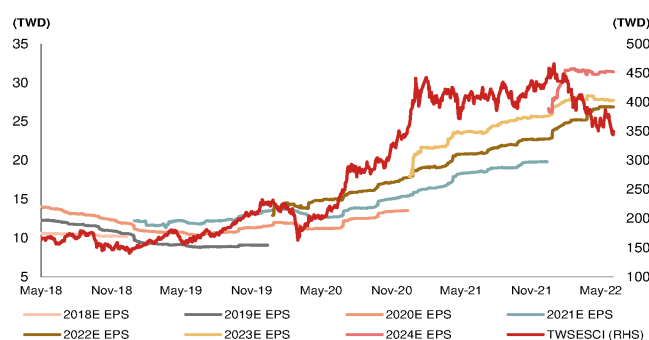
Source: Bloomberg Finance L.P., Nomura research

Fig. 41: SOX index vs Bloomberg consensus EPS revisions



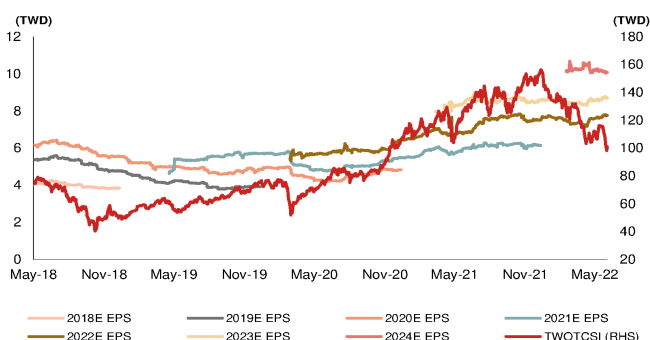
Source: Bloomberg Finance L.P., Nomura research

Fig. 42: TWSESCI index vs Bloomberg consensus EPS revisions



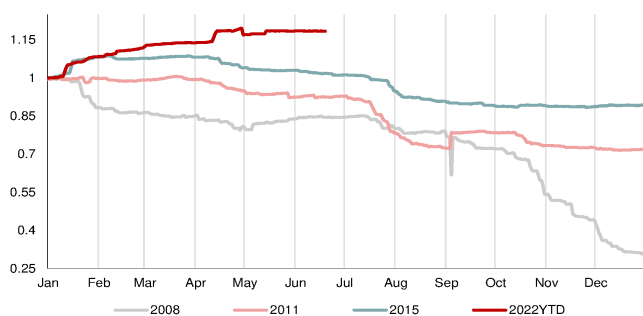
Source: Bloomberg Finance L.P., Nomura research

Fig. 43: TWOTCSI index vs Bloomberg consensus EPS revisions



Source: Bloomberg Finance L.P., Nomura research

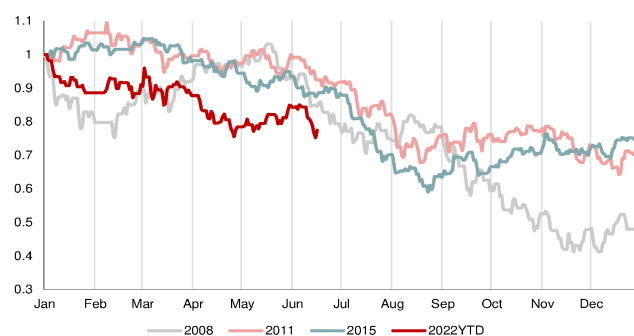
Fig. 44: TWSESCI's earnings revision trend in 2008, 2011, 2015 and 2022YTD



Source: Bloomberg Finance L.P., Nomura research

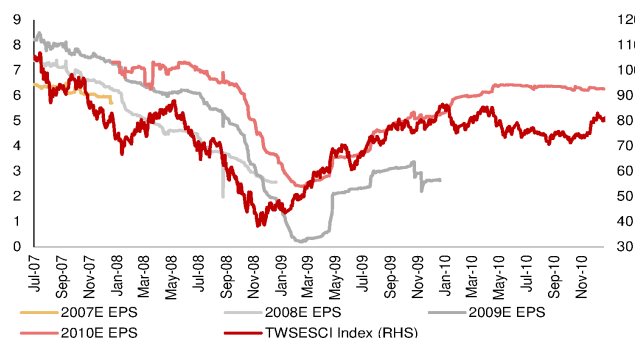
Fig. 45: TWSESCI's (excl.TSMC) performance in 2008, 2011, 2015 and 2022, YTD

Share price fell from May/June in 2008, 2011 and 2015



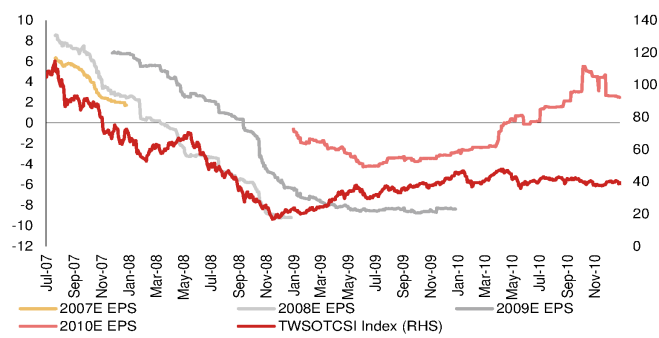
Source: Bloomberg Finance L.P., Nomura research

Fig. 46: TWSESCI Index vs Bloomberg consensus EPS revisions — 2007-2010



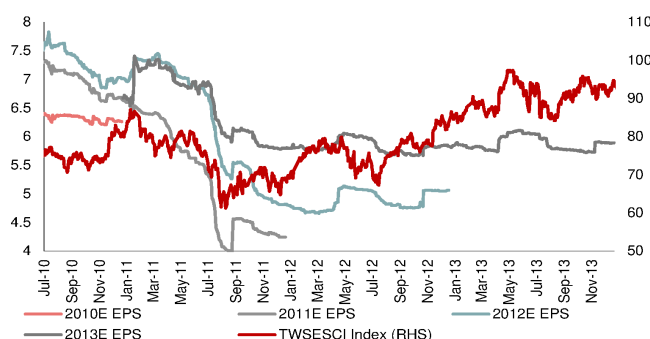
Source: Bloomberg Finance LP., Nomura research

Fig. 47: TWOTCSI Index vs Bloomberg consensus EPS revisions — 2007-2010



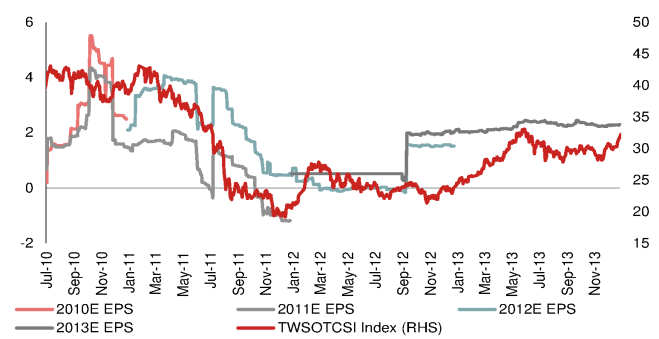
Source: Bloomberg Finance LP., Nomura research

Fig. 48: TWSESCI Index vs Bloomberg consensus EPS revisions — 2010-2013



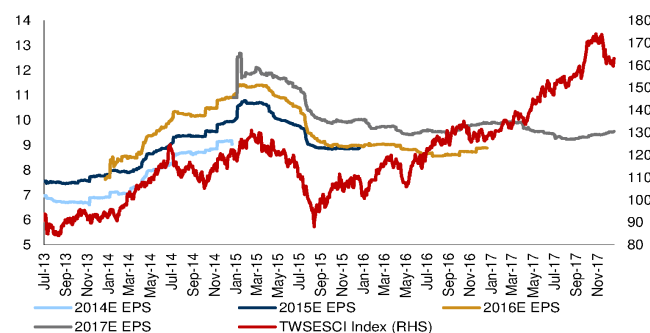
Source: Bloomberg Finance LP., Nomura research

Fig. 49: TWOTCSI Index vs Bloomberg consensus EPS revisions — 2010-2013



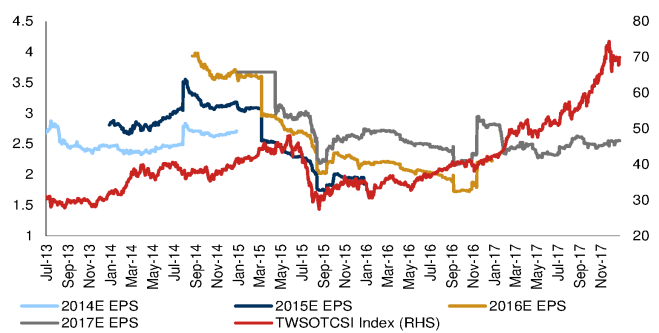
Source: Bloomberg Finance LP., Nomura research

Fig. 50: TWSESCI Index vs Bloomberg consensus EPS revisions — 2013-2017



Source: Bloomberg Finance LP., Nomura research

Fig. 51: TWOTCSI Index vs Bloomberg consensus EPS revisions — 2013-2017



Source: Bloomberg Finance LP., Nomura research

Fig. 52: Index performance in 2008, 2011, 2015 and 2022

TWSESCI Index					TWSOTCSI Index				
	High	Low	Diff	YTD return		High	Low	Diff	YTD return
2008	87.88	38.15	-57%	-45%	2008	71.48	16.67	-77%	-69%
2011	87.06	61.18	-30%	-15%	2011	43.11	19.12	-56%	-47%
2015	131.11	88.13	-33%	-10%	2015	48.09	27.46	-43%	-15%
2022	465.92	339	-27%	-23%	2022	154.36	96.32	-38%	-38%

Source: Bloomberg Finance LP., Nomura research

Fig. 53: Global fabless' and IDM's 2Q22 sales consensus (current vs pre-1Q22 earnings)

Street revised up its 2Q22 sales forecasts for most fabless after 1Q21 earnings

Fabless	2Q22 Sales Consensus (USD mn)			IDMs	2Q22 Sales Consensus (USD mn)		
	Current Consensus	Pre-1Q earnings Consensus	Change %		Current Consensus	Pre-1Q earnings Consensus	Change %
Qualcomm (QCL + QCT)	10,898	9,954	9%	Intel	17,964	18,263	-2%
AMD	6,519	6,116	7%	TI	4,501	4,984	-10%
Marvell	1,516	1,495	1%	NXP	3,275	3,131	5%
MediaTek	5,231	5,032	4%	STMicro	3,753	3,586	5%
Nvidia	8,102	8,487	-5%	Infineon	3,617	3,590	1%
Parade	215	208	4%	ON Semi	2,016	1,923	5%
Lattice Semi	158	150	5%	ADI	3,054	2,902	5%
Synaptics	475	458	4%	Skyworks	1,231	1,277	-4%
Broadcom (Avago)	8,394	7,973	5%	Qorvo	1,025	1,085	-6%
Novatek	1,206	1,268	-5%	Microchip	1,957	1,865	5%
Realtek	1,044	1,019	2%	Vishay	854	869	-2%
Himax	341	344	-1%	Renesas	2,938	2,637	11%
Silicon Laboratories	251	237	6%	Rohm	908	939	-3%
Cirrus Logic	369	289	28%	Total	47,095	47,050	0%
Silicon Motion	266	262	2%				
Will semi	996	1,004	-1%				
Giga Device	389	363	7%				
Phison	595	623	-4%				
Total	46,965	45,281	4%				

Note: Pre-earnings consensus is data as of 15 Apr

Source: Company data, Bloomberg consensus, Nomura research

Fig. 54: Global fabless' and IDM's 2022 sales consensus (current vs pre-1Q22 earnings)

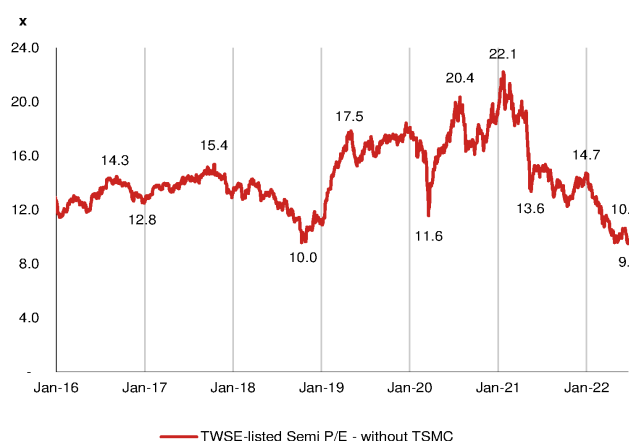
Street revised up its 2022 sales forecasts after 1Q22 earnings

Fabless	2022 Sales Consensus (USD mn)			IDMs	2022 Sales Consensus (USD mn)		
	Current Consensus	Pre-1Q earnings Consensus	Change %		Current Consensus	Pre-1Q earnings Consensus	Change %
Qualcomm (QCL + QCT)	44,670	42,471	5%	Intel	75,218	75,259	0%
AMD	26,293	24,146	9%	TI	19,299	20,006	-4%
Marvell	6,194	6,165	0%	NXP	13,118	12,708	3%
MediaTek	20,081	20,006	0%	STMicro	15,179	15,100	1%
Nvidia	33,729	34,815	-3%	Infineon	14,420	14,215	1%
Parade	848	829	2%	ON Semi	7,994	7,664	4%
Lattice Semi	634	612	4%	ADI	11,827	11,354	4%
Synaptics	1,921	1,862	3%	Skyworks	5,529	5,639	-2%
Broadcom (Avago)	32,944	32,172	2%	Qorvo	4,540	4,846	-6%
Novatek	4,836	4,974	-3%	Microchip	7,912	7,540	5%
Realtek	4,113	4,043	2%	Vishay	3,422	3,391	1%
Himax	1,542	1,642	-6%	Renesas	10,463	10,543	-1%
Silicon Laboratories	1,023	986	4%	Rohm	3,768	3,856	-2%
Cirrus Logic	1,827	1,761	4%	Total	192,689	192,123	0%
Silicon Motion	1,154	1,158	0%				
Will semi	4,391	4,811	-9%				
Giga Device	1,752	1,902	-8%				
Phison	2,440	2,532	-4%				
Total	190,392	186,886	2%				

Note: Pre-earnings consensus is data as of 15 Apr

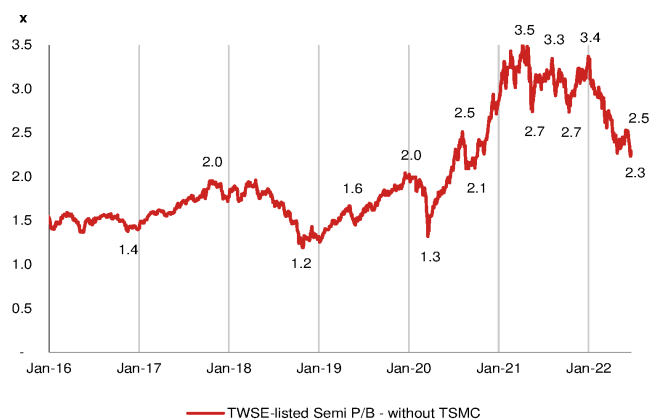
Source: Company data, Bloomberg consensus, Nomura research

Fig. 55: Taiwan large-cap semi P/E (excluding TSMC)



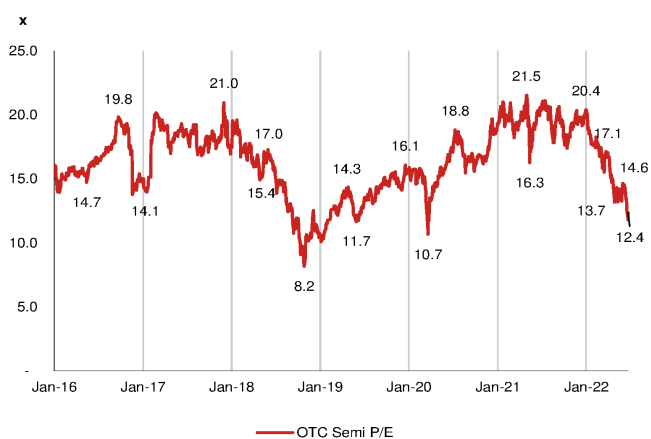
Source: Bloomberg Finance L.P., Nomura research

Fig. 56: Taiwan large-cap semi P/B (excluding TSMC)



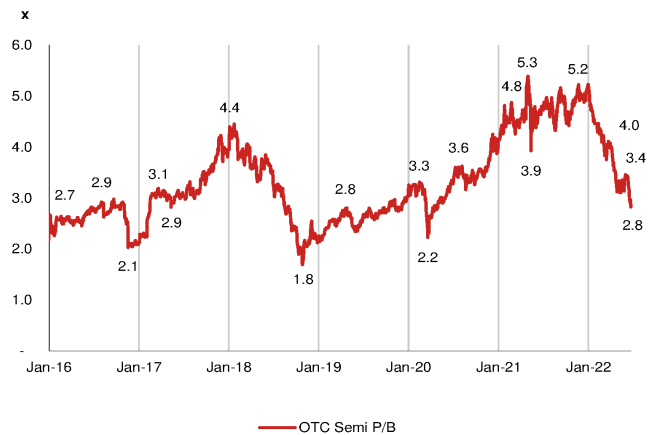
Source: Bloomberg Finance L.P., Nomura research

Fig. 57: Taiwan small-cap semi P/E



Source: Bloomberg Finance L.P., Nomura research

Fig. 58: Taiwan small-cap semi P/B



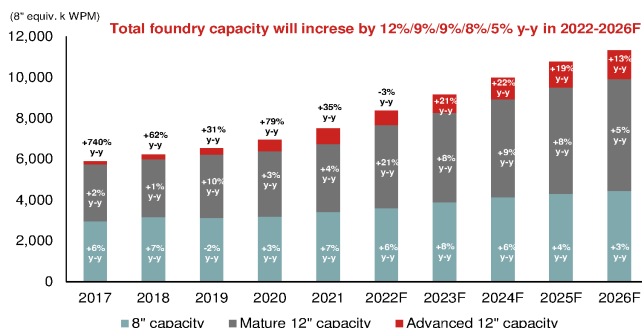
Source: Bloomberg Finance L.P., Nomura research

Fig. 59: Recent capacity expansion plans and capex announced by major IDMs and foundries

IDM	Latest CAPEX announcement	Recent capacity expansion
Infineon	EUR2.4bn in FY2022	<ul style="list-style-type: none"> • EUR2bn to build a new SiC/GaN fab in Kulim, Malaysia in 2H24 (Kulim 3) • Continuous ramped in own 12" factories in Austria and Germany • Invest USD34mn for backend capacity for automotive power ICs in Batam, Indonesia. • Outsourcing share is expected to increase from ~30% in FY21 to ~40% in FY25
Texas Instrument	2022: below USD3.5bn Avg USD3.5b/year for 2022-2025 ~10% of sales for 2026-	<ul style="list-style-type: none"> • RFAB2 (12"): 30% larger than RFAB1, equipment installations in 1H22, production in 2H22 • LFAB (Utah, 65/45nm): Clean room space equivalent of RFAB1, production in 1Q23 • Sherman (12"): USD30bn for 2025-2035 capacity, size of 4 RFAB2s, production from 2025
ST Micro	USD3.4-3.6bn	<ul style="list-style-type: none"> • USD2.1bn is for capacity • About half is for 12" fab for auto embedded processing solution: 14nm/28nm • Some for SiC in Catania and Singapore. • PMIC, analog mixing (power IGBT, MOSFET) in Singapore: 110nm • Agrate R3 (12"): start P1 production in 2H22, one-third belongs to Tower Semi (Intel) • Set up a mega factor for raw material in Europe
Microchip	USD450-550mn in FY2023 (CY2Q22-CY1Q23) Long-term capital intensity: 3%-6%	<ul style="list-style-type: none"> • Purchase an assembly test factory shell in the Philippines in Dec 2021
NXP	6-8% of sales in 2021-2024 2022: Above 10%	<ul style="list-style-type: none"> • Mainly outsourcing. Only does nodes>90nm internally. • Now: 43% in-house front-end manufacturing. Going to be 60% external and 40% internal.
ADI	2022/23: high single digits: Long-term: 4-6%	<ul style="list-style-type: none"> • Investing internal manufacturing operations from 0.18um upwards, will double output over next year or 15 months • Expanded footprints of Oregon and Limerick fabs. • Added significant capital to test operations at facilities in the Philippines, Thailand and Malaysia.
Intel	USD26-28bn in 2022 Long-term net capital intensity: ~25%	<ul style="list-style-type: none"> • EUR12bn in Leixlip, Ireland for Intel 4 • EUR17bn in Magdeburg, Germany for 2 new advanced fabs (Silicon Junction) in 2027 • USD20bn in New Albany, Ohio for 2 new advanced fabs in 2025 • USD5.4bn to acquire Tower Semi for ~166.6k/wpm 8" equiv capacity
Foundry	Latest CAPEX announcement	Recent capacity expansion
TSMC	USD40-44bn in 2022	<ul style="list-style-type: none"> • USD1.6bn in Kunamoto, Japan for 10k/wpm 16/12nm capacity (with Denso) • ~USD32bn for 2nm fab in Taichung, Taiwan in 2027
UMC	USD3.6bn in 2022	<ul style="list-style-type: none"> • Increase 5k/wpm 28nm capacity in Xiamen in 2022 (Fab 12X P1, United Semi) • Increase 5k/wpm 28nm capacity in Tainan, Taiwan in 2Q24 (Fab 12A P6) • USD5bn in Singapore in 2024 (Fab 12i P3) for 30k/wpm 28nm capacity. +USD0.6bn (shell) • USJC and Denso will build an IGBT line (12") in Mie Prefecture, Japan: 10k/wpm in 2025
Vanguard	TWD24bn (~USD0.84bn)	<ul style="list-style-type: none"> • USD~486mn in Singapore for 8" capacity in 1H23 (Fab 5, AUO Fab) • Fab3: Will finish 24k/wpm expansion in 2022. Plan: 8k in 4Q21/8k in 2Q22/8K in 3Q22.
SMIC	USD5bn in 2022	<ul style="list-style-type: none"> • Shanghai Lingang fab had ground-breaking in 1Q22 • Beijing and Shenzhen fab will start production by end of year.
Hua Hong	~USD1.5bn in 2022	<ul style="list-style-type: none"> • Wuxi Fab started Phase 2, to increase from 65k/wpm to 94.5k/wpm in 2022 • 1.4bn for 12", including 1.2bn for 12" from 65k to 94.5k/wpm; ~0.1bn for 8" fab
GlobalFoundries	USD4bn in 2022 Less in 2023 directionally 2024: ~20% of sales	<ul style="list-style-type: none"> • Increase high single-digit y-y capacity in 2022 for 22FDX/28/40nm • SG Phase 1 Module will have equipment in 2H22 and production in 1H23 (37.5k/wpm) • Fab 8 in Malta, New York will get fully tooled in mid-2023. USD550mn for FinFET capacity. • Wafer output to increase 10% y-y in 2022.
PSMC	USD1.5bn	<ul style="list-style-type: none"> • Tongluo 12" Fab to reach 10-15k/wpm in 2H23; 25-35k/wpm in 2024 • Zhunan 8B Fab to reach 126k/wpm in 2022 (from 115k/wpm in 4Q21)

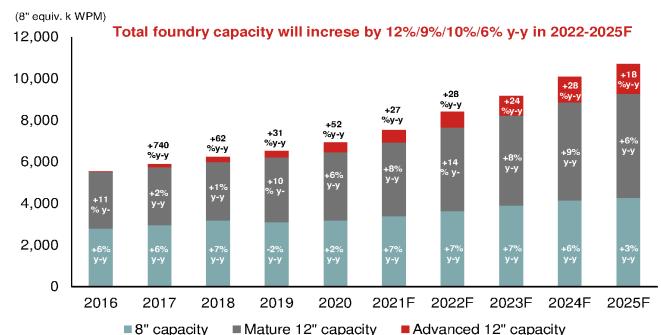
Source: Company data, Nomura research

Fig. 60: Global foundry capacity expansions - 1Q22



Source: Company data, Gartner, Nomura research

Fig. 61: Global foundry capacity expansions - 4Q21



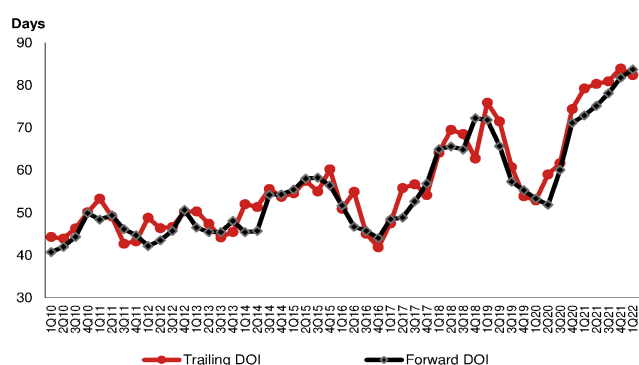
Source: Company data, Gartner, Nomura research

Fig. 62: Foundry companies' mature nodes expansion plans

	1Q22	2Q22F	3Q22F	4Q22F	1Q23F	2Q23F	3Q23F	4Q23F	1Q24F	2Q24F	3Q24F	4Q24F
TSMC			Nanjing Fab (12", 28nm): reach 40k/wpm by 2H23						Kaohsiung Fab (12", 22/28nm): start production Japan Fab (12", 22/28nm): 45k/wpm (12/16nm: 10k/wpm)			
UMC		Fab 12A Tainan P5 (12", 28nm): increase 10k/wpm				Fab 12A Tainan P6 (12", 28nm): 27.5k/wpm		Fab 12A Tainan P6 (12", 28nm): increase 5k/wpm to 32.5k/wpm				
			Fab 12X P1 Xiamen (United Semi): increase 5k/wpm					Fab 12i Singapore P3 (12", 22/28nm): 30k/wpm				
Vanguard	Taoyuan Fab 3 (8"): Reach 8k/wpm in 1Q22, 16k/wpm in 2Q22, 24k/wpm in 3Q22				Fab 5 Singapore: 20k/wpm							
SMIC				Shenzhen (12"): 40k/wpm Beijing Jingcheng (12", 28nm and above): 100k/wpm			Shanghai Lingang (12"): 100k/wpm					
Hua Hong	Wuxi Fab P2 (12"): Increase from 65k/wpm to 95k/wpm											
PSMC (logic+memory)	Fab P1/2+P3 (12"): Increase 105k/wpm to 111k/wpm		Fab P1/2+P3 (12"): Increase from 111k/wpm to 114k/wpm				Fab P5 Tongluo Fab (12"): reach 10k/wpm	Fab P5 Tongluo Fab (12"): reach 35k/wpm				
			Fab 8B (8") : Increase from 113k/wpm to 126k/wpm									
Nexchip	N2 Fab (12"): 40k/wpm				N3 Fab (12"): 40k/wpm							
Global Foundries					Singapore Fab (12", Module 7H): 37.5k/wpm							
							Malta Fab 8 (12"): 12.5k/wpm Dresden Fab 1(12"): keep increasing					
SiiTerra					8" Fab: Increase annual capacity by 20%							

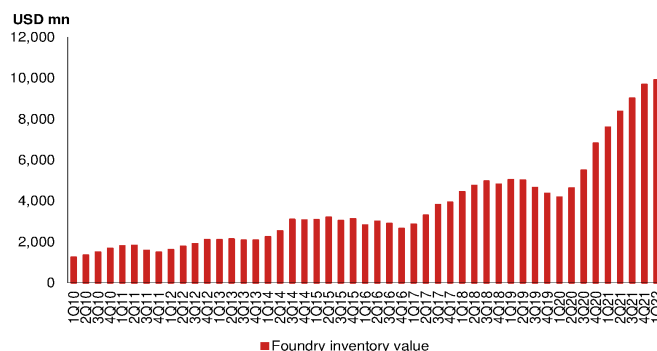
Note: Pink block: new fab. Grey block: existing fab.
Source: Company data, Nomura research

Fig. 63: Foundry DOI



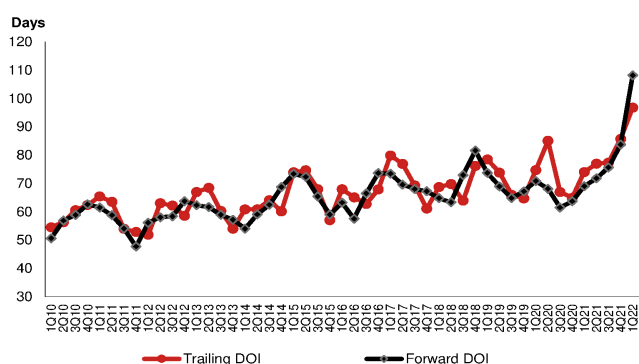
Source: Company data, Bloomberg Finance L.P., Nomura research

Fig. 64: Foundry inventory value



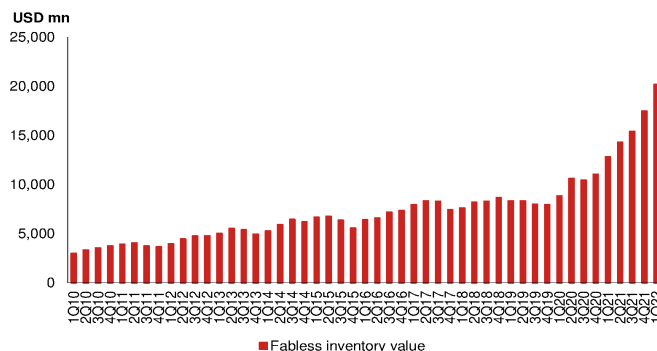
Source: Company data, Bloomberg Finance L.P., Nomura research

Fig. 65: Fabless DOI



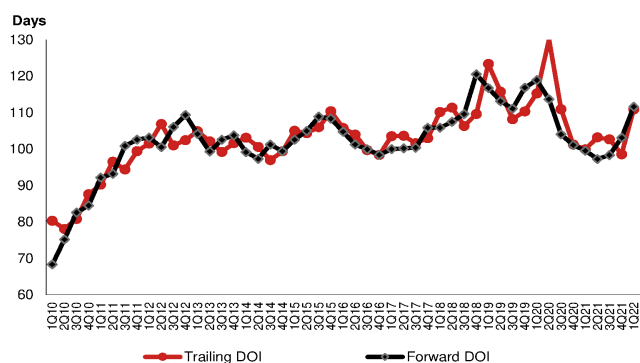
Source: Company data, Bloomberg Finance L.P., Nomura research

Fig. 66: Fabless inventory value



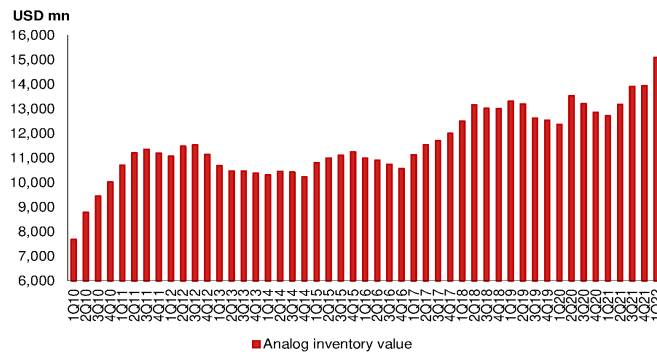
Source: Company data, Bloomberg Finance L.P., Nomura research

Fig. 67: Analog IDMs DOI



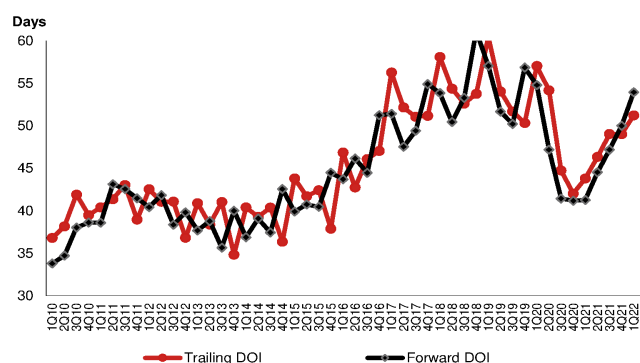
Source: Company data, Bloomberg Finance L.P., Nomura research

Fig. 68: Analog IDMs inventory value



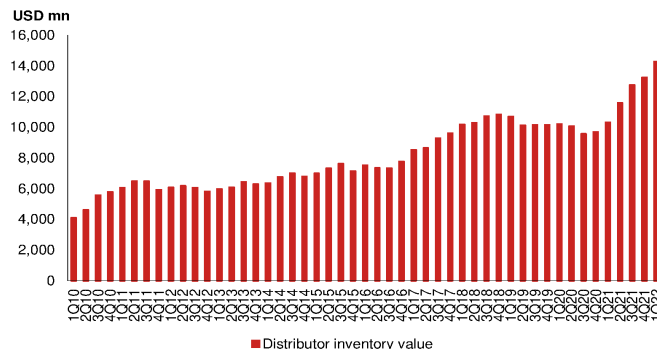
Source: Company data, Bloomberg Finance L.P., Nomura research

Fig. 69: Distributors – DOI



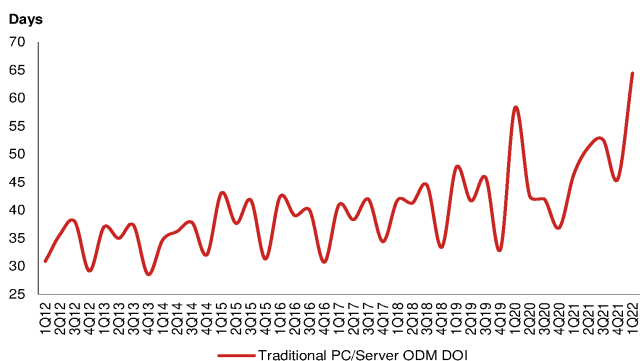
Source: Company data, Bloomberg Finance L.P., Nomura research

Fig. 70: Distributors' inventory value



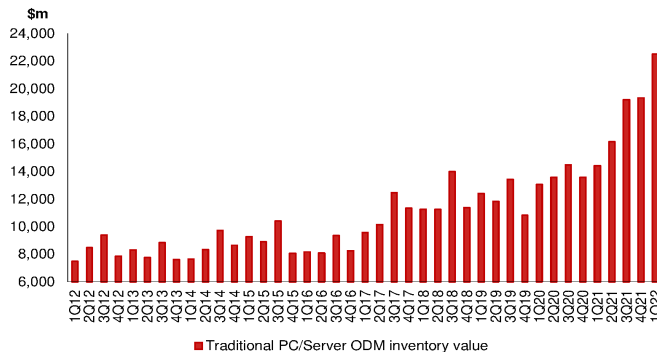
Source: Company data, Bloomberg Finance L.P., Nomura research

Fig. 71: Traditional PC/server ODM DOI



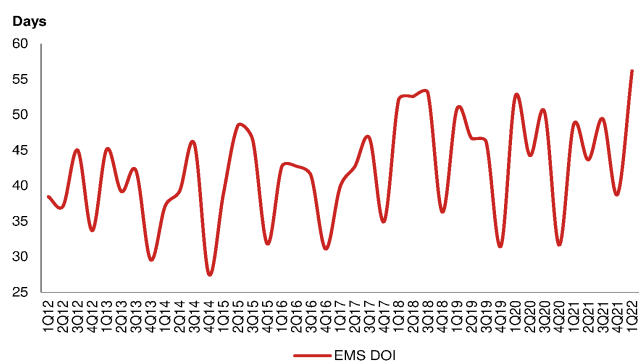
Source: Company data, Bloomberg Finance L.P., Nomura research

Fig. 72: Traditional PC/server ODM inventory value



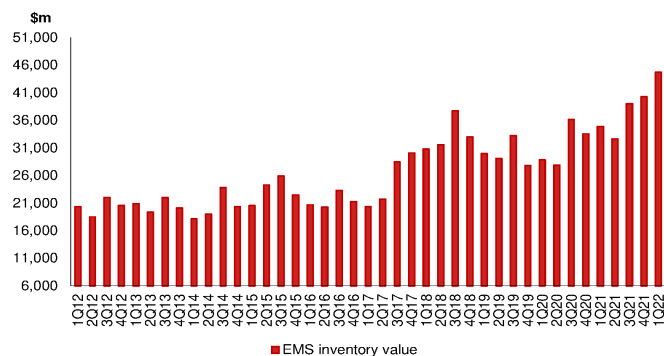
Source: Company data, Bloomberg Finance L.P., Nomura research

Fig. 73: EMS DOI



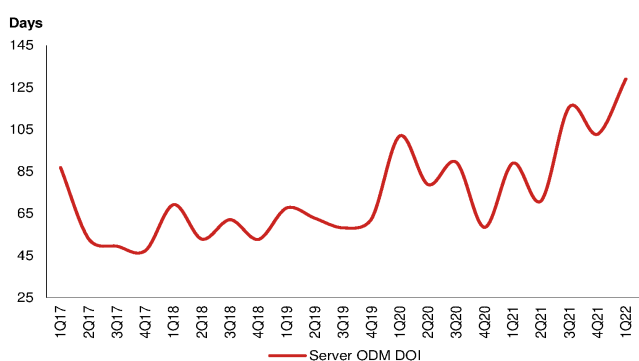
Source: Company data, Bloomberg Finance L.P., Nomura research

Fig. 74: EMS inventory value



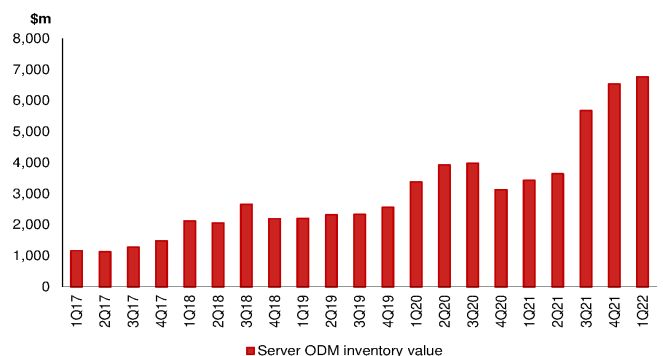
Source: Company data, Bloomberg Finance L.P., Nomura research

Fig. 75: Server ODM DOI



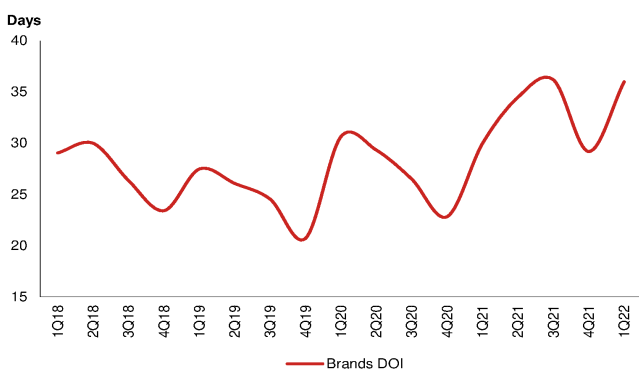
Source: Company data, Bloomberg Finance L.P., Nomura research

Fig. 76: Server ODM inventory value



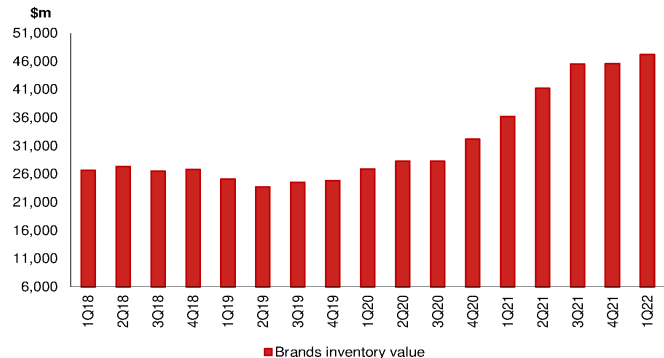
Source: Company data, Bloomberg Finance L.P., Nomura research

Fig. 77: Brands DOI



Source: Company data, Bloomberg Finance L.P., Nomura research

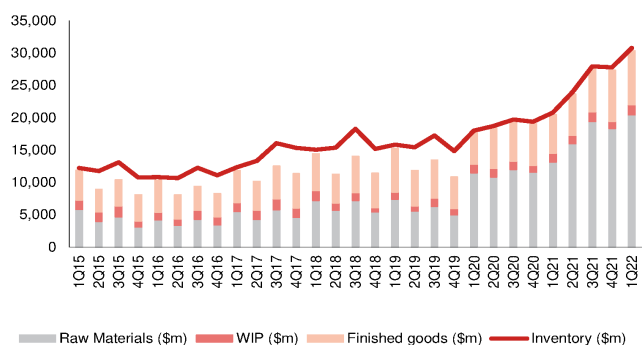
Fig. 78: Brands inventory value



Source: Company data, Bloomberg Finance L.P., Nomura research

Fig. 79: Inventory trend of PC/server ODMs

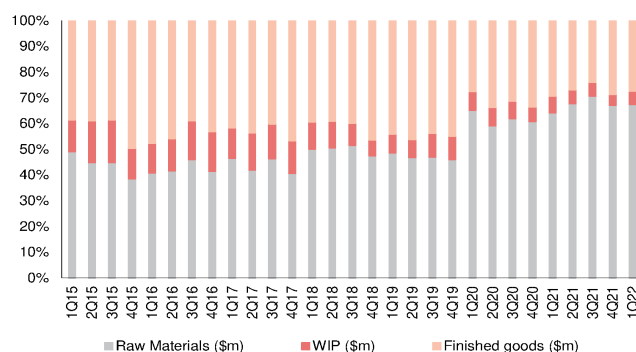
Inventories were climbing due to increasing materials



Source: Bloomberg Finance L.P., Nomura research

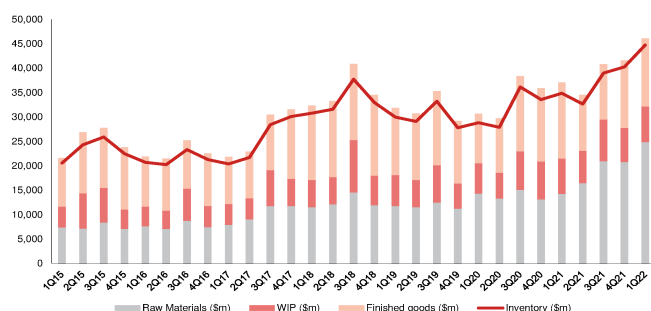
Fig. 80: Inventory breakdown of PC/server ODMs

Majority of inventories are materials rather than finished goods



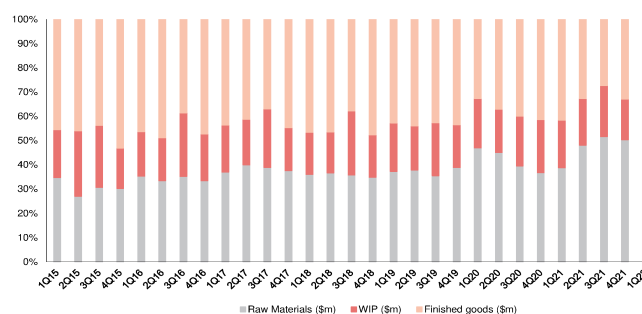
Source: Bloomberg Finance L.P., Nomura research

Fig. 81: Inventory trend of EMS



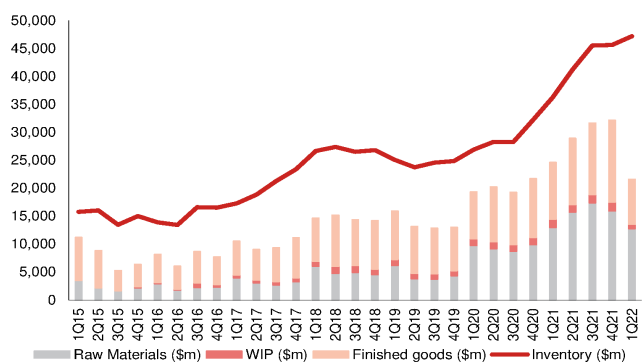
Source: Bloomberg Finance L.P., Nomura research

Fig. 82: Inventory breakdown of EMS



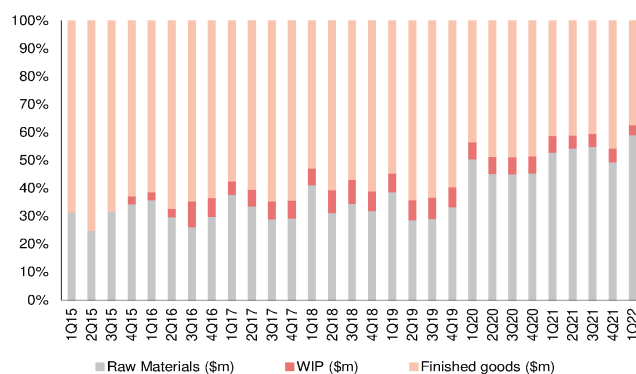
Source: Bloomberg Finance L.P., Nomura research

Fig. 83: Inventory trend of brands



Source: Bloomberg Finance L.P., Nomura research

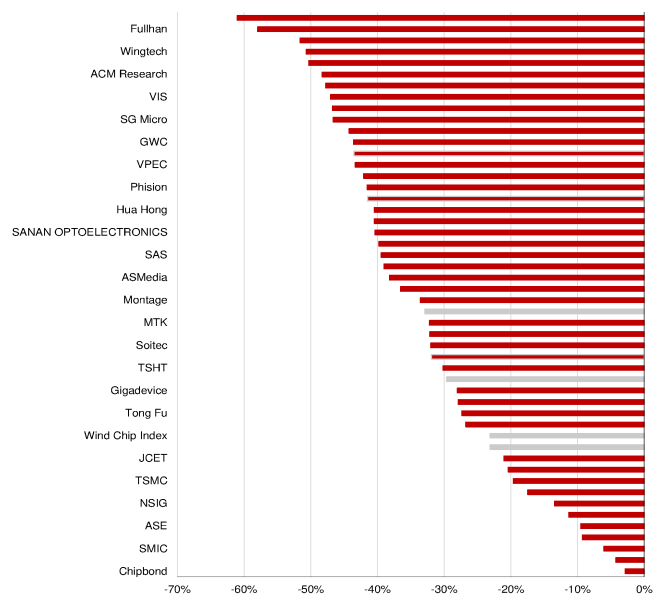
Fig. 84: Inventory breakdown of brands



Source: Bloomberg Finance L.P., Nomura research

Fig. 85: Semi companies' share price performance 2022, YTD

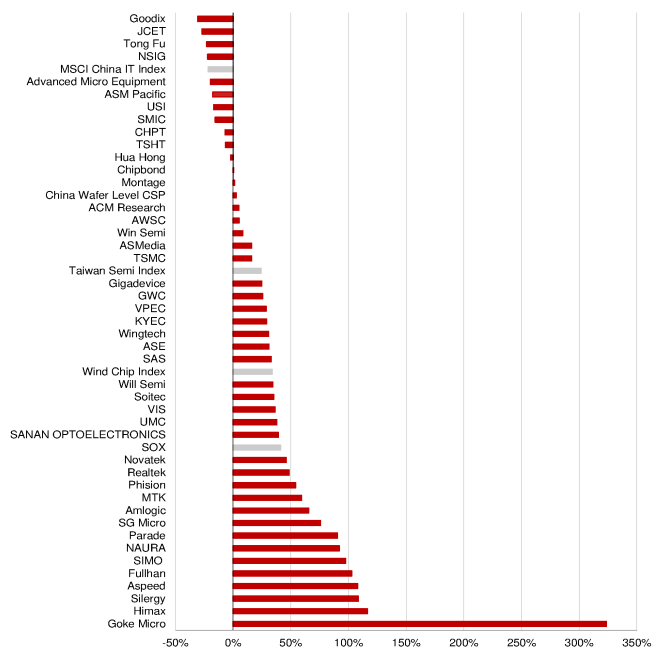
No single stock in Greater China delivered positive return YTD



Source: Bloomberg Finance LP., Wind, Nomura research

Fig. 86: Semi companies' share price performance in 2021

2021 was overall a good year for Greater China Semi



Source: Bloomberg Finance LP., Wind, Nomura research

Greater China Semi

EQUITY: TECHNOLOGY

Depleting inventory through supply cuts

A realistic way to deplete inventory is to cut upstream Semi supply rather than expecting a demand recovery

Action: Avoid upstream Semi sectors including foundries, IDMs and their suppliers such as Semi wafers and front-end SPEs due to the 'long bullwhip effect'

We have been conservative on certain Semi subsectors such as OSAT since June 2021 ([link](#)) and expected end-demand uncertainties to rise after the "demand pull-in effect" driven by the first wave COVID-19 outbreak in 2020. After another year of concern, **we now turn more cautious on upstream Semi manufacturing sectors, such as foundries, Integrated Device Manufacturers (IDMs), and their suppliers including Semi wafers, and likely SPEs (semiconductor production equipment) due to the 'long bullwhip effect' in the supply chain**, which is slowing the reaction of upstream Semi sectors to end-demand weakness, and thus could lead to the lower production utilization rates and result in capex adjustments. **Although our ratings on NAURA (002371 CH, Neutral), AMEC (688012 CH, Buy), ACM Research (ACMR US, Buy) remain unchanged, we suggest investors avoid upstream Semi sectors until the supply cuts materialize. On the other hand, we downgraded SUMCO (3436 JP) to Neutral on 16 June ([link](#)).** We maintain GlobalWafers (6488 TT) at a Neutral rating, to reflect the less favorable Semi wafer supply/demand outlook, with potential rising competition from NSIG (688126 CH, Neutral) by 2025F. We expect NSIG's 12" prime wafer market share to reach 4% by 2025F, up from less than 1% in 2021 ([Fig. 104-108](#)).

Demand weakness of tech products could continue for a few more months; await consumer spending to return to normal

We reviewed consumer spending data from the US and China. In the US, consumer spending has been leaning toward "non-durable goods", such as services, since 2Q20. In contrast, the demand for consumer electronics, IT equipment, automotive, and household equipment all slowed significantly in 1Q22. However, **if we look at the current average consumer spending trend in the US (i.e., ~10% y-y growth), it is still much higher than the pre-COVID level of ~5% y-y; thus, we believe it is reasonable to expect consumer spending trend to normalize in the future.** In China, due to the "Zero COVID-19 policy", the country's consumer spending normalized in late 2021. Although the lockdowns in Shanghai in 2Q22 have dampened consumer spending and may sequentially recover, **we expect the trend, after reopening, to lean toward services, similar to that in the US. Thus, we recommend monitoring whether China's stimulus policies would meaningfully lift demand for tech products ([Fig. 87-90](#)).**

Inventory is now moving to upstream Semi manufacturing sectors; cutting down supply is a realistic way to deplete inventory

Semi inventory destocking started in Mar-2022, although different end-applications have different correction time frames. We note the inventory correction first started in consumer electronics (including smartphones), followed by surveillance, PCs, then likely server/networking and lastly automotive ([Fig. 91-94](#)). **Wafer bank inventory is increasing, while end-demand is turning weak; thus, we view it is more realistic to actively adjust inventory from the supply side, such as foundries and IDMs, rather than waiting for a demand recovery ([Fig. 95-100](#)).** We believe upstream manufacturing is likely to see more order cuts, starting from 8" foundries, to 12" foundries, and lastly, IDM companies, considering their sales exposure to different end-applications. The Semi industry is now in capacity-reallocation mode; thus, the shortage will likely ease faster than expected, which we expect to be the end of this year or early 2023F. According to our recent industry survey, some tier-2 foundries are considering reviewing the capex of the equipment under customers' LTA (long-term agreements), or delaying capex.

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Technology Strategy

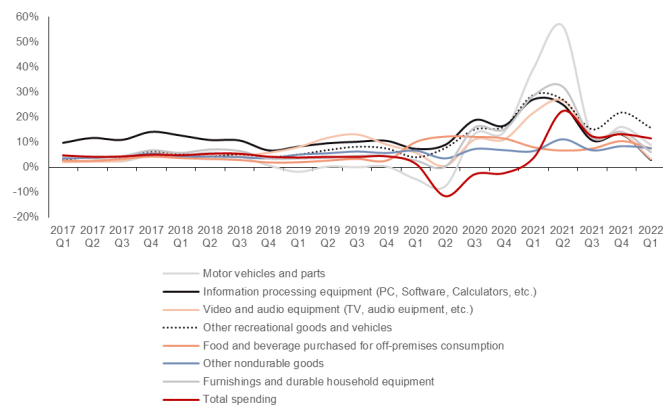
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US and China consumer spending – US consumer spending likely to decline more

In the US, consumer spending has been leaning toward “non-durable goods”, such as services, since 2Q20, and the non-durable goods spending trend is higher than the average consumer spending trend in the US (Fig. 87). In contrast, demand for consumer electronics, IT equipment, automotive, and household equipment all slowed down significantly in 1Q22, and is lower than the average consumer spending trend in the US (Fig. 88). However, if we look at the current average consumer spending trend in the US of around 10% y-y growth, it is still much higher than pre-COVID levels of ~5% y-y. Thus, we believe it is reasonable to expect the consumer spending trend to normalize in the future, rather than to stay at high levels, considering the global macroeconomic uncertainties.

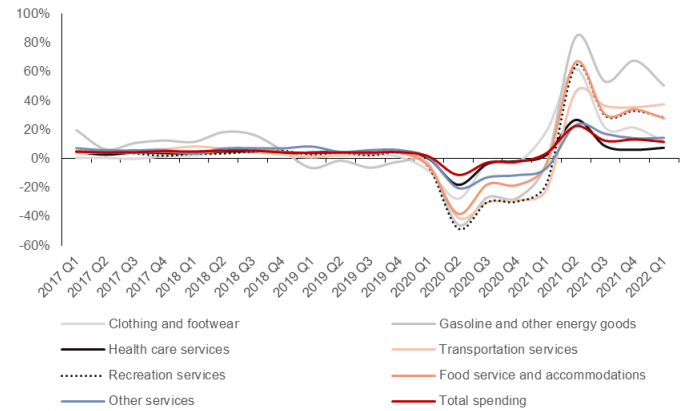
Due to the government’s “Zero COVID-19 policy”, consumer spending in China already normalized in late 2021 (Fig. 90). Although the lockdowns in Shanghai in 2Q22 are likely to further dampen consumer spending, we think the trend after Shanghai’s reopening will likely lean toward services, similar to that in the US. Thus, we recommend monitoring whether China’s stimulus policies would meaningfully lift the demand for tech products.

Fig. 87: US consumer spending, y-y change – 1



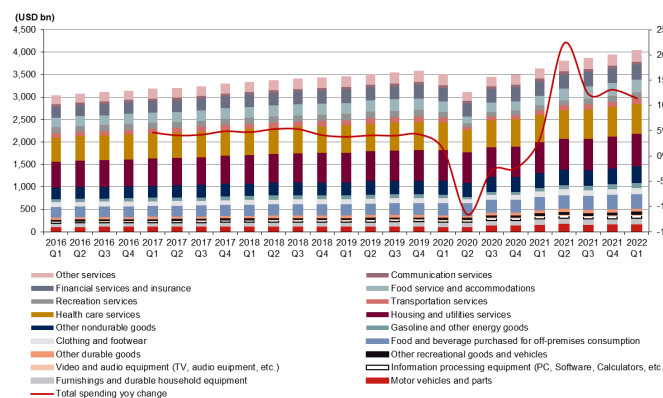
Source: U.S. Bureau of Economic Analysis (BEA)

Fig. 88: US consumer spending, y-y change – 2



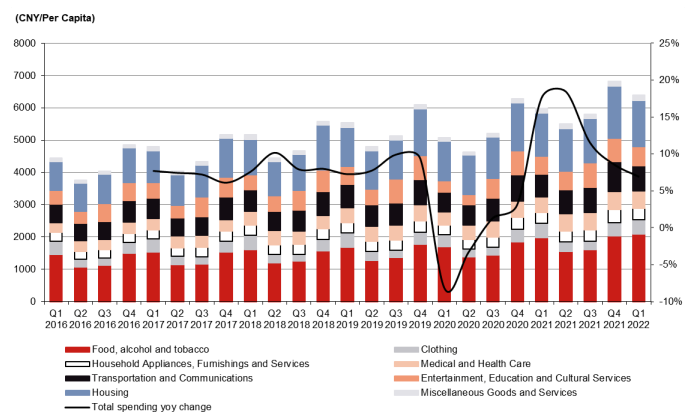
Source: U.S. Bureau of Economic Analysis (BEA)

Fig. 89: US consumer spending structure



Source: U.S. Bureau of Economic Analysis (BEA)

Fig. 90: China consumer spending structure



Source: National Bureau of Statistics of China

Different end applications face different inventory correction time frames

Automotive and industrial applications started to rebuild inventory much later than consumer electronics, by around 1-4 quarters from 4Q20. Thus, we expect them to also face inventory corrections later.

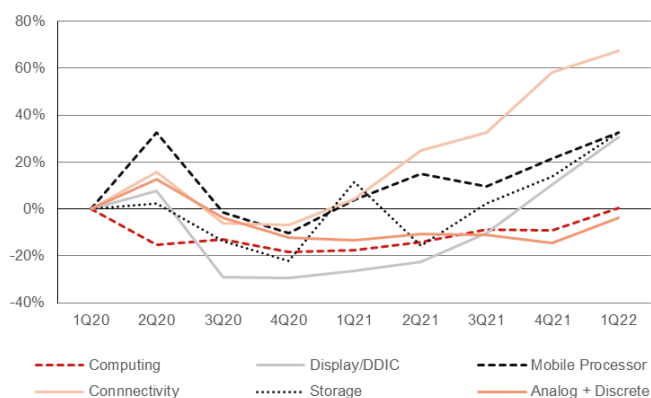
- DDIC (display driver IC): used in consumer electronics including smartphones, IT systems such as PCs, and automotive.
- Storage: mainly NAND controllers, used in smartphones, PCs and servers.
- Connectivity: mainly Avagao (Broadcom) and Realtek, used in networking, PCs and servers.
- Mobile processor: mainly Mediatek and QCOM, used in smartphones.
- Computing: mainly Intel, AMD and nVidia, used in PCs, servers, and gaming.
- Analog + Discrete: widely used in every end-applications, but normally viewed as an indicator of automotive and industrial.

Fig. 91: Change in inventory days since 1Q20 by IC type

	1Q20	2Q20	3Q20	4Q20	1Q21	2Q21	3Q21	4Q21	1Q22
Display/DDIC	0%	8%	-29%	-29%	-26%	-22%	-10%	10%	30%
Storage	0%	2%	-14%	-22%	12%	-16%	2%	14%	33%
Connectivity	0%	16%	-6%	-7%	4%	25%	32%	58%	67%
Mobile Processor	0%	33%	-1%	-10%	4%	15%	10%	22%	33%
Computing	0%	-15%	-13%	-18%	-18%	-14%	-9%	-9%	1%
Analog + Discrete	0%	13%	-4%	-12%	-13%	-10%	-11%	-14%	-4%

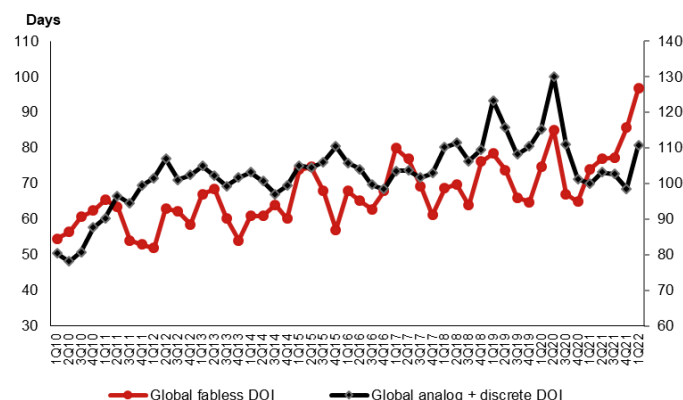
Source: Company data, Nomura research

Fig. 92: Trend of inventory days change since 1Q20 by IC type



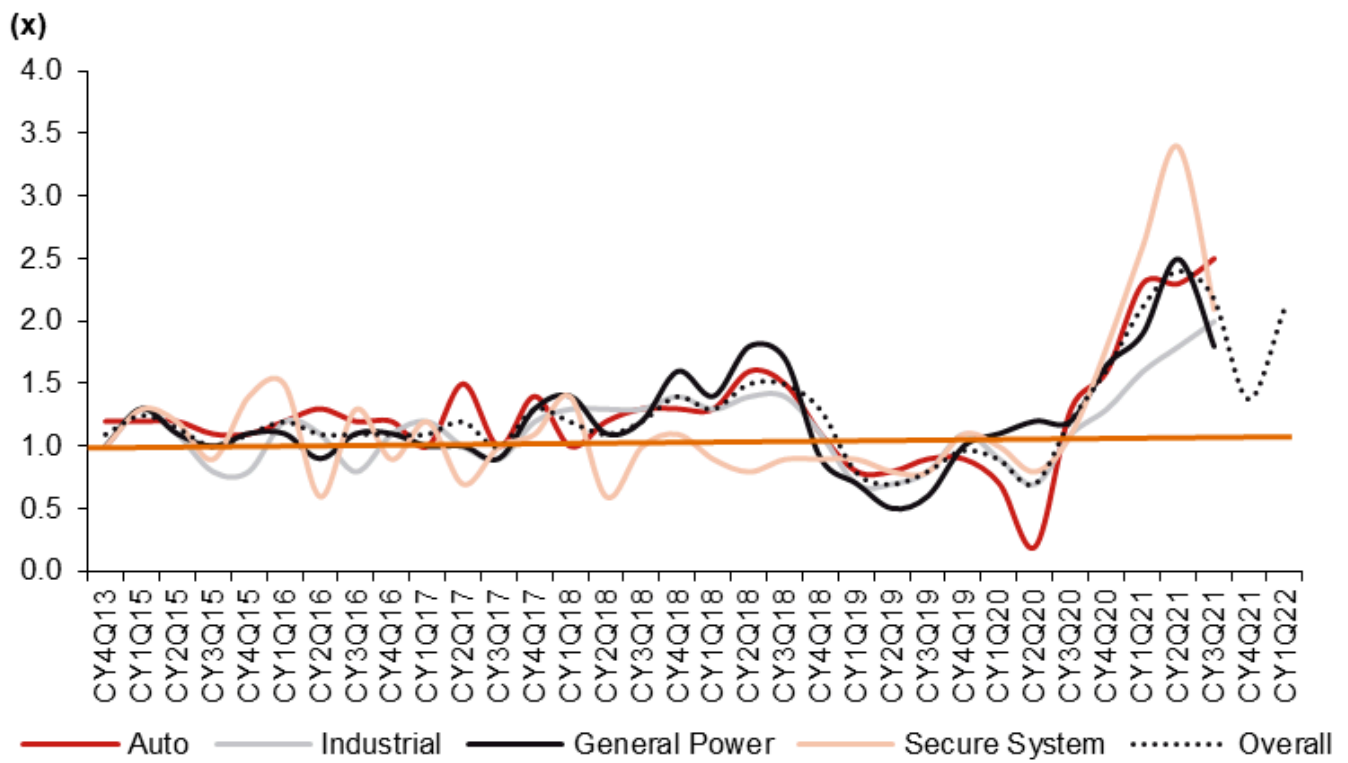
Source: Company data, Nomura research

Fig. 93: Inventory days of global fabless companies and analog + discrete companies



Source: Company data, Nomura research

Fig. 94: Infineon: book to bill (B/B) ratio



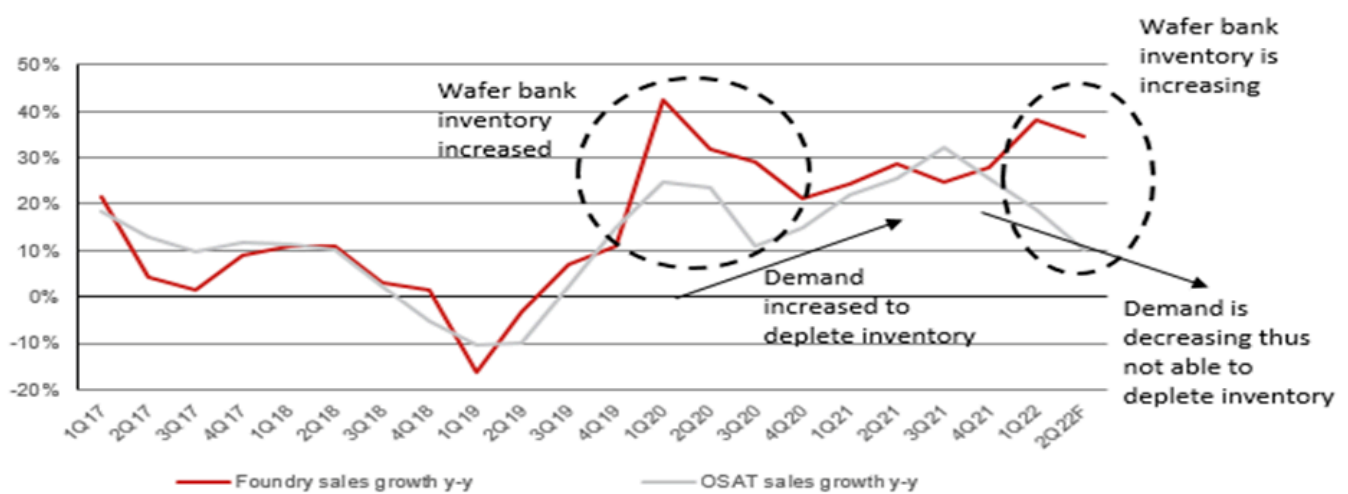
Source: Company data. Note: Infineon stopped providing B/B ratio since 4QCY21, but only backlog

Cutting upstream Semi supply a more realistic way to deplete inventory

A more realistic way to deplete inventory, at present, is to cut capacity at foundries and IDMs, in our view, in contrast to 2020.

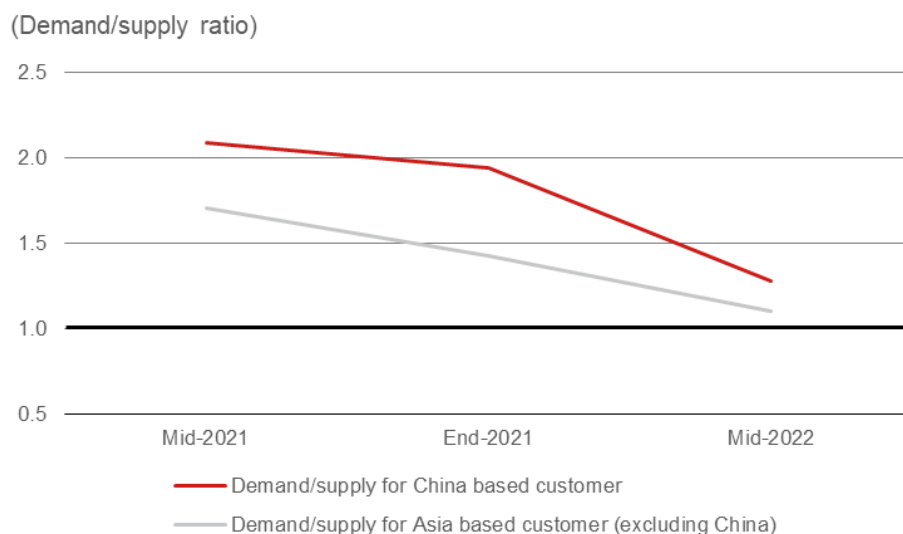
- As the risk of overall demand weakness is rising, it would not be efficient to deplete inventory by merely expecting end-demand to recover like it did in 2020-21.
- IC design companies have started, and may continue to cut down their wait-in-line orders at foundries in coming months, in order to manage inventory risk.
- OSAT companies' sales growth momentum, stock price and valuations slowed down much earlier in 2H21. However, the OSAT sector's business outlook may not recover until the foundry sector cuts supply to contain the flood of inventory.
- If end-demand continues to weaken, then in our view 8" foundry capacity tightness would ease, to be followed by 12" foundries, then IDMs, as IDMs have more sales exposure to automotive and industrial applications.

Fig. 95: Global major foundries' and OSATs' sales y-y growth



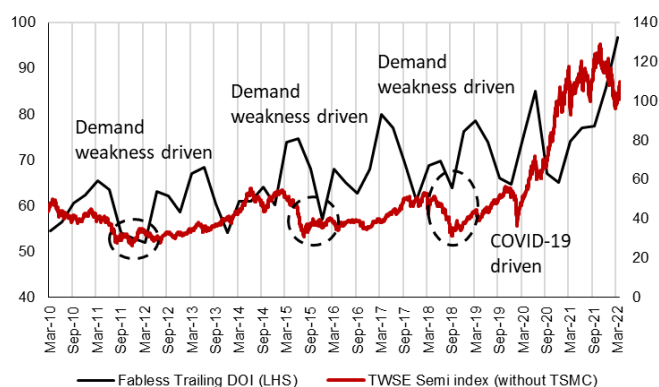
Source: Company data, Nomura research

Fig. 96: Leading foundry's 2022F customer demand-to-supply ratio



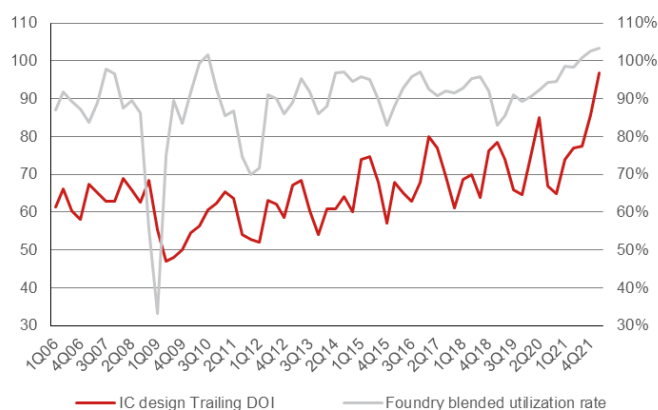
Source: Nomura research

Fig. 97: Global fabless DOI vs Taiwan Semi index



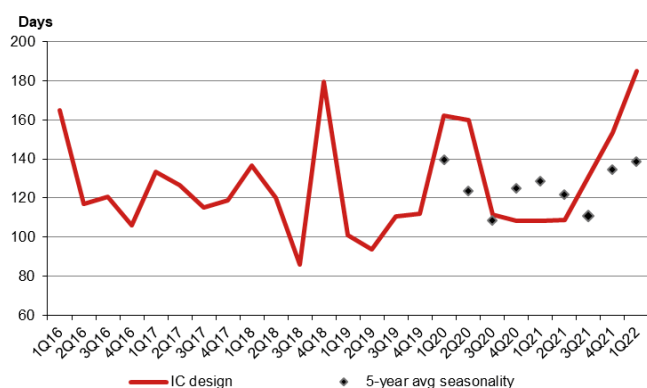
Source: Bloomberg Finance LP, Company data, Nomura research

Fig. 98: Global fabless DOI vs foundry utilization rate



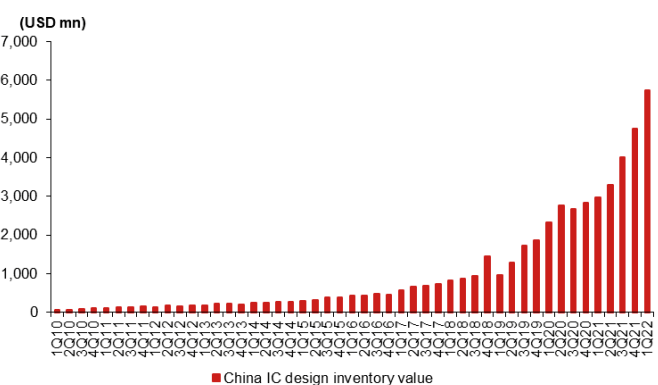
Source: Bloomberg Finance LP, Company data, Nomura research

Fig. 99: China fabless DOI vs average seasonality



Source: Bloomberg Finance LP, Company data, Nomura research

Fig. 100: China fabless: inventory value



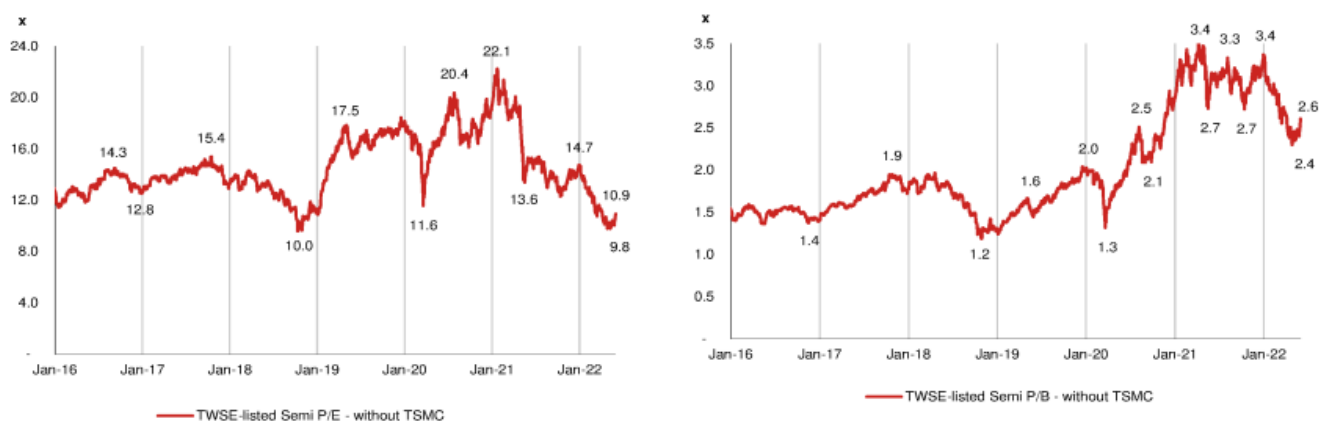
Source: Bloomberg Finance LP, Company data, Nomura research

P/E valuations may be cheap, but not P/B

It remains unclear how long the end-demand weakness will last. Hence, we may see the Semi industry entering into a consensus earnings downward revision period in 2H22. In our view, P/E valuation may be misleading unless we can gauge normalized earnings. We usually use P/B to value the Semi manufacturing sectors including foundry, OSAT, and Semi wafers. Thus, we believe it is also important to use P/B to check downside risk.

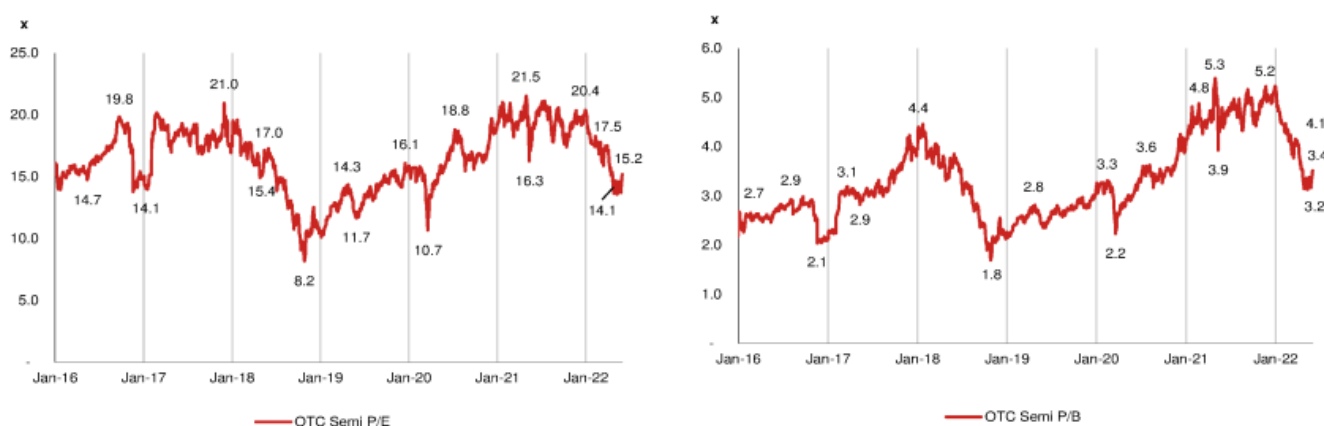
Fig. 101 and *Fig. 102* show many Taiwan Semi names (excluding TSMC) have relatively low P/E, but relatively high P/B.

Fig. 101: Taiwan big cap semis' P/E and P/B (excluding TSMC)



Source: Bloomberg Finance LP., Nomura research

Fig. 102: Taiwan mid and small-cap semi P/E and P/B



Source: Bloomberg Finance LP., Nomura research

The same situation also happens to China Semi companies. In China A-share, IC design, equipment and power discrete companies drove the high P/B and P/S in this cycle in 2020-2021 compared with the last upcycle in 2017-2018. Valuations for the conventional Semi sector, such as OSAT and foundry, have been relatively low (*Fig. 103*).

Fig. 103: China Semi sector's P/E, P/B and P/S

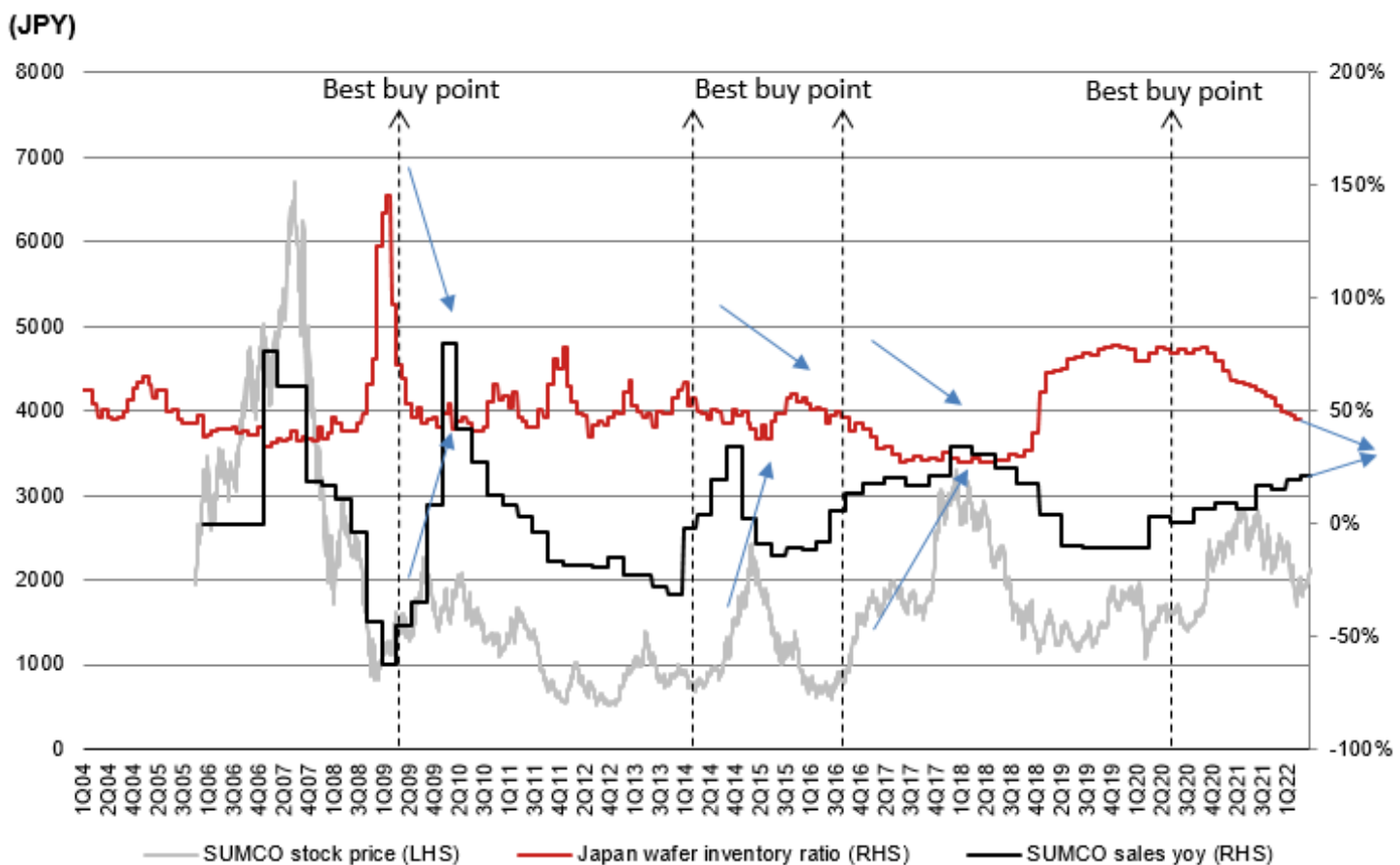
Source: Bloomberg Finance LP, Nomura research

Semi wafer will likely suffer if foundry and IDM cut supply alongside rising competition

We turned conservative on the Semi wafer sector in early 2021, given the failure of GlobalWafers (6488 TT, Neutral) to acquire Siltronic (WAF GR, NR), driven by geopolitical issues. However, we now turn more cautious on the Semi wafer sector for the following reasons:

- Semi wafer demand would suffer if foundry and IDM start to cut supply. Low Semi wafer inventory is a negative for Semi wafer companies, as it implies “overheated” Semi wafer demand (**Fig. 104**). It is likely the Semi wafer cycle will peak by end-2022F, in our view.
- Market consolidation is not likely to happen unless geopolitical issues are resolved.
- Greenfield capacity expansion is necessary, in our view, for the first time since the pre-Global Financial Crisis era in 2004-2008. Semi wafer companies will have to expand; otherwise they risk losing market share in the next cycle (**Fig. 105**).
- The Semi wafer companies in China, such as NSIG (688126 CH, Neutral), will impact Semi wafer supply more significantly in the next cycle after years of technology development (**Fig. 106 - 108**). We expect NSIG’s 12” prime wafer market share to reach 4% by 2025F, up from less than 1% in 2021.

Fig. 104: SUMCO's stock price vs customers' Semi wafer inventory level and sales y-y momentum

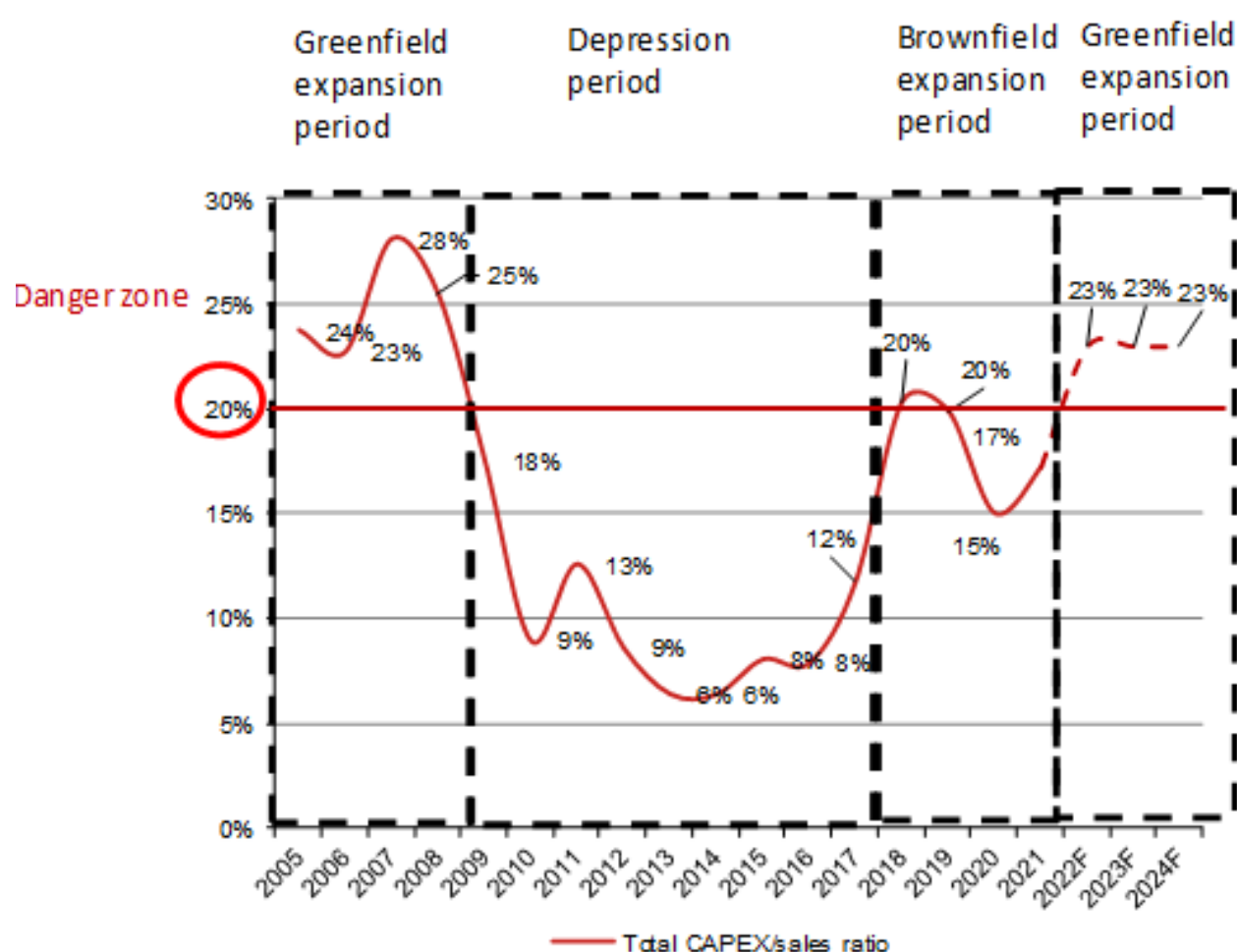


Note: We use SUMCO as an illustration as it has the longest stock listing history among our covered companies, and all other Semi wafer shares have a correlation with SUMCO share prices. Source: METI, company data, Nomura research

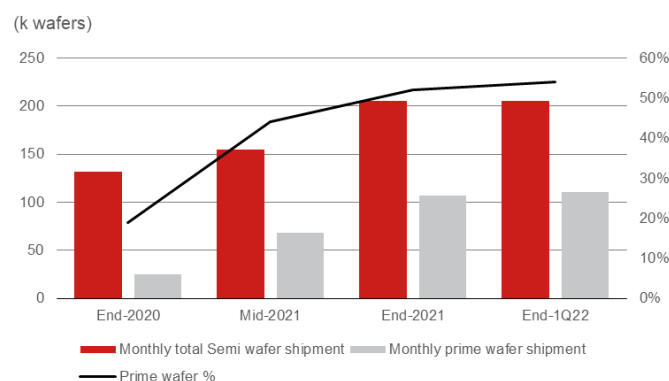
Fig. 105: Simple assumption for global Semi wafer capex-to-sales ratio, and historical total capex-to-sales ratio of Top-5 Semi wafer companies

Top 5 Semi wafer companies are Shin-etsu, SUMCO, GlobalWafers, Siltronic and SK Siltron

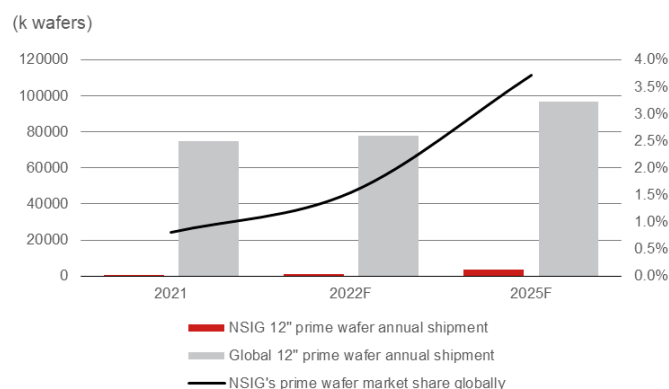
Global Semi wafer market annually (USD bn)	16
Each of top 5 Semi wafer companies' CAPEX for greenfield expansion (USD bn)	2
The total CAPEX of top 5 Semi wafer companies' greenfield expansion (USD bn)	10
NSIG's CAPEX for greenfield expansion (USD bn)	1
The minimum annual CAPEX of the top 5 Semi wafer companies and NSIG in 2022-24F (USD bn)	3.67
The CAPEX to sales ratio (not considering smaller players' CAPEX yet)	23%



Source: Company data, Nomura research and estimates

Fig. 106: NSIG: monthly 12" Semi wafer shipment and prime wafer shipment

Source: Company data, Nomura research

Fig. 107: NSIG's prime wafer market share globally

Source: Company data, Nomura research

Fig. 108: Global 12" Semi wafer supply demand outlook

							(million sheet/month)							
CY	16	17	18	19	20	21	22E	23E	24E	25E	26E	27E	28E	29E
<New forecast>														
300mm total global demand	5.2	5.5	6.1	5.9	6.5	7.3	8.1	8.1	8.5	9.0	9.6	10.2	10.8	11.4
300mm total global capacity	5.2	5.5	6.4	6.8	7.2	7.8	8.1	8.4	9.1	10.1	10.8	11.5	11.5	11.5
Operation rate	100%	101%	95%	87%	89%	93%	100%	96%	94%	90%	89%	88%	94%	99%
300mm total demand (% y-y)	5%	7%	10%	-3%	9%	12%	11%	0%	6%	6%	6%	6%	6%	6%
300mm total capacity (% y-y)	0%	6%	16%	6%	6%	8%	3%	4%	9%	11%	7%	7%	0%	0%

↑

< Old forecast >										
300mm Total Global Demand	7.3	7.7	8.0	8.4	8.8	9.3	9.8	10.2	10.8	
300mm Total Global Capacity	7.8	8.0	8.2	8.9	9.8	10.2	10.8	11.3	11.9	
Operation rate < Old forecast >	93%	97%	97%	95%	91%	91%	91%	91%	91%	
300mm Total Demand (% y-y)	12%	6%	5%	5%	5%	5%	5%	5%	5%	

300mm wafer capacity							(million sheet/month)				
<New forecast>	16	17	18	19	20	21	22E	23E	24E	25E	
Shin-Etsu	1.54	1.69	2.09	2.19	2.29	2.49	2.59	2.69	2.82	2.97	
SUMCO	1.40	1.43	1.54	1.65	1.70	1.74	1.76	1.76	1.91	2.21	
SK Siltron	0.70	0.78	0.92	1.00	1.20	1.30	1.32	1.36	1.49	1.62	
Siltronic	0.78	0.80	0.90	0.99	0.99	0.99	0.99	0.99	1.14	1.20	
GlobalWafers	0.75	0.79	0.83	0.85	1.00	1.12	1.20	1.28	1.40	1.65	
Others(NSIG, etc.)	0.03	0.02	0.12	0.12	0.12	0.17	0.20	0.27	0.34	0.42	

↑

< Old forecast >							16	17	18	19	20	21	22E	23E	24E	25E
Shin-Etsu													2.59	2.69	2.82	2.97
SUMCO													1.76	1.76	1.91	2.21
SK Siltron													1.32	1.36	1.49	1.62
Siltronic													0.99	0.99	1.14	1.20
GlobalWafers													1.20	1.28	1.40	1.65
Others(NSIG etc)													0.12	0.12	0.12	0.12

Source: Company data, Nomura estimates

China analog IC

EQUITY: TECHNOLOGY

Demand headwinds with easing supply

Analog IC inventory correction risk approaching due to weakening demand with more sufficient foundry capacity

Action: Analog IC inventory correction risk approaching; maintain Buy on SG Micro, but downgrade Awinic to Neutral

Analog IC has been one of our favourite sub-sectors in the China Semi market, where Chinese companies continue to expand their market share particularly in the domestic market (see '*Greater China Analog IC - The key substitutes for Texas Instruments in China*'), including SG Micro (300661 CH, Buy) and Awinic (688798 CH, Neutral). However, considering Awinic's larger sales exposure to Android smartphone (likely around 65% currently), and given the weakening demand for Android smartphones worldwide ('*Asia Handsets - No recovery for the remainder of the year?*'), it is likely to drive a correction of smartphone analog IC inventory in 2H22F. Thus, on 13 June, we cut Awinic's 2022-23F earnings by 13-27%, and downgraded the stock to Neutral, with a lower TP of CNY166, based on 60x 2023F EPS CNY2.76 (previously: 100x 2023F EPS of CNY3.8). On the other hand, although we reaffirmed Buy on SG Micro considering its market share gains capability in overseas markets, we lowered the valuation multiple to reflect the potential Semi downcycle risk. We cut our TP to CNY365, based on 70x 2023F EPS CNY5.22 (previously: 100x 2023F EPS of CNY4.9), by lowering the valuation multiple to address the potential Semi downcycle risk spreading to the analog IC market.

'Long bullwhip effect' in supply chain makes analog and discrete IC companies face inventory correction later than digital IC companies

The Semi inventory destocking finally started in Mar 2022, but different ICs and end-applications are facing different correction time frames due to the 'long bullwhip effect' in the supply chain. We have seen inventory correction in consumer electronics (including smartphones) first, followed by surveillance, and then PCs, and then likely server/networking and lastly automotive/industrial. We note that analog and discrete ICs are lagging behind digital ICs in this cycle, because analog and discrete ICs are widely used in different end-applications with more sales exposure to automotive and industrial applications, where automotive and industrial applications reacted much slowly to the strong end-demand recovery back in 2H20. Thus, we may see more and more analog IC companies face inventory correction risk from 2H22F and beyond, if end-demand continues to be slow across the whole spectrum of end-applications (*Figs. 109-111*).

Analog IC supply to likely ease faster than expected

Smartphone and panel-related analog IC demand has been slowing at foundries, and the slowdown is now spreading to analog ICs for PC and server. Thus, foundries are now able to reallocate more capacity for automotive and industrial applications. As a result, we think that overall analog IC supply, including those for automotive and industrial applications, will likely ease by the end of 2022F or early 2023F at the earliest.

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Different ICs and end-applications face different inventory correction time-frames

Automotive and industrial applications started to rebuild inventory much later than consumer electronics, by around one-to-four quarters since 4Q20. Thus, automotive and industrial applications will face inventory correction later than other applications:

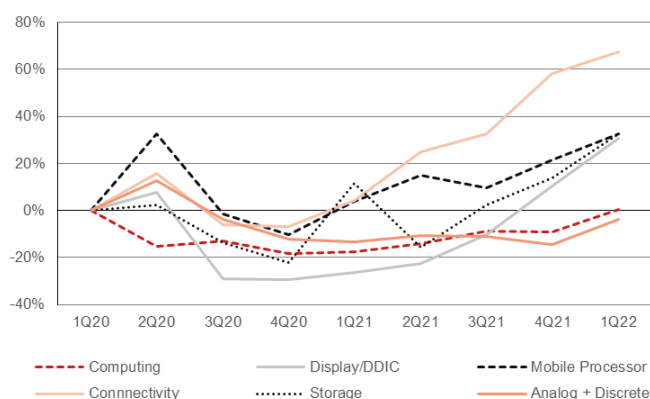
- **DDIC (display driver IC):** used in consumer electronics including smartphones, IT systems including PCs, and automotive.
- **Storage:** mainly NAND controllers, used in smartphones, PCs and servers.
- **Connectivity:** mainly Avagao (Broadcom) and Realtek, used in networking, PCs and servers.
- **Mobile processor:** mainly Mediatek and QCOM, used in smartphones.
- **Computing:** mainly Intel, AMD and nVidia, used in PCs, servers, and gaming.
- **Analog + Discrete:** widely used in every end-application, but normally viewed as an indicator of automotive and industrial.

Fig. 109: Changes to inventory days since 1Q20 by type of ICs

	1Q20	2Q20	3Q20	4Q20	1Q21	2Q21	3Q21	4Q21	1Q22
Display/DDIC	0%	8%	-29%	-29%	-26%	-22%	-10%	10%	30%
Storage	0%	2%	-14%	-22%	12%	-16%	2%	14%	33%
Connectivity	0%	16%	-6%	-7%	4%	25%	32%	58%	67%
Mobile Processor	0%	33%	-1%	-10%	4%	15%	10%	22%	33%
Computing	0%	-15%	-13%	-18%	-18%	-14%	-9%	-9%	1%
Analog + Discrete	0%	13%	-4%	-12%	-13%	-10%	-11%	-14%	-4%

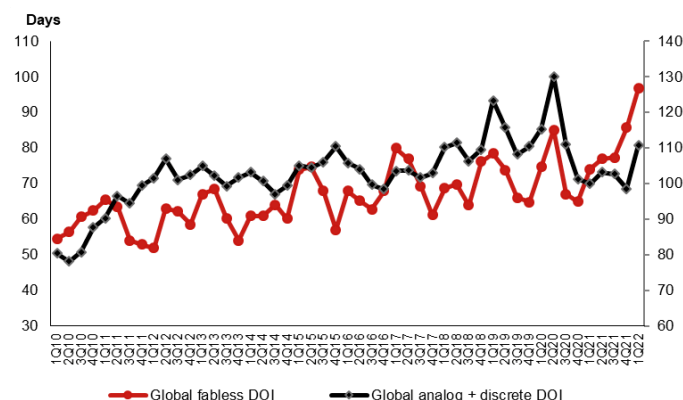
Source: Company data, Nomura research

Fig. 110: Line chart of changes to inventory days since 1Q20 by different types of ICs



Source: Company data, Nomura research

Fig. 111: Inventory days of global fabless companies and analog + discrete companies



Source: Company data, Nomura research

Tech Downstream

Global Markets Research

27 June 2022

EQUITY: TECHNOLOGY

Weak SP and PC; solid demand for server

SP and PC suffer from weak demand and supply issues, while server should be relatively resilient in 2022F

Smartphone: Global shipments to decline by 7.6% in 2022F

We forecast global smartphone (SP) shipment growth rate of -7.6%/ 3.4% for 2022F/ 23F ([link](#)), as we think supply chain disruptions due to the lockdown in China and the eroding consumer purchasing power due to the rising inflation globally are making the chances of SP seasonal recovery slim for 2H22F. The growth in 2023F is mainly on the low bases in countries/ regions such as China and Central/ Eastern Europe.

We think the demand for iPhone will likely be more resilient than that for Chinese Android SPs. Therefore, we project iPhone shipment volume to grow 2% y-y to 237.5mn units in 2022F, while we estimate most Chinese SP brand shipments to decline by double-digit % y-y for the same year. Given the weak demand in the China SP market, Chinese brands are focusing on inventory control and lowering costs as much as possible, and hence we expect most suppliers of Android SPs to suffer deteriorating profitability in 2Q22F and likely in 2H22F.

PC: We forecast global PC unit decline of 10%/ 4.7% for 2022F/ 23F

We forecast global PC unit shipments in 2022F to be 308mn, representing a 10% y-y decline (NB: -11.5%, DT: -5.2%), and to be 294mn in 2023F, representing a 4.7% y-y decline (NB: -5.3%, DT: -2.9%) ([link](#)). We think the demand for **DT PC** has been more stable, likely due to the back-to-office demand from enterprises and the slower growth compared with NB PC during 2020-21. The shipment decline of NB PC in 2022F can be mainly attributed to the weakness in **consumer NB** (-20%/ -7.3% y-y, in terms of units, for 2022F/ 23F), of which **Chromebook** dropped 49% y-y and **non-Chromebook consumer NB** declined 8% y-y. On the other hand, **commercial NB** shipment appears more resilient (-3.3%/ -3.6% y-y in units for 2022F/ 23F, on our estimate), driven by the corporate replacement cycle, increasing mobility requirements for work, and Windows 11.

Server: We forecast global server unit growth of 6.5%/ 6.0% for 2022F/ 23F

We forecast global server unit shipment growth of 6.5% in 2022F and 6% in 2023F, with likely revenue growth of 10% in both the years. Our server unit forecast for 2022F implies: 1) 15-20% growth from key US CSP vendors, 2) flat/ slight growth for enterprise servers (e.g., Dell and HPE are likely flat, and Lenovo up 10%), 3) flat/slight growth for China cloud. We believe the pent-up demand into 2022F will be the major reason to drive server market growth, regardless of new platform delays (see our [Anchor report](#)). The severely constrained supply in 2021 resulted in lower-than-expected server shipments in 2021, despite the strong demand from cloud customers. In 2022 so far, we note server makers continue to suffer IC/component shortage, but we have not seen demand weakness for top US CSPs yet. We now expect the new platforms, i.e., Intel's Eaglestream and AMD's Genoa, to see small ramp-ups in 4Q22-1Q23F, with more volumes in 2023F. On the other hand, we expect the Whitley platform to ramp up rapidly in 2022F, and likely become a longer-life mainstream platform for server in 2022-23.

Investment view: Buy server and Apple plays, cautious on NB and Android plays

We have Buy ratings on Lotes (3533 TT), Aspeed (5274 TT), Wiwynn (6669 TT), Unimicron (3037 TT), and ASMedia (5269 TT) as we expect these to be the beneficiaries of server and upgrade trends. We are cautious on NB-related plays, such as Lenovo (992 HK, Reduce), and Quanta (2382 TT, Neutral). We like select Apple plays, such as Hon Hai (2317 TT), Luxshare (002475 CH), ZDT (4958 TT), and SG Micro (300661 CH) [all Buys], and are cautious on stocks which have high-Android SP exposure, such as Mediatek (2454 TT), Xiaomi (1810 HK), Sunny (2382 HK), Awinic (688798 CH), AAC (2018 HK) [all Neutral].

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Smartphone: No recovery for the remainder of the year?

Global SP market to decline 7.6% in 2022F on macro risks

As we highlighted in *Asia Handsets - No recovery for the remainder of the year?* on 26 May, we project 2022F/23F global SP shipment volume at 1,254mn/ 1,297mn units, representing a 7.6% decline for 2022F, which is below the market expectation of a flat to low single-digit percentage decline (e.g. *Mediatek forecasts a flat SP market for 2022*). We forecast global SP to record 3.4% unit growth in 2023F, on low bases in some countries/regions (such as China and Central/Eastern Europe) in 2022F. The purchasing power in the emerging markets (e.g., Southeast Asia) and Europe will likely deteriorate further due to the rising inflation, in our view.

Likely no recovery in 2H22?

We believe it is a consensus view that China's weak SP demand has been caused by lockdowns and economic weakness, and 2Q22 should be a near-term trough for China's SP shipment volume growth, assuming the lockdown issues would be alleviated by late-2Q22. We assume China SP demand would rebound q-q in 3Q22F (the decline in 3Q22F to narrow to 4% y-y in 3Q22F from a 19% y-y decline in 2Q22F), along with potential stimulus plans from the China government.

However, we note overseas SP shipments for Chinese SP brands have been facing rising headwinds since mid-2Q22, given the sudden slowdown in consumer purchase power due to the 'runaway' inflation. We think overseas demand will likely deteriorate further in 2H22F, diminishing the hope of a seasonal SP recovery in 3Q22F (or the entire 2H22F).

Slower 5G SP growth in 2022-23F from inflationary pressure, weak China demand

We forecast 2022F/23F global 5G SP shipment volume to be 678mn/795mn. Our forecasts are in line with *Mediatek's latest guidance of 670-680mn market demand for 5G SP in 2022*. We observe the 5G penetration in China has been stagnant at a high level, but given the decline of China's domestic SP market and likely slowing SP growth, alongside the reduced purchasing power in emerging markets, we estimate the 5G SP shipment volume of Chinese brands to be 315mn/365mn for 2022F/23F.

Fig. 112: Global smartphone forecasts

(mn units)	2020	2021	2022F	2023F
China	325	328	290	305
y-y	-11.8%	1.1%	-11.7%	5.0%
AP ex China	338	365	330	347
y-y	-1.6%	8.2%	-9.8%	5.4%
North America	146	163	159	159
y-y	-10.4%	11.8%	-2.6%	0.1%
Latin America	127	134	137	140
y-y	-9.3%	6.2%	1.9%	2.0%
Western Europe	112	119	115	116
y-y	-8.6%	6.4%	-3.8%	1.0%
Central & Eastern Europe	84	87	71	75
y-y	2.4%	3.5%	-18.1%	5.0%
Middle East & Africa	151	161	153	156
y-y	-3.2%	6.4%	-4.8%	2.0%
Global	1,282	1,358	1,254	1,297
y-y	-6.7%	5.9%	-7.6%	3.4%

Source: Nomura estimates

Fig. 113: Global 5G smartphone forecasts

(m units)	2019	2020	2021	2022F	2023F
China brands	13	140	265	315	365
Samsung	6	26	70	130	185
Apple	0	70	171.5	216	225
Others	1	3	10	17	20
Total 5G SP (m units)	20	239	517	678	795
5G SP penetration	1%	19%	38%	54%	61%

Source: Nomura estimates

Most Chinese SP brands to decline by double-digit % y-y in 2022F

We project the Oppo group to ship 170mn units (-20% y-y) in 2022F, vs Vivo's 105mn units (-18% y-y), Xiaomi's 170mn units (-11% y-y), and Honor's 52mn units (+28% y-y, as 1H21 was a low base). Chinese brands have been severely affected by the demand weakness in China in 1H22, and we expect inflation-driven demand weakness across the globe from late-2Q22F. The possibility of a seasonal SP demand recovery in 3Q22F (or even in 2H22F) is low, in our view, as emerging market demand is deteriorating.

Inventory control and low cost are the main strategies for Chinese brands amid the tough environment

Under a weak demand environment, the inventory digestion (for both components and channel inventory) of Chinese SP OEMs seems to be slow, leading to severe order cuts since Feb-2022. We believe there was a wave of cutting prices for component suppliers effective from April. In our view, deeper price cuts will likely materialize in 2H22F.

We observe that Chinese brands are mostly focusing on driving costs lower, rather than spec upgrades or innovations for 2H22 new projects, in order to alleviate the impact of weakening purchasing power. This will likely cause most suppliers for Android SPs to suffer deteriorating profitability in 2Q22F, and we do not rule out the possibility of weak earnings lasting into 2H22F, given the lowered prices and volume.

Fig. 114: China smartphone brands forecasts

	2020	2021	2022F
(mn units)	A	A	F
China Smartphone Market	325	328	290
y-y	-12%	1%	-12%
	2020	2021	2022F
Top Chinese OEM global shipment	A	A	F
Huawei	189	38	20
Honor		41	52
Oppo+OnePlus+Realme	161	211	170
Vivo	112	128	105
Xiaomi	148	191	170
Lenovo+Moto	33	51	53

Source: Nomura estimates

Apple iPhone: China's lockdown impacts manageable

We maintain our iPhone shipment volume forecasts made *on 29 April*, i.e., we forecast 237.5mn units (+2.2% y-y) for 2022F. We also forecast the supply chain to produce 49mn units of iPhones (+9% y-y) in 2Q22F, with limited impacts from the China lockdowns.

According to Hon Hai 's chairman, so far inflation has had a greater impact on lower-price devices than premium products. We expect iPhone shipment volume to remain resilient (hence, we maintain our forecasts, see below table), but we would advise monitoring whether the rising inflationary pressure would have a knock-on effect on the premium segment later.

Fig. 115: Apple iPhone shipment forecasts

<i>(mn unit)</i>	1Q21	2Q21	3Q21	4Q21	1Q22	2Q22F	2020	2021	2022F
iPhone 11	9.0	12.5	9.0	8.0	9.0	6.0	63.0	38.5	20.0
iPhone SE2	5.0	5.0	4.6	4.0	1.0	0.5	40.0	18.6	1.5
iPhone 12 5.4"	2.0	1.0	0.5	-	-	-	12.0	3.5	-
iPhone 12 6.1"	12.0	12.5	10.0	11.0	5.0	4.0	26.5	45.5	19.0
iPhone 12 Pro 6.1"	11.0	5.5	2.0	-	-	-	16.5	18.5	-
iPhone 12 Pro Max 6.7"	13.0	7.0	3.0	-	-	-	19.0	23.0	-
iPhone 13 5.4"			2.0	4.5	2.0	0.5		6.5	5.0
iPhone 13 6.1"			6.0	28.0	18.0	17.0		34.0	54.0
iPhone 13 Pro 6.1"			7.0	11.0	9.0	5.0		18.0	17.0
iPhone 13 Pro Max 6.7"			7.5	15.0	13.0	9.0		22.5	26.0
iPhone SE3					2.0	7.0			15.0
iPhone 14 series									80.0
Other iPhones	2.0	1.5	0.4	-	-	-	35.5	3.9	-
Total iPhone EMS production	54.0	45.0	52.0	81.5	59.0	49.0	212.5	232.5	237.5
Total iPhone sell-in	55.0	47.0	47.0	85.0	57.0	50.0	209.0	234.0	

Source: Nomura estimates

Asia PC: NB back to below-2020 level?

Global PC growth rate at -10%/-4.7% for 2022F/23F, with NB - 11.5%/-5.3%

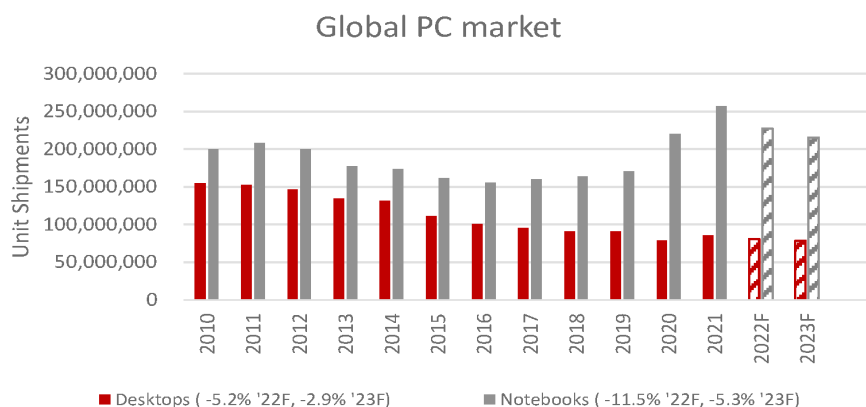
In *Asia PC - NB back to below-2020 level?* published on 1 June, we forecast global PC unit to be 308mn, -10% y-y (NB: -11.5%, DT: -5.2%) for 2022F and 294mn units, -4.7% y-y (NB: -5.3%, DT: -2.9%) for 2023F. Our 2022 PC unit forecast (308mn units) is within the range of HP's latest guidance of 300-330mn units, but lower than Dell's view about 330mn units and AMD's view about a high-single-digit decline. DT PCs should outperform NB PCs, in our view, as branded DT PCs have been resilient (only down by low-single-digits y-y in 2022), while white-box DT PCs are weaker due to cryptocurrency risks and macro weakness.

Most of the downside in our revisions comes from NB PCs, as we highlighted in mid-March that the *Russia- Ukraine conflict has accelerated NB PC order cuts*, which was a first wave of significant order revisions for the NB PC supply chain due to concerns of weakening demand. In April, NB PC supply chain encountered severe impacts from the China lockdowns, with the NB shipments of Taiwanese ODMs dropping by 36.5% y-y / 41.1% m-m, and the recovery in May was not that meaningful (-18.9% y-y / +22.0% m-m). We believe some escalating signs of demand weakness were overlooked (see *our report on Quanta on May 14*), as some NB brands pushed out sizeable orders from April to May/June, citing component shortages and logistics issues for the shipment delay, even though their main ODM manufacturing sites are not located in the Greater Shanghai area.

Consumer NB in 2023F back to below-2020 level; commercial NB still resilient

We estimate **consumer NB** shipments will decline by 20% y-y in 2022F, with Chromebook contributing 70% of the decline, and non-Chromebook consumer NB declining by 8% y-y. We forecast consumer NB to decline by 7.3% in 2023F, mostly driven by non-Chromebook NBs, and reaching a level of c.95mn units in 2023F, which is between 2019 (88mn units) and 2020 (109mn units), given the retreat of WFH demand but still a larger installed base now vs the pre-COVID level. We forecast **commercial NB** shipments will moderately decline by 3.3%/3.6% in 2022F/23F, steadily holding up at the 120-125mn unit level p.a. This is significantly higher than the 82.6mn/110mn units in 2019/20, driven by the corporate replacement cycle, increasing mobility requirements for work, and Windows 11.

Fig. 116: Global PC market forecasts



Source: IDC, Nomura estimates

Brand dynamics: Apple and Dell outperform, while Acer and HP see higher pressure

We notice that Dell and Apple have been outperforming in NB shipments in 2022, thanks to Dell's high exposure (70%+) to the commercial NB segment and Apple's market share gain through Apple Silicon upgrades. Acer and HP have shown more severe drops in NB supply chain volumes YTD, likely because they had higher bases in 2021 on Chromebooks and have more exposure to consumer NBs.

Based on Taiwanese ODM makers' data, the Shanghai lockdown caused NB shipments to

decline dramatically in April, and the recovery in May was not as meaningful as the drop in the previous month (Fig. 120). However, Compal and Wistron still guide for q-q growth in 2Q22 (Fig. 119, implying 116%/32% m-m shipment pickups in June), likely because they have higher exposure to Dell and are optimistic about commercial PC models. Although we understand the 2Q22 guidance from Compal's and Wistron is based on their customers' order visibility and confidence levels, we are concerned that the recovery of the supply chain from the lockdowns may not be as rapid as expected, which may lead to downside risks to their shipment targets in 2Q22. Meanwhile, Quanta guided NB shipments down 20% q-q due to the disruption in lockdowns (implying a 58% m-m pickup in June), and we think this is likely because its plant for Apple in Shanghai was severely impacted by the production suspension, and its other customers, HP and Acer, have lower visibility on consumer NBs. Overall, we forecast total NB shipments to decline by 14% q-q and 20% y-y in 2Q22F based on the NB ODMs' guidance.

Fig. 117: NB shipment breakdown by company

mn units	2017	2018	2019	2020	2021	2022F	2022 y-y
Lenovo	37.2	39.3	43.5	53.8	61.9	55.0	-11%
HP	39.8	40.8	42.2	52.2	57.7	49.0	-15%
Dell	24.7	25.9	26.1	34.4	41.3	40.5	-2%
Apple	15.9	15.3	15.4	20.8	25.3	26.0	3%
ASUS	15.4	14.1	13.9	17.2	20.3	18.5	-9%
Acer	14.2	14.1	13.8	18.0	20.6	15.5	-25%
Others	13.0	14.0	16.0	23.7	29.9	22.9	-24%
Global	160.2	163.6	170.8	220.0	257.0	227.4	-11.5%

Source: IDC, Nomura estimates

Fig. 118: Quarterly company dynamics

mn units	Company shipments					Supply chain volume	
	1Q21	2Q21	3Q21	4Q21	1Q22	2Q22F	3Q22F
Lenovo	15.7	15.2	15.1	16.0	14.1	13-14	14-14.5
HP	15.3	15.0	13.3	14.1	11.6	11-11.5	12-12.5
Dell	9.0	9.4	10.9	12.1	8.9	9.5-10	11.0
Apple	6.3	5.7	6.4	6.9	6.2	4.5	7-8
ASUS	4.4	4.6	5.6	5.7	5.2	4.5	4.5-5
Acer	5.1	5.4	5.0	5.1	4.5	3.8-4	4-4.5

Source: IDC, Nomura estimates

Fig. 119: Taiwan NB ODM quarterly shipments

(units in '000s)	1Q19	2Q19	3Q19	4Q19	1Q20	2Q20	3Q20	4Q20	1Q21	2Q21	3Q21	4Q21	1Q22	2Q22F
Quanta	7,300	8,700	9,300	9,800	7,300	14,500	18,300	19,700	19,000	19,000	17,400	19,900	16,900	13,520
Compal	9,300	12,500	11,500	10,600	7,800	12,500	11,600	15,700	13,100	13,000	15,300	16,100	11,800	12,626
Wistron	3,600	4,200	4,500	5,100	3,550	5,200	5,200	6,400	5,400	6,100	6,600	7,500	5,600	6,000
Inventec	4,100	4,900	4,900	5,000	3,400	5,700	5,700	5,200	4,800	5,000	5,900	5,600	5,000	4,950
Pegatron	1,875	2,400	2,725	3,100	1,525	3,025	3,050	2,600	2,250	2,400	2,650	3,100	2,335	2,102
Others	10,487	8,503	12,656	13,749	10,845	14,270	18,294	18,661	18,776	16,427	16,012	15,727	16,138	N.A.
Total	36,662	41,203	45,581	47,349	34,420	55,195	62,144	68,261	63,326	61,927	63,862	67,927	57,773	49,438

YoY														
Total	-2.0%	6.8%	4.8%	7.3%	-6.1%	34.0%	36.3%	44.2%	84.0%	12.2%	2.8%	-0.5%	-8.8%	-20.2%
Quanta	-18.0%	-5.4%	-6.1%	2.1%	0.0%	66.7%	96.8%	101.0%	160.3%	31.0%	-4.9%	1.0%	-11.1%	-28.8%
Compal	9.4%	20.2%	9.5%	3.9%	-16.1%	0.0%	0.9%	48.1%	67.9%	4.0%	31.9%	2.5%	-9.9%	-2.9%
Wistron	-12.2%	-2.3%	-2.2%	13.3%	-1.4%	23.8%	15.6%	25.5%	52.1%	17.3%	26.9%	17.2%	3.7%	-1.6%
Inventec	2.5%	2.1%	-2.0%	6.4%	-17.1%	16.3%	16.3%	4.0%	41.2%	-12.3%	3.5%	7.7%	4.2%	-1.0%
Pegatron	-5.1%	60.0%	47.3%	27.8%	-18.7%	26.0%	11.9%	-16.1%	47.5%	-20.7%	-13.1%	19.2%	3.8%	-12.4%

QoQ														
Total	-16.9%	12.4%	10.6%	3.9%	-27.3%	60.4%	12.6%	9.8%	-7.2%	-2.2%	3.1%	6.4%	-14.9%	-14.4%
Quanta	-24.0%	19.2%	6.9%	5.4%	-25.5%	98.6%	26.2%	7.7%	-3.6%	0.0%	-8.4%	14.4%	-15.1%	-20.0%
Compal	-8.8%	34.4%	-8.0%	-7.8%	-26.4%	60.3%	-7.2%	35.3%	-16.6%	-0.8%	17.7%	5.2%	-26.7%	7.0%
Wistron	-20.0%	16.7%	7.1%	13.3%	-30.4%	46.5%	0.0%	23.1%	-15.6%	13.0%	8.2%	13.6%	-25.3%	7.1%
Inventec	-12.8%	19.5%	0.0%	2.0%	-32.0%	67.6%	0.0%	-8.8%	-7.7%	4.2%	18.0%	-5.1%	-10.7%	-1.0%
Pegatron	-22.7%	28.0%	13.5%	13.8%	-50.8%	98.4%	0.8%	-14.8%	-13.5%	6.7%	10.4%	17.0%	-24.7%	-10.0%

Source: Company data, Nomura estimates

Fig. 120: Taiwan NB ODM monthly shipments

(units in '000s)	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22
Quanta	6,400	6,000	6,600	6,100	6,200	6,700	5,900	5,500	6,000	6,100	7,000	6,800	6,000	4,800	6,100	3,200	4,000
Compal	4,300	3,300	5,500	4,400	3,800	4,800	4,900	4,700	5,700	5,100	5,300	5,600	3,600	3,600	4,600	2,200	3,300
Wistron	1,700	1,500	2,200	2,000	1,800	2,300	2,000	2,100	2,500	2,300	2,500	2,700	1,700	1,600	2,300	1,600	1,900
Inventec	1,600	1,500	1,700	1,600	1,600	1,800	1,900	2,000	2,000	1,800	2,000	1,800	1,500	1,500	2,000	1,800	1,700
Pegatron	675	575	1,000	750	775	875	750	900	1,000	1,000	1,100	1,000	775	560	1,000	625	600
Others																	
Total	14,675	12,875	17,000	14,850	14,175	16,475	15,450	15,200	17,200	16,300	17,900	17,900	13,575	12,060	16,000	9,425	11,500
YoY																	
Total	101.7%	197.7%	42.0%	9.8%	5.8%	17.7%	8.8%	5.9%	12.4%	2.0%	12.8%	0.8%	-7.5%	-6.3%	-5.9%	-36.5%	-18.9%
Quanta	220.0%	445.5%	57.1%	32.6%	31.9%	28.8%	5.4%	-12.7%	-6.3%	1.7%	6.1%	-4.2%	-6.3%	-20.0%	-7.6%	-47.5%	-35.5%
Compal	72.0%	106.3%	48.6%	2.3%	-9.5%	20.0%	22.5%	34.3%	39.0%	-5.6%	15.2%	-1.8%	-16.3%	9.1%	-16.4%	-50.0%	-13.2%
Wistron	70.0%	76.5%	29.4%	17.6%	5.9%	27.8%	17.6%	31.3%	31.6%	15.0%	19.0%	17.4%	0.0%	6.7%	4.5%	-20.0%	5.6%
Inventec	33.3%	275.0%	-5.6%	-20.0%	-5.9%	-10.0%	0.0%	5.3%	5.3%	5.9%	17.6%	0.0%	-6.3%	0.0%	17.6%	12.5%	6.3%
Pegatron	17.4%	53.3%	73.9%	-18.9%	-29.5%	-12.5%	-25.0%	-14.3%	0.0%	14.3%	25.7%	17.6%	14.8%	-2.6%	0.0%	-16.7%	-22.6%
MoM																	
Total	-17.3%	-12.3%	32.0%	-12.6%	-4.5%	16.2%	-6.2%	-1.6%	13.2%	-5.2%	9.8%	0.0%	-24.2%	-11.2%	32.7%	-41.1%	22.0%
Quanta	-9.9%	-6.3%	10.0%	-7.6%	1.6%	8.1%	-11.9%	-6.8%	9.1%	1.7%	14.8%	-2.9%	-11.8%	-20.0%	27.1%	-47.5%	25.0%
Compal	-24.6%	-23.3%	66.7%	-20.0%	-13.6%	26.3%	2.1%	-4.1%	21.3%	-10.5%	3.9%	5.7%	-35.7%	0.0%	27.8%	-52.2%	50.0%
Wistron	-26.1%	-11.8%	46.7%	-9.1%	-10.0%	27.8%	-13.0%	5.0%	19.0%	-8.0%	8.7%	8.0%	-37.0%	-5.9%	43.8%	-30.4%	18.8%
Inventec	-11.1%	-6.3%	13.3%	-5.9%	0.0%	12.5%	5.6%	5.3%	0.0%	-10.0%	11.1%	-10.0%	-16.7%	0.0%	33.3%	-10.0%	-5.6%
Pegatron	-20.6%	-14.8%	73.9%	-25.0%	3.3%	12.9%	-14.3%	20.0%	11.1%	0.0%	10.0%	-9.1%	-22.5%	-27.7%	78.6%	-37.5%	-4.0%

Source: Company data

Servers: relatively resilient growth in 2022F/23F among tech devices

Global server shipments to grow 6.5%/6.0% in 2022F/23F

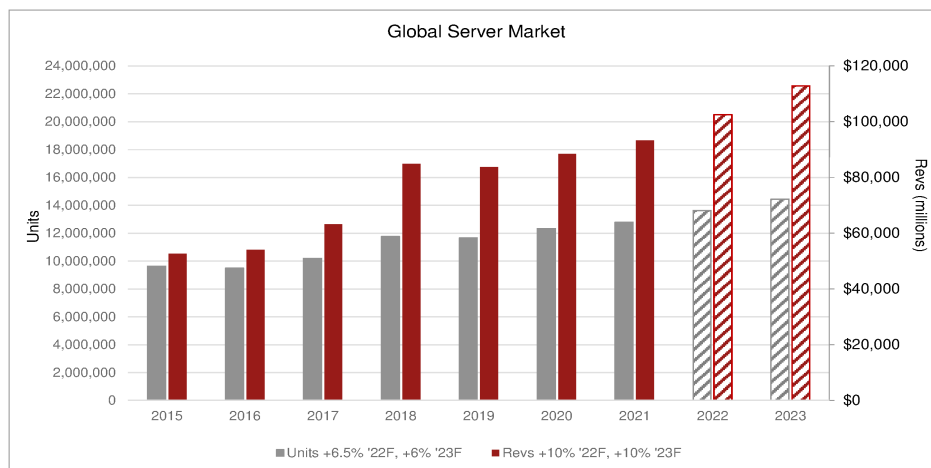
We expect global server unit growth of 6.5% in 2022F and 6% in 2023F, with revenue growth of 10% in both years. Our server unit forecast for 2022F implies: 1) 15-20% growth from key US CSP vendors, 2) flat/slight growth for enterprise servers (e.g., Dell and HPE are likely flat, and Lenovo up 10%), 3) flat/slight growth for China cloud vendors.

Pent-up demand is the key growth driver for servers in 2022F

We believe the pent-up demand into 2022F will be the major driver of server market growth, regardless of new platform delays (see our [Anchor report](#)), as supply was severely constrained in 2021, leading to lower-than-expected server shipments in 2021, despite the strong demand from cloud customers. In 2022, we observe server makers are still suffering from IC/component shortages, yet we are not seeing demand weakness for top US CSPs.

We understand investors' worries about potential order cuts from US CSPs, given the concerns of macro risks. However, we think even if orders are cut, it should happen "after" US CSPs get enough supply from server makers (which should be after IC/component bottlenecks are eased). Hence, we still expect the server supply chain to have strong earnings growth first (when bottlenecks are eased) in 3Q22F or 2H22F, before we see the impact of any order cuts.

Fig. 121: Global server market forecasts



Source: IDC, Nomura estimates

Whitley will be a longer-life mainstream platform; Eaglestream or Genoa delay risks will not hurt server demand in the near term

We now expect the new platforms, Intel's Eaglestream and AMD's Genoa, will have small ramps in 4Q22-1Q23F (if things are on track, based on current visibility), with more volume in 2023F; in the meantime, we expect the Whitley platform to ramp up rapidly in 2022F, and will be a longer-life mainstream platform for server in 2022-23F.

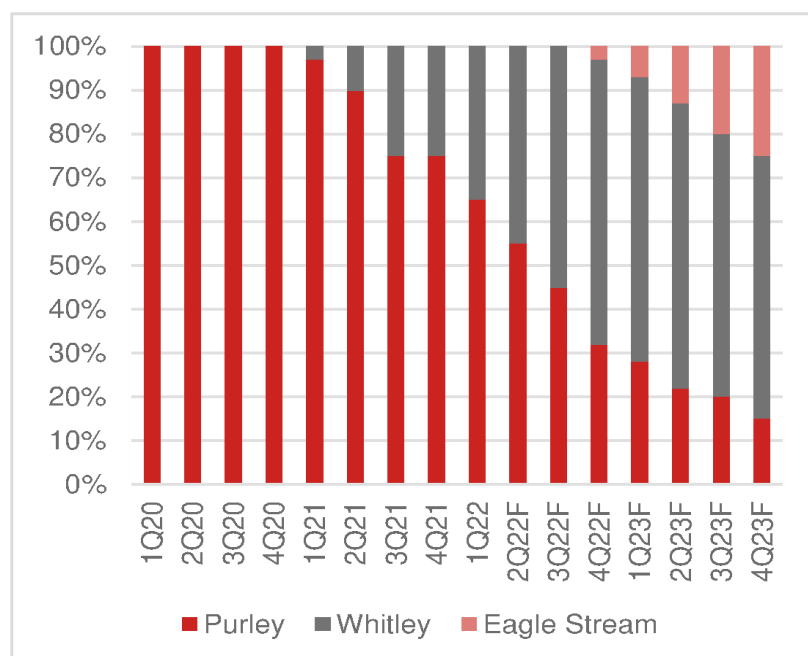
The late ramp-up of the new platforms will cause slower upgrades in some key components, in our view. However, the strong unit growth (due to pent-up demand) and the faster penetration of Whitley platform (which also slightly lead to component upgrades, though not as big as Eaglestream or Genoa) should be able to offset the lower ASP increase for component makers due to delays in new platforms. We think the benefits of platform upgrade from Eaglestream and Genoa will kick in end-2022 but the effect is more meaningful in 2023F. See below for the list of the companies we believe will be beneficiaries of the new server platform upgrades.

Fig. 122: Beneficiary of server platform upgrades

Components	Reasons	Key players
ABF IC substrates	EMIB and Elevated Fanout Bridge 2.5D package, for the heterogeneous IC integration	Ibiden, Shinko, Unimicron, AT&S, NYPCB
CCL and PCB	More ultra low loss CCLs with higher layer count motherboard PCB	CCL: EMC, ITEQ, TUC, Panasonic PCB: GCE, Wus, TTM, SCC, ISU
DDR5	15% larger silicon area vs. DDR4 as DDR5 integrates ECC (error correction code) on die for the first time; furthermore, in memory modules, two additional DRAM chips have to be used for ECC while DDR4 uses one extra DRAM chip, which means that compared to DDR4, the silicon area needs to be increased by c.28% for the same DRAM content per module	Samsung, SK Hynix, Micron
DDR5 interface IC	The increased number of chips used in the LRDIMM for DDR5 interface IC (which will lift the memory interface IC market from currently USD600-700mn to close to USD900mn by 2022-23F)	Renesas, Montage and Rambus
DDR5 PMIC	The number of PMICs will increase significantly due to the change of PMIC designed into each DDR5 DIMM (one CPU can support up to 8 DDR5 and each DDR5 module needs 2 DIMM), from prior just 1-2 DDR4 PMICs on motherboard	TI, Renesas, MPS. In Asia ex-Japan, we are seeing Richtek, Anpec, Montage, etc, working on it
PCIe Gen 5 IC	With double speed (from 64GB/s to 128GB/s, on x16 duplex), the signal decay issue would be larger and the re-timer demand would be bigger in gen 5 vs. gen 4.	Microchip, Parade, Astera Lab, Phison, etc.
BMC	Aspeed's AST2600 chip price [based on 28nm process for Eaglestream and Genoa] is 5-10% above current AST2500 [for Whitley]	Aspeed, Nuvoton
Thermal dissipation	The TDP of Whitley and Eaglestream are lifted to max 270Watt and 350Watt, from 140-205Watt in Purley, the thermal dissipation system will need to be enhanced	AVC, CCI, Auras, Delta
Power supply	The power supply will need to increase from 550-800Watt in Purley, to 800-1300Watt in Whitley, and over 1600Watt in Eaglestream	Delta, Lite-On Tech
CPU, PCIe, DDR sockets	Sockets for CPU, PCIe Gen 5, and DDR5 will have higher value due to higher transmission speed, higher density and complexity of I/O connects. The CPU socket ASP of Whitley and Eaglestream will be around 2.5x and 3.5x of the CPU socket ASP of Purley.	Lotes, FIT

Source: Nomura research

Fig. 123: Intel server platform penetration rate



Source: Nomura estimates

Investment view: Buy server and Apple plays, cautious on NB and Android SP plays

We have Buy ratings on Lotes (3533 TT), Aspeed (5274 TT), Wiwynn (6669 TT), Unimicron (3037 TT), and ASMedia (5269 TT) as we think they are all beneficiaries of server and upgrade trends. We like Lotes on its significant dollar content increases for high-speed transmission sockets and connectors. We like Aspeed (*report*) on its leading position in server BMC and the significant new addressable market for server security IC. We like Unimicron as it is well-positioned to benefit from Apple's Apple silicon growth and rising penetration of advanced packaging trend for HPC. We like ASMedia (*report*) on its surging dollar content of AMD new chipset (600-series), on top of the spec upgrades to USB4 and the subsequent new product cycle of own-branded host and device controllers.

We are cautious on NB-related plays, such as Lenovo (992 HK, Reduce) and Quanta (2382 TT, Neutral). We are cautious on Lenovo on the continued lack of a STAR Board listing catalyst, along with weakening PC demand into 2H22F, and the likely underperformance in the HK market in 2H22F (please refer to "*June-Q could be the downward inflection point*"). For Quanta, we believe its growth in servers will likely be offset by the weakening consumer NB/Chromebook demand, and the declining NB scale and Chromebook exposure will hurt its margins.

We are selectively positive on some Apple plays, such as Luxshare (002475 CH, Buy, on its market share gains in iPhone EMS, VCM, and bottom modules), and Hon Hai (2317 TT, Buy, on its solid execution and EV potential). For analog ICs related to smartphone applications, we are positive on SG Micro (300661 CH, Buy), due to its market share gain in various Apple products from 2022-2024F, including the iPhone.

We are cautious on stocks that have high-Android SP exposure, such as Mediatek (2454 TT), Xiaomi (1810 HK), Sunny (2382 HK), Awinic (688798 CH), AAC (2018 HK) (all Neutral), as we think there will be further earnings downside in 2Q22F and likely 2H22F, given deteriorating pricing and demand.

Appendix A-1

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As at 31 March 2022.

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A Target Price, if discussed, indicates the analyst's forecast for the share price with a 12-month time horizon, reflecting in part the analyst's estimates for the company's earnings. The achievement of any target price may be impeded by general market and macroeconomic trends, and by other risks related to the company or the market, and may not occur if the company's earnings differ from estimates.

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