

# Taiwan Semiconductor Manufacturing Co.

## Accelerated growth, global expansions and firmer pricing

Reiterate Rating: BUY | PO: 770.00 TWD | Price: 614.00 TWD

### In-line 2Q results

EPS of NT\$5.18 was largely in-line with BofA/consensus estimates. Revenue of NT\$372bn (+2.7% QoQ, +20% YoY) were slightly ahead while gross margin of 50% were 100bps lower than consensus, mainly due to dilution from higher 5nm sales contribution (up to 18%) and unfavorable exchange rate (50 bps impact). DoI increased by 2 days to 85 days with 5nm wafer prebuild for 2H shipment. We fine tune our earnings estimates post results, and our PO remains unchanged at NT\$770. Reiterate Buy.

### F/X hits near-term margins; high confidence on growth

3Q21 revenue is expected to increase 11% QoQ at mid-point (vs consensus +10% QoQ) while gross/op margins are expected to be 50.5%/39.5% at the mid-point (vs consensus at 52%/41%). Stronger NTD remains a headwind for margins, but the CEO remains upbeat for 2021 revenue (20%+ YoY) and long term revenue (~15% 5-year CAGR). Management sees capacity to remain tight into 2022 on strong customer demand. Any potential inventory correction that occurs should be milder than previous cycles given the strong secular industry growth, according to management.

### Global expansions in focus; firmer pricing ahead

TSMC now appears to be more active in setting up its global footprints. US fab is on track to ramp in 1H24 (5nm at 20k wpm) with potential for phase 2 expansion. In China, further expansion of 28nm capacity in Nanjing is schedule to ramp in 2H22. While the Japan R&D center mainly focus on advanced packaging, TSMC is also considering building a wafer fab for specialty technology. In addition to government incentives to help narrow the cost gap, TSMC will also exercise firmer pricing strategy to ensure proper returns on its global investments.

Estimates (Dec) (NT\$)	2019A	2020A	2021E	2022E	2023E
Net Income (Adjusted - mn)	345,264	517,885	589,837	707,177	809,659
EPS	13.32	19.97	22.75	27.27	31.22
EPS Change (YoY)	-1.6%	50.0%	13.9%	19.9%	14.5%
Dividend / Share	9.50	10.00	11.75	13.50	15.50
Free Cash Flow / Share	5.97	12.16	5.59	8.60	14.54
ADR EPS (US\$)	2.15	3.39	4.06	4.87	5.58
ADR Dividend / Share (US\$)	1.54	1.70	2.10	2.41	2.77
Valuation (Dec)					
P/E	46.11x	30.74x	26.99x	22.51x	19.66x
Dividend Yield	1.55%	1.63%	1.91%	2.20%	2.52%
EV / EBITDA*	23.90x	17.54x	14.61x	12.09x	10.53x
Free Cash Flow Yield*	0.972%	1.98%	0.911%	1.40%	2.37%

\* For full definitions of *IQmethod*<sup>SM</sup> measures, see page 14.

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**Refer to important disclosures on page 15 to 18. Analyst Certification on page 12. Price Objective Basis/Risk on page 12.**

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Timestamp: 15 July 2021 08:18AM EDT

### 15 July 2021

#### Equity

#### Key Changes

(NT\$)	Previous	Current
2021E EPS	23.15	22.75
2022E EPS	27.24	27.27
2023E EPS	31.10	31.22
2021E EBITDA (m)	1,090,784.4	1,079,081.9
2022E EBITDA (m)	1,299,779.0	1,304,147.1
2023E EBITDA (m)	1,489,662.9	1,496,930.1

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#### Stock Data

Price (Common / ADR)	614.00 TWD / 124.39 USD
Price Objective	770.00 TWD / 147.00 USD
Date Established	16-Apr-2021 / 16-Apr-2021
Investment Opinion	B-1-7 / B-1-7
52-Week Range	353.50 TWD-679.00 TWD
Market Value (mn)	568,687 USD
Market Value (mn)	15,921,254 TWD
Shares Outstanding (mn)	25,930.4 / 5,186.1
Average Daily Value (mn)	598.17 USD
Free Float	89.6%
BofA Ticker / Exchange	TSMWF / TAI
BofA Ticker / Exchange	TSM / NYS
Bloomberg / Reuters	2330 TT / 2330.TW
ROE (2021E)	30.2%
Net Dbt to Eqty (Dec-2020A)	-17.0%

HPC – high performance computing

CEO – Chief Executive Officer

DoI – days of inventory

# iQprofile<sup>SM</sup> Taiwan Semiconductor Manufacturing Co.

## Key Income Statement Data (Dec)

(NT\$ Millions)	2019A	2020A	2021E	2022E	2023E
Sales	1,069,985	1,339,255	1,602,230	1,900,183	2,164,554
Gross Profit	492,702	711,130	818,777	977,960	1,114,184
Sell General & Admin Expense	(28,086)	(35,570)	(39,810)	(43,209)	(45,528)
Operating Profit	372,701	566,784	645,639	783,266	898,956
Net Interest & Other Income	17,144	17,993	15,638	14,776	14,776
Associates	NA	NA	NA	NA	NA
Pretax Income	389,845	584,777	661,277	798,041	913,732
Tax (expense) / Benefit	(44,502)	(66,619)	(71,270)	(90,865)	(104,073)
Net Income (Adjusted)	345,264	517,885	589,837	707,177	809,659
Average Fully Diluted Shares Outstanding	25,930	25,930	25,930	25,930	25,930

## Key Cash Flow Statement Data

Net Income	345,264	517,885	589,837	707,177	809,659
Depreciation & Amortization	286,884	331,725	433,443	520,881	597,974
Change in Working Capital	(6,702)	(38,880)	(10,395)	(45,243)	(6,881)
Deferred Taxation Charge	NA	NA	NA	NA	NA
Other Adjustments, Net	(10,307)	11,937	(28,758)	(11,164)	(19,198)
Cash Flow from Operations	615,139	822,667	984,126	1,171,652	1,381,553
Capital Expenditure	(460,422)	(507,239)	(839,093)	(948,600)	(1,004,400)
(Acquisition) / Disposal of Investments	(10,785)	307	(18,234)	(20,790)	(22,666)
Other Cash Inflow / (Outflow)	12,405	1,150	6,428	(408)	374
Cash Flow from Investing	(458,802)	(505,782)	(850,900)	(969,798)	(1,026,692)
Shares Issue / (Repurchase)	0	0	0	0	0
Cost of Dividends Paid	(207,443)	(246,339)	(259,304)	(304,682)	(350,060)
Cash Flow from Financing	(215,806)	(73,869)	(155,654)	(288,336)	(347,951)
Free Cash Flow	154,717	315,428	145,033	223,052	377,153
Net Debt	(279,977)	(314,907)	(200,459)	(97,630)	(102,431)
Change in Net Debt	56,373	(69,662)	116,564	102,828	(4,801)

## Key Balance Sheet Data

Property, Plant & Equipment	1,352,377	1,555,589	1,790,078	2,233,299	2,639,011
Other Non-Current Assets	89,814	112,937	120,277	121,095	121,134
Trade Receivables	139,771	146,038	204,494	244,026	248,747
Cash & Equivalents	455,399	660,171	633,608	547,125	554,035
Other Current Assets	227,444	285,976	294,204	330,573	370,125
Total Assets	2,264,805	2,760,711	3,042,660	3,476,119	3,933,052
Long-Term Debt	25,100	254,105	308,380	319,368	320,758
Other Non-Current Liabilities	26,874	38,833	39,224	39,169	39,130
Short-Term Debt	150,322	91,159	124,769	130,126	130,846
Other Current Liabilities	440,414	525,992	510,136	549,940	566,255
Total Liabilities	642,710	910,089	982,509	1,038,604	1,056,990
Total Equity	1,622,095	1,850,622	2,060,151	2,437,515	2,876,062
Total Equity & Liabilities	2,264,805	2,760,711	3,042,660	3,476,119	3,933,052

## iQ<sup>method SM</sup> - Bus Performance\*

Return On Capital Employed	18.5%	25.0%	24.2%	25.5%	25.3%
Return On Equity	20.9%	29.8%	30.2%	31.5%	30.5%
Operating Margin	34.8%	42.3%	40.3%	41.2%	41.5%
EBITDA Margin	61.6%	67.1%	67.3%	68.6%	69.2%

## iQ<sup>method SM</sup> - Quality of Earnings\*

Cash Realization Ratio	1.8x	1.6x	1.7x	1.7x	1.7x
Asset Replacement Ratio	1.6x	1.5x	1.9x	1.8x	1.7x
Tax Rate (Reported)	11.4%	11.4%	10.8%	11.4%	11.4%
Net Debt-to-Equity Ratio	-17.3%	-17.0%	-9.7%	-4.0%	-3.6%
Interest Cover	NM	NM	NM	NM	NM

## Key Metrics

\* For full definitions of iQ<sup>method SM</sup> measures, see page 14.

## Company Sector

Semiconductors

## Company Description

TSMC was founded in 1987 and is listed in Taiwan (2330TT) and the US (TSM/NYS). TSMC is the largest and undisputed global leader in IC manufacturing. As a build-to-order foundry, it provides a wide-range value-add activities: IC manufacturing, mask-making, IC design services, turn-key solution, and process development. We attribute its success to its proven, winning business model, unparalleled scale advantage, optimized execution, and technology scope and depth. 5 shrs = 1 ADR.

## Investment Rationale

The ongoing semi content growth in mobile, rise of artificial intelligence (AI), and proliferation of Internet of Things (IoT) should result in sustainable upside in aggregate computing power globally. TSMC, as the leading contract manufacturer of semiconductor chips, is in a good position to capitalize. We are structurally positive on TSMC and expect it to sustain over 10% growth with rising FCF and dividends in the next three to five years.

## Stock Data

Shares / ADR	5.00
Price to Book Value	7.7x

## Key Changes

(US\$)	Previous	Current
2021E EPS	4.13	4.06
2023E EPS	5.55	5.58



# Accelerated growth, global expansions and firmer pricing

## Result in-line; HPC remains the bright spot

2Q21 net income NT\$134bn (EPS NT\$5.18, -4% QoQ, +11% YoY) broadly in-line with BofA/consensus estimates, as stronger revenue largely offsets the slightly lighter gross margin on stronger NTD against USD. According to the company, the stronger revenue can be attributed to sustained demand in high performance computing (HPC) and recovery in automotive market.

On a positive note, we see sub-7nm revenue contribution sustained at ~50% which is similar to 1Q level, with further gain in 5nm despite normally weak iPhone seasonality. Also, revenue contribution from HPC platform reached ~40% in the quarter - a record high in history, likely on ongoing share gain by customers. In the meantime, smartphone and internet-of-things (IoT) were with softer QoQ momentum vs HPC/auto, while consumer electronics delivered the weakest revenue QoQ likely on seasonal softness.

### Exhibit 1: 2Q21 result review

2Q21 net income largely in-line, with stronger revenue offset by lighter margins

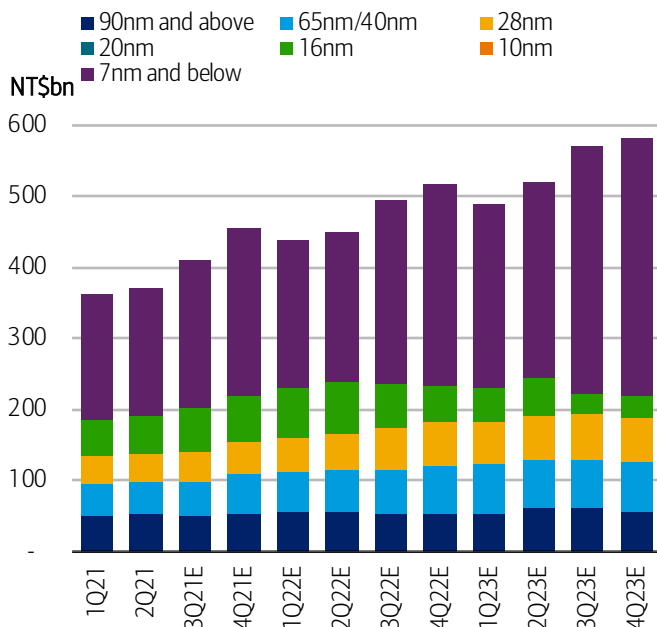
NT\$bn	2Q20	1Q21	2Q21	QoQ %	YoY %	BofAe	Diff	Consensus	Diff
Revenue	311	362	372	2.7%	19.8%	366	1.7%	371	0.2%
Gross profit	165	190	186	-1.9%	13.1%	185	0.7%	190	-1.8%
Gross margin	53%	52%	50%	-2.3 ppt	-3 ppt	51%	-0.5 ppt	51%	-1 ppt
Opt income	131	151	146	-3.2%	11.1%	145	0.5%	149	-2.4%
Opt margin	42%	42%	39%	-2.4 ppt	-3.1 ppt	40%	-0.4 ppt	40%	-1 ppt
Pretax income	136	155	149	-3.7%	9.5%	150	-0.1%	152	-1.8%
Pretax margin	44%	43%	40%	-2.6 ppt	-3.8 ppt	41%	-0.7 ppt	41%	-0.8 ppt
Net income	121	140	134	-3.9%	11.2%	132	1.5%	135	-0.6%
Net margin	38.9%	38.6%	36.1%	-2.5 ppt	-2.8 ppt	36.1%	0 ppt	36.4%	-0.3 ppt
EPS (NT\$)	4.66	5.39	5.18	-3.9%	11.2%	5.10	1.5%	5.21	-0.6%

Source: BofA Global Research estimates, company data, Bloomberg

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### Exhibit 2: Revenue by technology node

TSMC's growth ahead is mainly powered by advanced nodes (7nm below)

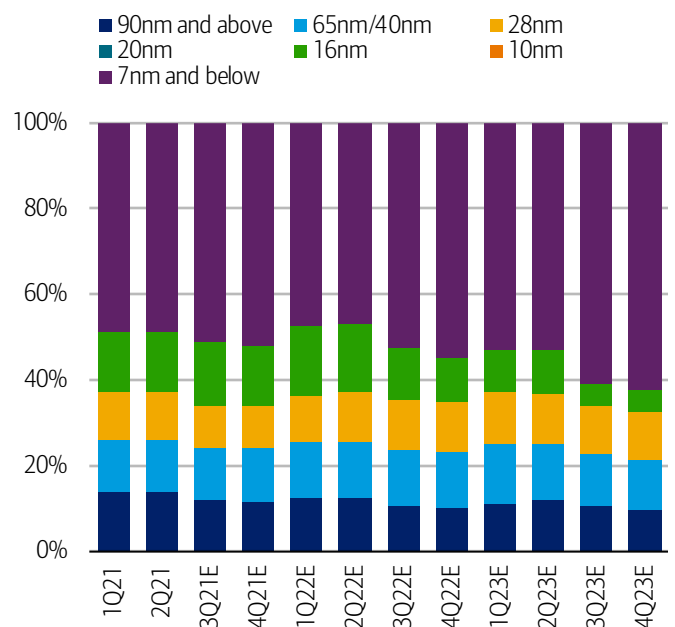


Source: BofA Global Research estimates, company data

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### Exhibit 3: Revenue % by technology node

5nm and 7nm revenue contribution sustained at ~50% in 1H21



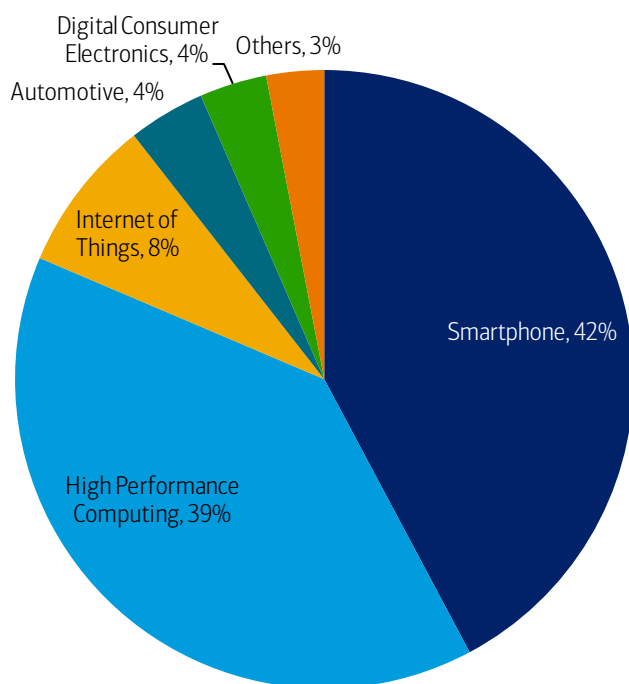
Source: BofA Global Research estimates, company data

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**Exhibit 4: TSMC's revenue mix by platform – 2Q21**

HPC and Automotive were stronger area in 2Q21, with double digit QoQ growth



Source: Company data

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**Lighter 3Q guide with stronger 4Q implied**

Into 3Q21 the firm guides revenue in the range of US\$14.6-14.9bn (+11% QoQ at mid-point), thanks to strength on all fronts including HPC, smartphone, IoT and auto. Gross margin is guided to be in the range of 49.5-51.5% with foreign exchange assumption of NTD/USD 27.9, while operating margin is guided to be 38.5-40.5%. Management further elaborates that 5nm ramp continues to impact overall gross margin, with 200-300bps impact for whole year level. However, it remains confident that gross margin for the node will reach corporate average level after ramping by 7-8 quarters.

Longer term, management reiterates its target of achieving higher end of its 10-15% revenue CAGR range in 2020-25, with at least 50% gross margin and 20+% ROE. Also it updates its perspective on industry growth, now expecting semi ex-memory and foundry to grow ~17%/20% (was ~12%/16%) in 2021, while reaffirming that the firm will outgrow the foundry industry in the year. By baking in full year and 3Q guidance, the firm's 4Q revenue is implied to grow by at least low teen % QoQ.

**Exhibit 5: 3Q21 guidance vs prior BofAe/consensus**

3Q revenue guidance lighter but full-year guidance stronger; GM guidance weaker on 5nm dilution

	3Q21 guidance	QoQ	Prior BofAe	Consensus
Sales	US\$14.6-14.9bn	Up 10-12%	Up 16%	Up 10%
GPM	49.5-51.5%	Down 0.5 ppt to up 1.5 ppt	51.5%	52.1%
OPM	38.5-40.5%	Down 0.6 ppt to up 1.4 ppt	41.1%	41.2%
FX(NTD/USD)	27.90			

Source: BofA Global Research, Bloomberg, company data

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**Exhibit 6: BofAe vs consensus**

We are ahead of consensus EPS by 1-4%

NT\$bn	2021E			2022E			2023E		
	BofA	Consensus	Diff	BofA	Consensus	Diff	BofA	Consensus	Diff
Revenue	1,602	1,565	2.4%	1,900	1,820	4.4%	2,165	2,147	0.8%
Gross profit	819	810	1.1%	978	945	3.5%	1,114	1,120	-0.5%
Gross margin	51.1%	51.8%	-0.7ppt	51.5%	51.9%	-0.5ppt	51.5%	52.1%	-0.7ppt
Opt income	646	640	0.9%	783	747	4.9%	899	879	2.2%
Opt margin	40.3%	40.9%	-0.6ppt	41.2%	41.0%	0.2ppt	41.5%	41.0%	0.6ppt
Pretax income	661	654	1.1%	798	765	4.3%	914	905	1.0%
Pretax margin	41.3%	41.8%	-0.5ppt	42.0%	42.0%	0.0ppt	42.2%	42.2%	0.1ppt
Net income	590	583	1.1%	707	682	3.7%	810	805	0.6%
EPS (NT\$)	22.75	22.50	1.1%	27.27	26.29	3.7%	31.22	31.04	0.6%

Source: BofA Global Research estimates, company data, Bloomberg

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**Exhibit 7: Earnings estimate change**

We fine tune 2021-23E EPS by -2 to 0% to reflect result/outlook

NT\$bn	2021E			2022E			2023E		
	New	Old	Diff	New	Old	Diff	New	Old	Diff
Revenue	1,602	1,601	0.1%	1,900	1,865	1.9%	2,165	2,124	1.9%
Gross profit	819	826	-0.9%	978	970	0.8%	1,114	1,103	1.0%
GPM	51.1%	51.6%	-0.5ppt	51.5%	52.0%	-0.5ppt	51.5%	51.9%	-0.4ppt
Opt income	646	657	-1.7%	783	779	0.6%	899	892	0.8%
Opt margin	40%	41%	-0.7ppt	41%	42%	-0.5ppt	42%	42%	-0.4ppt
Pretax income	661	675	-2.1%	798	797	0.1%	914	910	0.4%
Pretax margin	41%	42%	-0.9ppt	42%	43%	-0.8ppt	42%	43%	-0.6ppt
Net income	590	600	-1.7%	707	706	0.1%	810	806	0.4%
EPS (NT\$)	22.75	23.15	-1.7%	27.27	27.24	0.1%	31.22	31.10	0.4%

Source: BofA Global Research estimates

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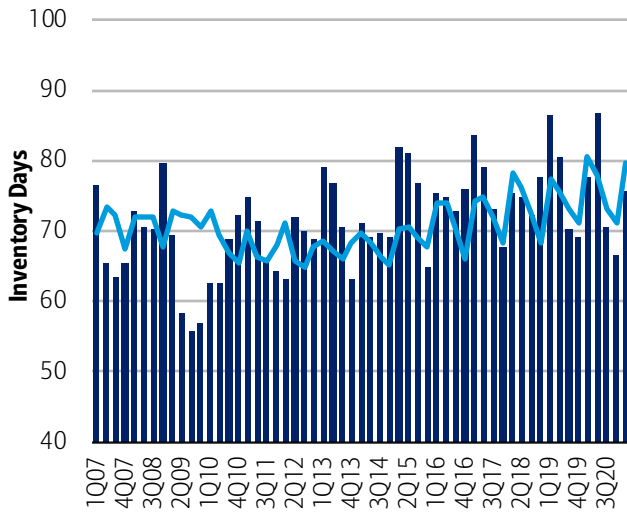
## Inventory concern remains manageable

For inventory, TSMC’s inventory edged up slightly QoQ mainly on 5nm wafer prebuild, according to management. That said, it still believed that it’s in healthy level, while there’s chance for customers to increase the inventory level given 1) preparation to combat supply chain turmoil led by COVID-19; and 2) new product launches ahead.

Overall, we find the words from management echoing our findings in the supply chain, as we see 1) a lower inventory borne by fabless and integrated device manufacturer (IDM) by end-1Q21; and 2) now it seems like supply shortage situation is spreading into downstream vendors. Further - we share the firm’s view that even if there’s inventory correction going forward, the magnitude will be lighter vs previous cycles thanks to structural demand from the likes of 5G/HPC, which is also a reason behind current supply/demand imbalance in semis fabrication.

**Exhibit 8: Global fabless DOI vs five-year seasonality**

Sky-blue line is five-year seasonality

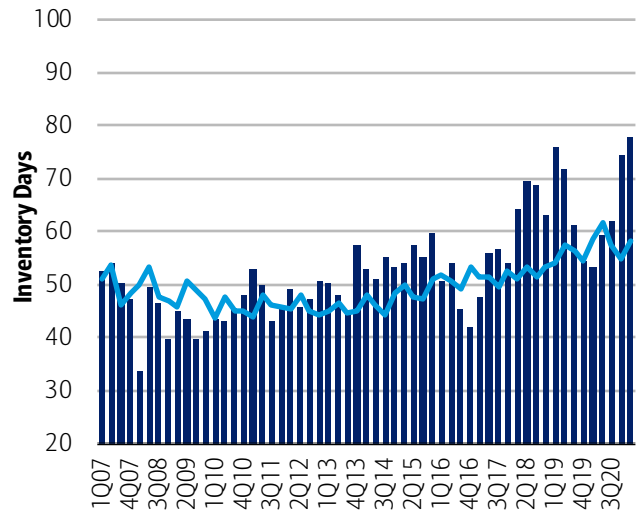


Source: BofA Global Research, Bloomberg, company data

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**Exhibit 9: Global foundry DOI vs five-year seasonality**

Sky-blue line is five-year seasonality

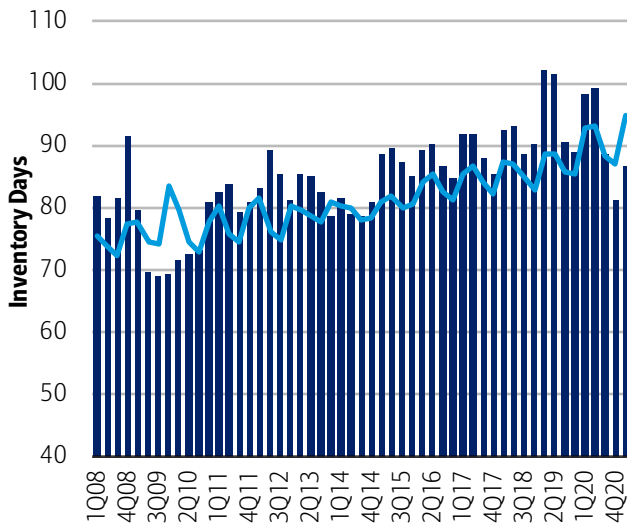


Source: BofA Global Research, Bloomberg, company data

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**Exhibit 10: Global chipmaker DOI vs five-year seasonality**

Sky-blue line is five-year seasonality

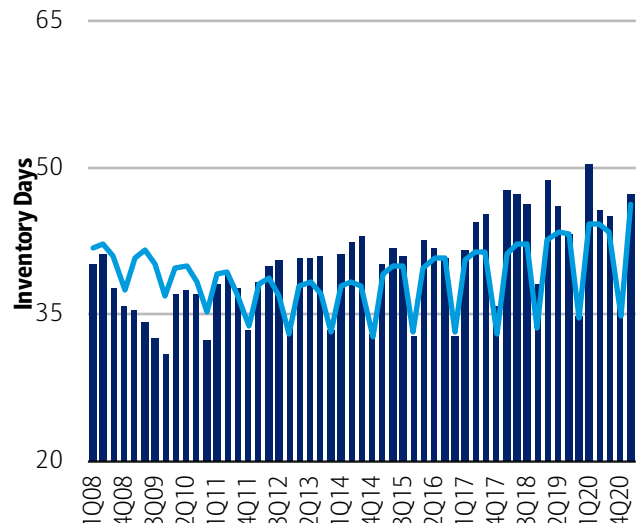


Source: BofA Global Research, Bloomberg, company data

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**Exhibit 11: Global downstream tech DOI vs five-year seasonality**

Sky-blue line is five-year seasonality



Source: BofA Global Research, Bloomberg, company data

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## Long-term AI/HPC industry forces more widely accepted

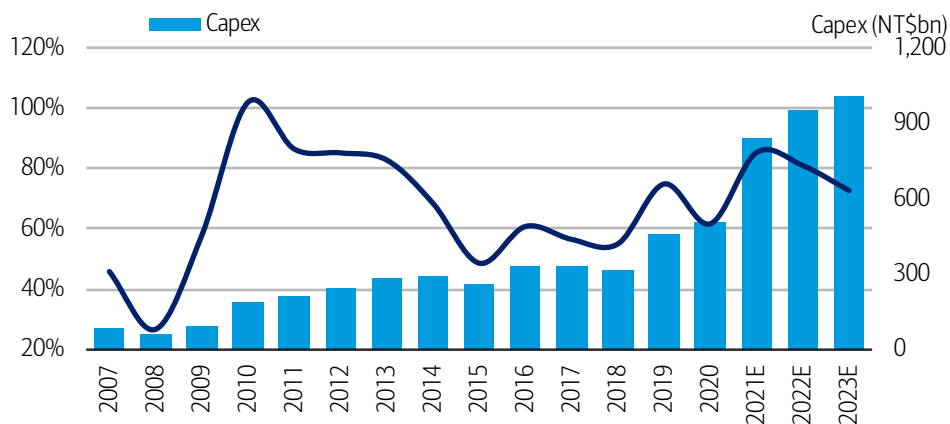
Capex and capital intensity is not much asked during the call in our view, which may suggests a broader acceptance of its 3-year US\$100bn capex plan, signally higher confidence level for the megatrends from the likes of artificial intelligence (AI) application specific integrated circuit (ASIC) and HPC. In our view, the former could be aided by a more completed offering in advanced packaging including system on integrated chips (SoIC), chip on wafer on substrate (CoWoS) and integrated fan-out (InFO), while the latter may benefit TSMC on likely further Intel outsourcing as well as non-Intel share gain (NVDA, AMD, RISC-V).

Elsewhere, we're also seeing further traction into auto (NXP) and networking infrastructure (Marvell's Ethernet PHY/Broadcom's Tomahawk) for 7/5nm. Further on 5nm family, management reiterates its target of generating 20% revenue from 5nm in 2021, while stating that 4nm progress is on track.

Last but not least for 3nm, the company cites that it is on schedule to enter mass production in 2H22, with even higher tape out volume in year 1 vs 5nm. Initially, management expects the ramp to be still led by smartphone customers, while indicating HPC will be an increasingly important growth engine for TSMC into 3nm – to become the biggest growth driver for the company in next 5 years.

### Exhibit 12: Capex as % of operating cash flow

The 3-year capex plan of US\$100bn for 2021-23E remains unchanged



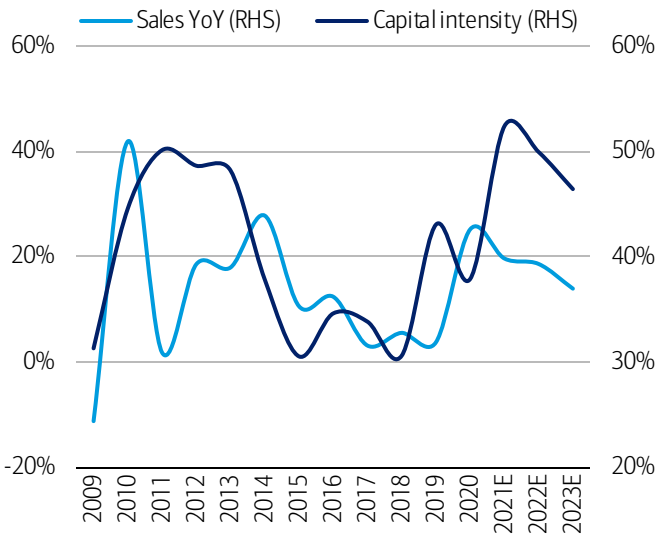
Source: BofA Global Research estimates, company data

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**Exhibit 13: Capital intensity vs sales YoY**

Capital intensity to stay at ~50% levels in 2021-23E

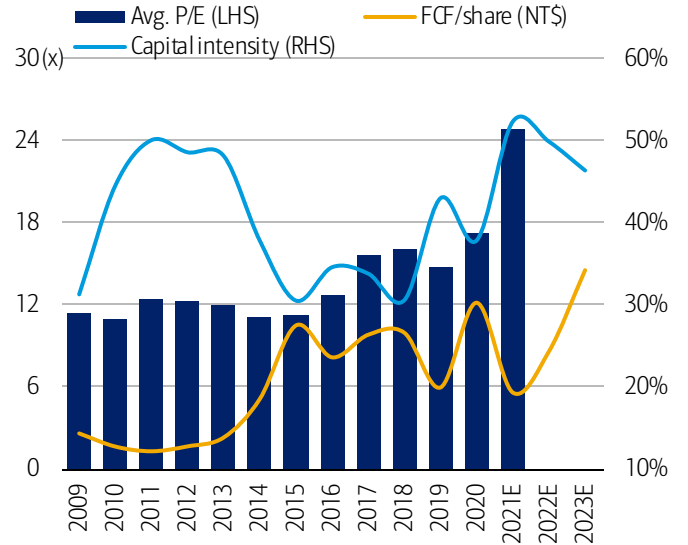


Source: BofA Global Research estimates, company data

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**Exhibit 14: Capital intensity vs P/E and FCF/share**

High capital intensity indicates robust demand, leading to the re-rating

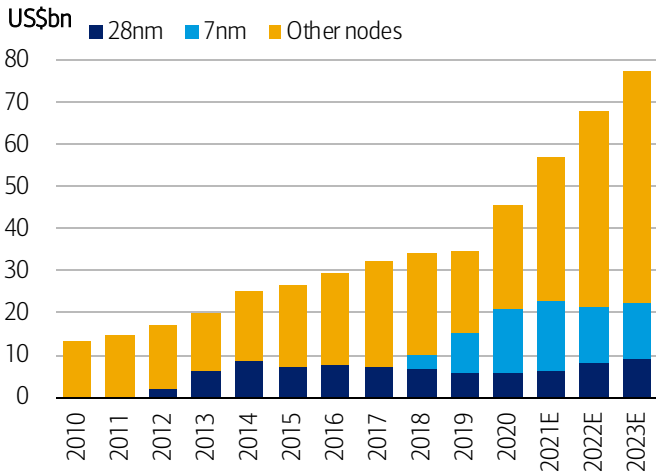


Source: BofA Global Research estimates, company data

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**Exhibit 15: Revenue contribution – 28nm vs 7nm**

7nm and 28nm contribute above US\$20bn revenue

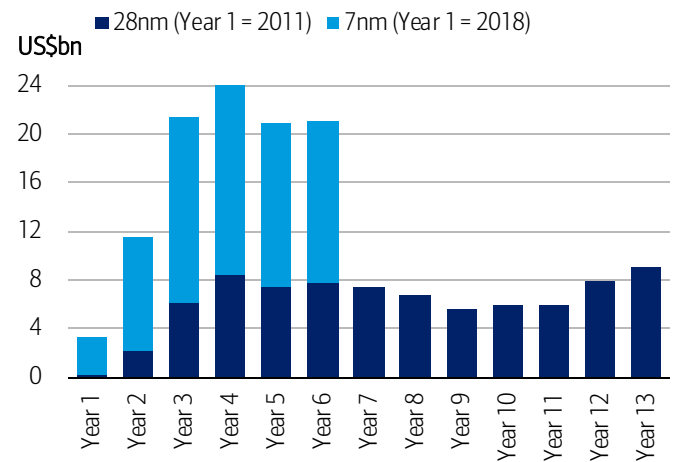


Source: BofA Global Research estimates, company data

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**Exhibit 16: Revenue contribution – 28nm vs 7nm (year 0 to year 13)**

We estimate 7nm and 28nm to consist of 40% wafer revenue in 2021E



Source: BofA Global Research estimates, company data

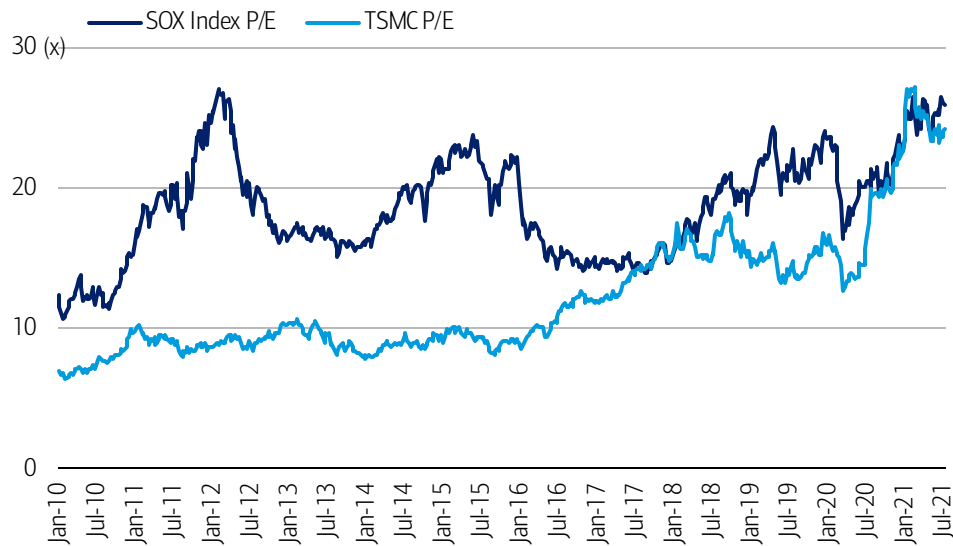
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**Exhibit 17: Forward P/E comparison, TSMC vs SOX Index**

P/E of TSMC and SOX index go closely with each other, and are at the same level of ~25x in 2021



Source: BofA Global Research estimate, Bloomberg, company data

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**Exhibit 18: Earnings model**

TSMC targets to deliver 10-15% revenue CAGR for 2020-25

(NT\$bn, %)	1Q21	2Q21	3Q21E	4Q21E	1Q22E	2Q22E	3Q22E	4Q22E	2020	2021E	2022E	2023E
Revenues	362	372	411	456	438	449	494	519	1,339	1,602	1,900	2,165
Cost of Sales	(173)	(186)	(204)	(221)	(215)	(218)	(240)	(250)	(628)	(783)	(922)	(1,050)
Gross Profit	190	186	208	235	223	231	254	269	711	819	978	1,114
Operating Expenses	(39)	(41)	(45)	(49)	(45)	(46)	(51)	(53)	(144)	(173)	(195)	(215)
Operating Income	151	146	163	186	178	186	204	216	567	646	783	899
Non-operating Income (Exp)	5	4	4	4	4	4	4	4	18	16	15	15
Pretax Income	155	149	167	190	182	189	207	219	585	661	798	914
Net tax	(15)	(15)	(19)	(22)	(20)	(22)	(24)	(25)	(67)	(71)	(91)	(104)
Net Income	140	134	148	168	162	168	183	194	518	590	707	810
Fully Diluted EPS - Local (NT\$)	5.4	5.2	5.7	6.5	6.2	6.5	7.1	7.5	20.0	22.7	27.3	31.2
<b>% of Revenue</b>												
Gross Profit	52	50	51	52	51	52	52	52	53	51	51	51
Operating Expenses	(11)	(11)	(11)	(11)	(10)	(10)	(10)	(10)	(11)	(11)	(10)	(10)
Operating Income	42	39	40	41	41	41	41	42	42	40	41	42
Pretax Income	43	40	41	42	42	42	42	42	44	41	42	42
Net Income	39	36	36	37	37	37	37	37	39	37	37	37
<b>QoQ Growth %</b>												
Revenues	0	3	11	11	(4)	2	10	5				
Gross Profit	(3)	(2)	12	13	(5)	4	10	6				
Operating Income	(4)	(3)	12	14	(4)	4	10	6				
Net Income	(2)	(4)	10	14	(4)	3	9	6				
<b>YoY Growth %</b>												
Revenues	17	20	15	26	21	21	20	14	25	20	19	14
Gross Profit	18	13	9	20	18	24	23	14	44	15	19	14
Operating Income	17	11	9	19	18	27	25	16	52	14	21	15
Net Income	19	11	7	18	16	25	24	15	50	14	20	14
EPS									50	14	20	14

Source: BofA Global Research estimates, company data

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**Exhibit 19: Operation model**

We expect TSMC to generate solid utilization and rising blended ASPs in coming years

	1Q21	2Q21	3Q21E	4Q21E	1Q22E	2Q22E	3Q22E	4Q22E	2020	2021E	2022E	2023E
Utilization	99%	99%	99%	104%	101%	102%	100%	96%	96%	100%	100%	94%
Shipments (12-inch equivalent, '000s)	3,359	3,449	3,587	3,766	3,691	3,802	3,954	3,954	12,396	14,161	15,400	16,600
Total revenue (NT\$bn)	362	372	411	456	438	449	494	519	1,339	1,602	1,900	2,165
ASP (\$)	3,844	3,852	4,109	4,344	4,255	4,235	4,479	4,703	3,668	4,045	4,422	4,674
<b>Sequential growth (%)</b>												
Shipments	3%	3%	4%	5%	-2%	3%	4%	0%	23%	14%	9%	8%
ASP (\$)	-2%	0%	7%	6%	-2%	0%	6%	5%	7%	10%	9%	6%
<b>Revenue share by process technology</b>												
0.11um and above	11%	11%	10%	9%	10%	10%	9%	8%	12%	10%	9%	8%
90nm	3%	3%	2%	2%	3%	3%	2%	2%	2%	2%	2%	2%
65nm	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
40nm	7%	7%	7%	8%	8%	8%	8%	8%	9%	7%	8%	7%
28nm	11%	11%	10%	10%	11%	12%	12%	12%	13%	10%	12%	12%
16-20nm	14%	14%	15%	14%	16%	16%	12%	10%	18%	14%	13%	7%
5-10nm	49%	49%	51%	52%	48%	47%	53%	55%	41%	50%	51%	58%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
<b>Revenue percentage by platform</b>												
Smartphone	45%	42%							48%	46%	47%	46%
High Performance Computing	35%	39%							33%	35%	36%	37%
Internet of Things	9%	8%							8%	8%	8%	8%
Automotive	4%	4%							3%	4%	4%	3%
Digital Consumer Electronics	4%	4%							4%	4%	3%	3%
Others	3%	3%							4%	3%	3%	3%
Total	20%	19%							100%	100%	100%	100%
<b>Revenue percentage by region</b>												
North America	67%	64%	64%	64%	71%	70%	70%	70%	62%	65%	70%	70%
Asia Pacific	17%	15%	11%	13%	14%	13%	12%	13%	11%	14%	13%	13%
China	6%	11%	11%	8%	9%	10%	10%	9%	17%	9%	10%	10%
Europe	6%	6%	6%	6%	5%	5%	5%	5%	5%	6%	5%	5%
Japan	4%	4%	9%	10%	2%	2%	3%	3%	4%	7%	2%	3%

Source: BofA Global Research estimates, company data

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**Exhibit 20: Balance sheet**

Despite significant capex hike, we expect TSMC's balance sheet to stay pretty solid

(NT\$bn)	1Q21	2Q21	3Q21E	4Q21E	1Q22E	2Q22E	3Q22E	4Q22E	2020	2021E	2022E	2023E
Cash	665	748	627	634	629	604	526	547	660	634	547	554



**Exhibit 20: Balance sheet**

Despite significant capex hike, we expect TSMC's balance sheet to stay pretty solid

(NT\$bn)	1Q21	2Q21	3Q21E	4Q21E	1Q22E	2Q22E	3Q22E	4Q22E	2020	2021E	2022E	2023E
Short Term Investment	132	123	140	145	142	144	157	165	131	145	165	188
Accounts receivable	167	178	197	204	194	201	242	244	146	204	244	249
Inventory	155	170	133	131	138	147	158	146	137	131	146	162
Other current assets	21	22	19	19	20	20	20	19	17	19	19	20
<b>Current Assets</b>	<b>1,140</b>	<b>1,241</b>	<b>1,117</b>	<b>1,132</b>	<b>1,123</b>	<b>1,116</b>	<b>1,103</b>	<b>1,122</b>	<b>1,092</b>	<b>1,132</b>	<b>1,122</b>	<b>1,173</b>
Long Term Investments	29	29	29	29	29	29	29	29	28	29	29	29
Fixed Assets	1,659	1,723	1,688	1,790	1,909	2,023	2,131	2,233	1,556	1,790	2,233	2,639
Other Assets	92	100	88	91	93	93	91	92	85	91	92	92
<b>Long-term Assets</b>	<b>1,779</b>	<b>1,852</b>	<b>1,805</b>	<b>1,910</b>	<b>2,031</b>	<b>2,145</b>	<b>2,251</b>	<b>2,354</b>	<b>1,669</b>	<b>1,910</b>	<b>2,354</b>	<b>2,760</b>
<b>Total Assets</b>	<b>2,919</b>	<b>3,093</b>	<b>2,922</b>	<b>3,043</b>	<b>3,154</b>	<b>3,261</b>	<b>3,355</b>	<b>3,476</b>	<b>2,761</b>	<b>3,043</b>	<b>3,476</b>	<b>3,933</b>
Short term loans	137	139	130	124	133	131	129	129	89	124	129	130
Notes & Accounts Payable	39	41	46	52	49	53	58	62	41	52	62	77
Current portion of long term debt	-	-	1	1	1	1	1	1	3	1	1	1
Other current Liabilities	486	467	378	458	457	445	397	488	485	458	488	490
<b>Current Liabilities</b>	<b>662</b>	<b>648</b>	<b>555</b>	<b>635</b>	<b>639</b>	<b>630</b>	<b>585</b>	<b>680</b>	<b>617</b>	<b>635</b>	<b>680</b>	<b>697</b>
Long term debt	277	410	292	308	322	333	314	319	254	308	319	321
Other non-current liabilities	40	41	38	39	39	39	39	39	39	39	39	39
<b>Long-term Liabilities</b>	<b>316</b>	<b>451</b>	<b>330</b>	<b>348</b>	<b>361</b>	<b>372</b>	<b>353</b>	<b>359</b>	<b>293</b>	<b>348</b>	<b>359</b>	<b>360</b>
<b>Total Liabilities</b>	<b>978</b>	<b>1,099</b>	<b>885</b>	<b>983</b>	<b>1,000</b>	<b>1,003</b>	<b>938</b>	<b>1,039</b>	<b>910</b>	<b>983</b>	<b>1,039</b>	<b>1,057</b>
Total parent shareholders' equity	1,939	1,992	2,036	2,058	2,152	2,257	2,415	2,436	1,850	2,058	2,436	2,874
Minority Interest	2	2	2	2	2	2	2	2	1	2	2	2
<b>Total Liabilities and Equity</b>	<b>2,919</b>	<b>3,093</b>	<b>2,922</b>	<b>3,043</b>	<b>3,154</b>	<b>3,261</b>	<b>3,355</b>	<b>3,476</b>	<b>2,761</b>	<b>3,043</b>	<b>3,476</b>	<b>3,933</b>

Source: BofA Global Research estimates, company data

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**Exhibit 21: Cash flow**

Even with high capital investment, TSMC can still deliver improving dividend payout policy, according to management

(NT\$bn)	1Q21	2Q21	3Q21E	4Q21E	1Q22E	2Q22E	3Q22E	4Q22E	2020	2021E	2022E	2023E
Net Profit	140	134	148	168	162	168	183	194	518	590	707	810
Depreciation & Amortization	101	104	113	116	122	130	136	133	332	433	521	598
Change in Working Capital	(26)	(11)	26	1	(0)	(13)	(47)	15	(39)	(10)	(45)	(7)
Other adjustment	14	(40)	(1)	(2)	(2)	(4)	(2)	(3)	12	(29)	(11)	(19)
<b>Operating Cash Flow</b>	<b>228</b>	<b>187</b>	<b>286</b>	<b>283</b>	<b>281</b>	<b>281</b>	<b>270</b>	<b>339</b>	<b>823</b>	<b>984</b>	<b>1,172</b>	<b>1,382</b>
Capital Expenditure	(248)	(167)	(210)	(214)	(237)	(237)	(237)	(237)	(507)	(839)	(949)	(1,004)
Proceeds from sale of non-current assets	0	0	0	0	0	0	0	0	1	0	0	0
Acquisitions/Disposals of investments	4	0	(17)	(4)	2	(1)	(14)	(8)	0	(18)	(21)	(23)
Other investment items	0	(3)	12	(3)	(1)	(0)	2	(1)	1	6	(1)	(0)
<b>Investing Cash Flow</b>	<b>(244)</b>	<b>(170)</b>	<b>(215)</b>	<b>(222)</b>	<b>(236)</b>	<b>(238)</b>	<b>(249)</b>	<b>(246)</b>	<b>(506)</b>	<b>(851)</b>	<b>(970)</b>	<b>(1,027)</b>
Net Share issue/repurchase	-	-	-	-	-	-	-	-	-	-	-	-
Dividends paid	(65)	(65)	(65)	(65)	(71)	(78)	(78)	(78)	(259)	(259)	(305)	(350)
Change in debt	71	140	(126)	10	22	10	(21)	5	173	94	16	2
Other financing cash flow	9	(0)	-	-	-	-	-	-	(3)	8	-	(0)
<b>Financing Cash Flow</b>	<b>15</b>	<b>75</b>	<b>(191)</b>	<b>(55)</b>	<b>(49)</b>	<b>(68)</b>	<b>(99)</b>	<b>(73)</b>	<b>(89)</b>	<b>(157)</b>	<b>(288)</b>	<b>(348)</b>
<b>Net Change in Cash</b>	<b>(2)</b>	<b>93</b>	<b>(121)</b>	<b>6</b>	<b>(4)</b>	<b>(25)</b>	<b>(78)</b>	<b>21</b>	<b>228</b>	<b>(23)</b>	<b>(86)</b>	<b>7</b>
Exchange effect	6	(9)	-	-	-	-	-	-	(23)	(3)	-	-
Cash, Beginning of Year	660	665	748	627	634	629	604	526	455	660	634	547
Cash, End of Year	665	748	627	634	629	604	526	547	660	634	547	554

Source: BofA Global Research estimates, company data

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## Price objective basis & risk

### Taiwan Semiconductor Manufacturing Co. (TSMWF / TSM)

We value TSMC at NT\$770 per share (US\$147 per ADR), based on a 30x 4Q21-3Q22E P/E, slightly above its past 10-year trading range (10x-27x), and also slightly above the upcycle of SOX Index. We expect the valuation to be underpinned its stronger industry position especially in leading edge technology, improved earnings quality and subsequently FCF/dividend upside.

Downside risks are: 1) slowing global smartphone demand, and 2) execution risks in advanced nodes.

## Analyst Certification

I, Robin Cheng, hereby certify that the views expressed in this research report accurately reflect my personal views about the subject securities and issuers. I also certify that no part of my compensation was, is, or will be, directly or indirectly, related to the specific recommendations or view expressed in this research report.

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## APR - Semiconductor Coverage Cluster

Investment rating	Company	BofA Ticker	Bloomberg symbol	Analyst
<b>BUY</b>				
	ASE Technology Holding	XRIF	3711 TT	Robin Cheng
	ASE Technology Holding -ADR	ASX	ASX US	Robin Cheng
	ASM Pacific Technology	ASMFV	522 HK	Simon Woo, CFA
	Aspeed	XLKMF	5274 TT	Mike Yang
	eMemory	XYLWF	3529 TT	Mike Yang
	GlobalWafers	XWLF	6488 TT	Robin Cheng
	Macronix International	MXICF	2337 TT	Dai Shen
	MediaTek	MDTKF	2454 TT	Robin Cheng
	Micron Technology, Inc	MU	MU US	Simon Woo, CFA
	Nanya Technology	NNYAF	2408 TT	Simon Woo, CFA
	Novatek	NVKMF	3034 TT	Robin Cheng
	NYPCB	NANYF	8046 TT	Brad Lin
	Parade	PRDWF	4966 TT	Mike Yang
	Phison Electronics	PISNF	8299 TT	Simon Woo, CFA
	Realtek	RLTKF	2379 TT	Robin Cheng
	Samsung Elec -G	SSNHZ	SMSN LI	Simon Woo, CFA
	Samsung Electronics	SSNLF	005930 KS	Simon Woo, CFA
	Samsung Electronics Preferred	SSNNF	005935 KS	Simon Woo, CFA
	Silicon Motion	SIMO	SIMO US	Simon Woo, CFA
	SK Hynix	HXSCF	000660 KS	Simon Woo, CFA
	Soulbrain	XSBOF	357780 KS	Dah-Yeon Rhee
	Taiwan Semiconductor Manufacturing Co.	TSM	TSM US	Robin Cheng
	Taiwan Semiconductor Manufacturing Co.	TSMWF	2330 TT	Robin Cheng
	United Microelectronics Corp.	XUMIF	2303 TT	Robin Cheng
	United Microelectronics Corp.	UMC	UMC US	Robin Cheng
	Win Semiconductors	XWIF	3105 TT	Robin Cheng
<b>NEUTRAL</b>				
	ASMedia Technology Inc.	XZSFF	5269 TT	Mike Yang
	Genius Electronic Optical	GNSEF	3406 TT	Robin Cheng
	Powertech Technology	XPPZF	6239 TT	Simon Woo, CFA
	SK Materials	XSKKF	036490 KS	Dah-Yeon Rhee
<b>UNDERPERFORM</b>				
	Hua Hong Semi	HHUSF	1347 HK	Robin Cheng
	JCET Group Co Ltd	XJIEF	600584 CH	Robin Cheng
	Montage Technology	XRDF	688008 CH	Mike Yang
	Shenzhen Goodix	XQPLF	603160 CH	Mike Yang
	Silergy	SLRGF	6415 TT	Robin Cheng
	Wonik IPS	XRHQF	240810 KS	Dah-Yeon Rhee
<b>RWV</b>				
	Semiconductor Manufacturing Int'l Corp	SIUIF	981 HK	Robin Cheng



**iQ<sub>method</sub><sup>SM</sup> Measures Definitions**

<b>Business Performance</b>	<b>Numerator</b>	<b>Denominator</b>
Return On Capital Employed	$\text{NOPAT} = (\text{EBIT} + \text{Interest Income}) \times (1 - \text{Tax Rate}) + \text{Goodwill Amortization}$	Total Assets – Current Liabilities + ST Debt + Accumulated Goodwill
Return On Equity	Net Income	Amortization
Operating Margin	Operating Profit	Shareholders' Equity
Earnings Growth	Expected 5 Year CAGR From Latest Actual	Sales
Free Cash Flow	Cash Flow From Operations – Total Capex	N/A
		N/A

**Quality of Earnings**

Cash Realization Ratio	Cash Flow From Operations	Net Income
Asset Replacement Ratio	Capex	Depreciation
Tax Rate	Tax Charge	Pre-Tax Income
Net Debt-To-Equity Ratio	Net Debt = Total Debt – Cash & Equivalents	Total Equity
Interest Cover	EBIT	Interest Expense

**Valuation Toolkit**

Price / Earnings Ratio	Current Share Price	Diluted Earnings Per Share (Basis As Specified)
Price / Book Value	Current Share Price	Shareholders' Equity / Current Basic Shares
Dividend Yield	Annualised Declared Cash Dividend	Current Share Price
Free Cash Flow Yield	Cash Flow From Operations – Total Capex	Market Cap = Current Share Price × Current Basic Shares
Enterprise Value / Sales	$\text{EV} = \text{Current Share Price} \times \text{Current Shares} + \text{Minority Equity} + \text{Net Debt} + \text{Other LT Liabilities}$	Sales
EV / EBITDA	Enterprise Value	Basic EBIT + Depreciation + Amortization

*iQ<sub>method</sub><sup>SM</sup>* is the set of BofA Global Research standard measures that serve to maintain global consistency under three broad headings: Business Performance, Quality of Earnings, and valuations. The key features of *iQ<sub>method</sub>* are: A consistently structured, detailed, and transparent methodology. Guidelines to maximize the effectiveness of the comparative valuation process, and to identify some common pitfalls.

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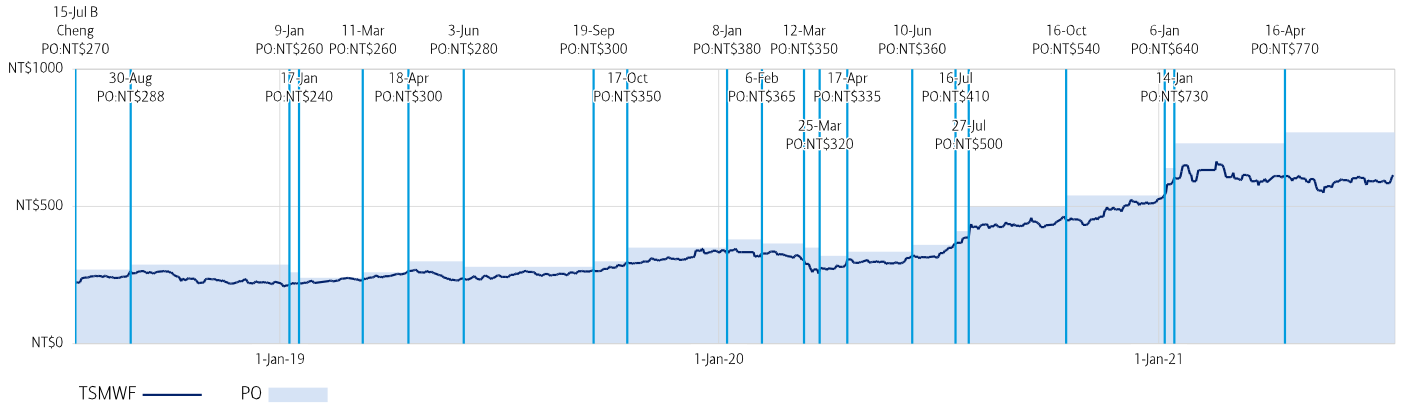
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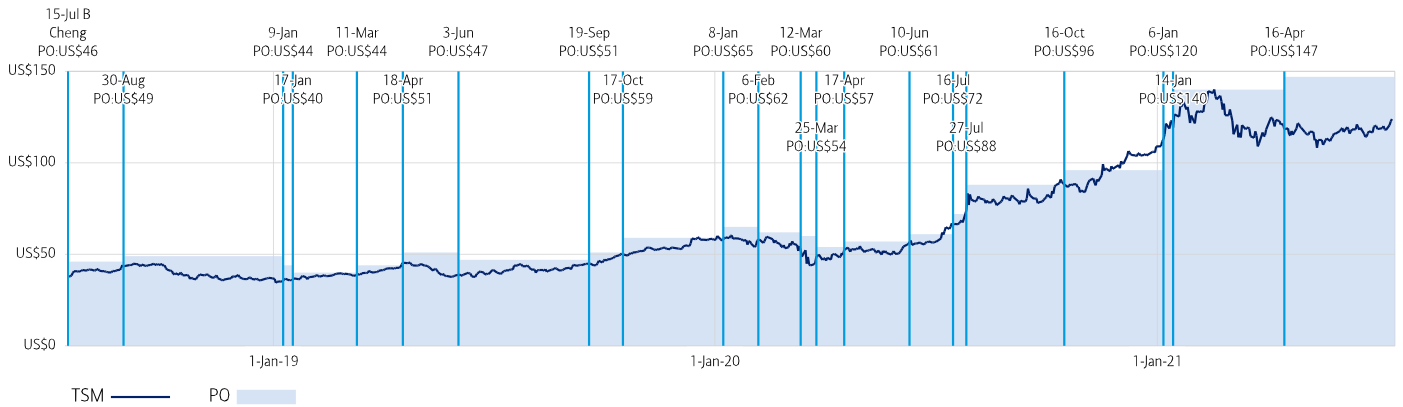
### TSMC (TSMWF) Price Chart



B: Buy, N: Neutral, U: Underperform, PO: Price Objective, NA: No longer valid, NR: No Rating

The Investment Opinion System is contained at the end of the report under the heading "Fundamental Equity Opinion Key". Dark grey shading indicates the security is restricted with the opinion suspended. Medium grey shading indicates the security is under review with the opinion withdrawn. Light grey shading indicates the security is not covered. Chart is current as of a date no more than one trading day prior to the date of the report.

### TSMC (TSM) Price Chart



B: Buy, N: Neutral, U: Underperform, PO: Price Objective, NA: No longer valid, NR: No Rating

The Investment Opinion System is contained at the end of the report under the heading "Fundamental Equity Opinion Key". Dark grey shading indicates the security is restricted with the opinion suspended. Medium grey shading indicates the security is under review with the opinion withdrawn. Light grey shading indicates the security is not covered. Chart is current as of a date no more than one trading day prior to the date of the report.

### Equity Investment Rating Distribution: Technology Group (as of 30 Jun 2021)

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	218	67.91%	Buy	135	61.93%
Hold	61	19.00%	Hold	38	62.30%
Sell	42	13.08%	Sell	20	47.62%

### Equity Investment Rating Distribution: Global Group (as of 30 Jun 2021)

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	1947	60.07%	Buy	1252	64.30%
Hold	637	19.65%	Hold	395	62.01%
Sell	657	20.27%	Sell	340	51.75%

\* Issuers that were investment banking clients of BofA Securities or one of its affiliates within the past 12 months. For purposes of this Investment Rating Distribution, the coverage universe includes only stocks. A stock rated Neutral is included as a Hold, and a stock rated Underperform is included as a Sell.



**FUNDAMENTAL EQUITY OPINION KEY:** Opinions include a Volatility Risk Rating, an Investment Rating and an Income Rating. *VOLATILITY RISK RATINGS*, indicators of potential price fluctuation, are: A - Low, B - Medium and C - High. *INVESTMENT RATINGS* reflect the analyst's assessment of both a stock's: absolute total return potential as well as its attractiveness for investment relative to other stocks within its *Coverage Cluster* (defined below). There are three investment ratings: 1 - Buy stocks are expected to have a total return of at least 10% and are the most attractive stocks in the coverage cluster; 2 - Neutral stocks are expected to remain flat or increase in value and are less attractive than Buy rated stocks and 3 - Underperform stocks are the least attractive stocks in a coverage cluster. Analysts assign investment ratings considering, among other things, the 0-12 month total return expectation for a stock and the firm's guidelines for ratings dispersions (shown in the table below). The current price objective for a stock should be referenced to better understand the total return expectation at any given time. The price objective reflects the analyst's view of the potential price appreciation (depreciation).

Investment rating	Total return expectation (within 12-month period of date of initial rating)	Ratings dispersion guidelines for coverage cluster*
Buy	≥ 10%	≤ 70%
Neutral	≥ 0%	≤ 30%
Underperform	N/A	≥ 20%

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