

Taiwan Semiconductors	
Ticker Site BiG	TSM
Ticker BiGlobal Trade	TSM
Ticker BT24	TSM
Ticker BiG Power Trade	TSM
P/E Ratio 2019E	26.67
EV/EBITDA	10.18

Source: BiG Research;

Price and Performance (Values in USD)	
Price	57.84
52 week high	59.71
52 week low	34.21
YTD	56.7%
Average daily volume (un)	6,714,216
Market Capitalization (mn)	299,937
Beta	0.90

Source: BiG Research;

Analysts Consensus (last 3 months)	
Buy	4
Hold	2
Sell	1

Source: BiG Research;

Financial Data	
Sales (TWD mn)	1,031,474
EBITDA (TWD mn)	676,170
Number of Employees	48,752
ROA	16.0%
ROE	20.8%
D/E	0.11
Dividend Yield	0.71%

Source: BiG Research;

Notes:

All quotes were updated in Bloomberg at 15h45 of December 30th, 2019.

Relevant Information:

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Taiwan Semiconductors (Ticker: TSM US)

Description

It was established in 1987 with headquarters in Taiwan, and is now the largest semiconductor foundry, manufacturing more than 10 thousand products with 261 technologies to more than 450 customers.

Taiwan Semiconductors wants to be “the most advanced and largest technology and foundry services provider to fabless companies and IDMs”. Fabless companies are the ones that outsource the production of semiconductors, like Apple or Amazon. With this strategy in mind, as long as its products have quality and are technologically advanced, Taiwan Semiconductors will serve many customers in the tech industry and more specifically in the logical segment. The company’s market share in the total semiconductor foundry segment rose to 56% in 2018.

Taiwan Semiconductors trades in the NYSE with a market capitalization of USD 300 bn.

Investment Case

Growth and margins: Taiwan Semiconductors is growing at a pace around 5% per year with net income margins of more than 30%.

Free Cash Flow generation: After capex, the free cash flow is around USD 8 bn which the company uses to pay dividends and reduce debt.

Robust Balance Sheet: Company has more than USD 10 bn of net cash which may use to drive R&D or to purchase a competitor.

Growth of 5G, AI and cloud market to fuel TSMC revenues: given its exposure to these trends, it is expected that revenues continue to grow at least by 5% per year.

High market share: TSMC holds 56% of market share in foundry market.

Taiwan elections are the main risk: Given that Taiwan elections will be held in January 11th, we see more risk on the downside than upside for the stock, so we prefer to wait and evaluate an investment in TSMC after the elections.

Relative Valuation

Name	Country	Market Cap (mn)	Currency	P/E 2020E	EV/EBITDA	YTD	Div. Yield	ROE	NetDebt/EBITDA	Margin EBITDA
CABOT MICROELECTRONICS CORP	UNITED STATES	4,136	USD	16.6	20.8	49.1%	1.2%	4.8%	3.7	20.1%
TERADYNE INC	UNITED STATES	11,484	USD	21.6	14.3	118.4%	0.5%	30.9%	-0.9	29.1%
AMKOR TECHNOLOGY INC	UNITED STATES	3,168	USD	19.2	4.0	101.4%	n.a.	2.7%	1.1	18.7%
INFICON HOLDING AG-REG	SWITZERLAND	1,864	CHF	29.3	18.8	55.2%	2.9%	28.5%	-0.2	20.0%
ENTEGRIS INC	UNITED STATES	6,737	USD	21.2	18.6	79.1%	0.6%	25.3%	1.9	23.7%
ASML HOLDING NV	NETHERLANDS	112,161	EUR	30.5	35.4	92.1%	0.8%	19.3%	0.4	25.3%
WESTERN DIGITAL CORP	UNITED STATES	18,320	USD	9.9	23.3	66.6%	3.2%	-14.7%	6.8	6.6%
KLA CORP	UNITED STATES	27,996	USD	16.1	15.8	98.3%	1.7%	53.3%	1.0	34.4%
APPLIED MATERIALS INC	UNITED STATES	55,513	USD	13.9	14.2	85.2%	1.4%	35.9%	0.5	25.4%
ADVANCED MICRO DEVICES	UNITED STATES	50,520	USD	42.2	56.6	145.7%	n.a.	12.7%	-0.2	9.1%
SEAGATE TECHNOLOGY	UNITED STATES	15,526	USD	11.3	9.3	53.1%	4.3%	97.5%	1.4	17.7%
MICRON TECHNOLOGY INC	UNITED STATES	58,965	USD	10.3	5.3	67.3%	n.a.	10.0%	-0.2	46.2%
TAIWAN SEMICONDUCTOR-SP ADR	TAIWAN	299,937	USD	20.7	10.2	56.7%	3.5%	20.8%	-0.7	62.4%
Average exc. TSM				19.8	18.4	82.82%	1.85%	20.66%	1.6	22.6%

Source: BiG Research

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Analyst:
João Calado, CFA

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Income Statement (TWD m)	2018	2017
Revenues	1,031,474	977,447
Cost of goods sold	533,488	482,616
Research & Development	85,896	80,732
Marketing, General and admin.	26,254	27,169
Other expenses	2,213	1,370
Operating Expenses	647,850	591,888
EBIT	383,624	385,559
Interest expenses	3,051	3,330
EBT	397,510	396,133
Taxes	46,326	52,986
Net Income	351,184	343,147
Earnings Per Share	13.54	13.23

Source: Company's data

Free Cash Flow (TWD mn)	2018	2017
Operational Cash Flow	573,954	585,318
Business Net Income	397,510	396,133
Depreciation and Amortization	292,546	260,143
Changes in Working Capital	-61,665	9,979
Others	-54,437	-80,936
Investment Cash Flow	-314,269	-336,165
Capex	-322,500	-335,562
Financial investments & others	8,231	-603
Financial Cash Flow	-245,125	-215,698
Debt change	-37,335	-31,220
Share buyback	10	21
Dividends	-207,443	-181,513
Others	-357	-2,986
Change in free cash flow	14,561	33,456
Foreign exchange	9,862	-21,318
Cash at the end of period	577,815	553,392

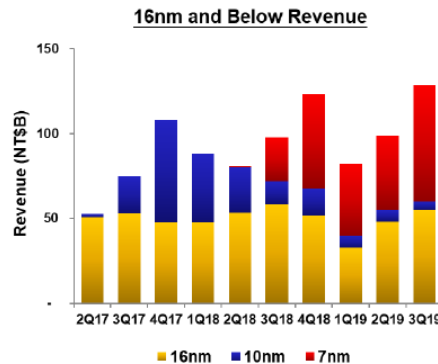
Source: Company's data

Balance Sheet (TWD mn)	2018	2017
Assets	2.090.128	1.991.862
Cash & Equivalents	577.815	553.392
Financial Assets	128.783	119.640
Receivables	129.263	122.488
Inventories	103.231	73.881
Property and equipment	1.072.050	1.062.542
Intangible Assets & Goodwill	17.002	14.175
Other Assets	61.984	45.743
Liabilities	412.632	469.102
Short term Debt	123.695	122.195
Long term Debt	56.900	91.800
Payables	115.944	123.467
Other liabilities	116.093	131.640
Total Shareowner's Equity	1.677.496	1.522.760
Total Equity and Liabilities	2.090.128	1.991.862

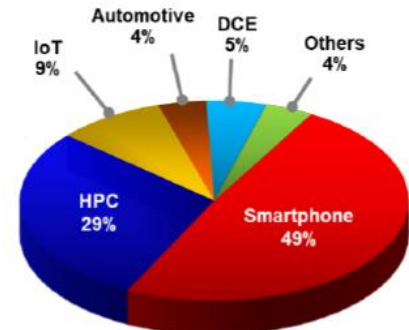
Source: Company's data

Income Statement

Taiwan Semiconductors revenues increased by 5.5% in 2018. Its net income margin was around 34% slightly below 2017 (35%). 63% of its revenue in 2018 came from advanced manufacturing processes (geometries of 28nm or smaller) and is increasing as a % of total in the new technologies:



Source: Company data



Source: Company data

Free Cash Flow

The company generates around TWD 575 bn per year in operational cash flow of which uses around TWD 330 bn for capex, being left TWD 245 bn (USD 8 bn) for dividends and to decrease debt.

Balance Sheet

TSM has a net cash position of around TWD 350 bn, which confers a high degree of security of its balance sheet and its capacity to invest in the business.

Last Earnings (3Q19):

In the 3Q19, the company's revenues rose 12.6% YoY to TWD 293 bn ahead of expectations of analysts and company guidance. Net income was TWD 101.1 bn vs est. TWD 96.16bn. For the 4Q19 the company anticipates revenues around TWD 313 bn. Given that in the first 9 months revenues grew by 1.5% to TWD 752.75 bn, the company is expected to reach TWD 1066 bn this year, rising around 3.5% vs 2018.

Management Team

C.C. Wei (CEO): Holds a Ph.D. in Electrical Engineering from the Yale University in US, and a bachelor in electrical engineering from National Chiao Tung University. Wei has been co-CEO since 2013. Mark Liu (former co-CEO) was elected Chairman, in 2018 when the founder of TSMC, Morris Chang retired. Wei joined TSMC in 1998 after being in ST Microelectronics and Texas Instruments.

In 2018, CEO Wei received from TSMC around USD 8mn, including salary, bonuses and other benefits.



Source: Company's data

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▲ Main Clients

Apple, Huawei, AMD, Broadcom, Hisilicon, Intel, Marvell, Mediatek, Nvidia, NXP, Qualcomm, Sony, Texas Instruments etc.

Communications (56% of revenues): In 2018 smartphone shipments were down 4% (the first decline in history of the market) due to high penetration in several countries and prolonged replacement cycle. TSMC expects this slight decline to continue in 2019. The transition to 5G, innovations in AI, performance and battery should propel sales. Moreover in underdeveloped countries the popularity of low-end smartphones is increasing. The most required features are low power IC and SoC design in which TSMC is the leader.

Computer (14% of revenues): In 2017 this market shrank -3% and in 2018 -1% due to longer replacement cycle and transition to mobile computing, partially offset by growth in business PC and server units. This segment requires lower power and high performance CPUs, GPUs, HDD controllers and ASICs (Application Specific Integrated Circuit, for example for blockchain).

Consumer Electronics (7% of revenues): In 2018, its shipments fell 4% as MP3 players, digital cameras and hand held game consoles are being cannibalized by smartphones. TVs and TV game consoles had a positive growth. Set top boxes declined due to economic uncertainty. It is expected further drops in consumer electronics prices.

Industrial and Standard Products (23% of revenues)**▲ R&D**

Logic <10nm chips: As a company focused on producing chips for big tech players, Taiwan Semiconductors needs to be in the vanguard of innovation.

- **7nm (+35% speed, 3x logic density and -65% reduction in power usage vs 16nm):** In 2018 it achieved that by being the first to ramp up the 7nm technology to high volume. This way it was able to sell its chips for the most advanced smartphones, game consoles, AI, CPUs, GPUs and networking devices.
- **N7+ (+20% greater logic density and 10% power reduction vs 7nm):** In 2019 it expects to produce in high volume the N7+ chip which will be the first commercially available EUV process technology.
- **5nm (+15% speed and -30% power usage vs 7nm):** The company is also developing the 5nm, targeting volume production in the first half of 2020.
- **3nm:** The 3nm chip is in development phase.

Logic >10nm chips:

- **12nm FinFET Compact Technology (12FFC):** This technology begun being mass produced in 2017 following the 16FF+ technology(2015). These technologies serve customers which produce low to mid range mobile phones, consumer electronics, digital TVs and IoT.
- **22nm:** The company is also developing new technologies for the 22nm chips that enhance performance and density. Their 22ULP (ultra low power) and 22ULL (ultra low leakage) are suitable for a wide range of devices like wearables, radio frequency or IoT.
- **Other technologies:** TSMC also produces 28nm, 40nm and 55nm chips.

5G: In 2018 the company produced in volume the first 5G mobile network chip based on 16nm FinFET(fin field-effect transistor).

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Automotive Industry: TSMC 16FF+ technology is in production for customer applications in automotive industry since 2017. The 7nm is also being developed and should be submitted for regulators approval in 2Q19.

OLED Technology: TSMC also launched a world leading 40nm high voltage technology with logic and SRAM density for customers to design more competitive OLED drivers.

Summary of TSMC's Major Future R&D Projects

Project Name	Description	Risk Production (Estimated Target Schedule)
5nm logic technology platform and applications	5 th generation FinFET CMOS technology platform for SoC	2019
Beyond-5nm logic technology platform and applications	6 th generation FinFET CMOS technology platform for SoC	2021
3D IC	Cost-effective solution with better form factor and performance for System-in-Package (SiP)	2018 - 2020
Next-generation lithography	EUV lithography and related patterning technology to extend Moore's Law	2018 - 2020
Long-term research	Specialty SoC technology (including new NVM, MEMS, RF, analog) and transistors for 8 - 10 year out horizon	2018 - 2025

The projects above account for roughly 70% of the total R&D budget for 2019, estimated to be around 9% of 2019 revenue.

Source: Company data

Production

In 2018, TSMC exceeded 12 million 12-inch equivalent wafers production. The company has 3 12-inch wafer GIGAFAB fabs, 4 8-inch wafer fabs and 1 6-inch fab, all in Taiwan. Has 1 12-inch wafer fab belonging to its subsidiary TSMC Nanjing Company Limited, and 2 8-inch wafer fabs in US and China.

Risks

Taiwan elections: On January 11th, the Taiwan elections for the President and Vice President of the region will be held. The incumbents (from the DPP party) may be reelected for another term, however in local elections of 2018, this party suffered a big defeat by failing to retain the 13 cities and counties it previously held, keeping only 5. Tsai Ing-wen one of the leaders of the party is up for re-election and gained some voters by advocating to freedom of the region and people. Xi Jinping, said in a speech that the unification of Taiwan was inevitable. If elections evolve into a conflict with China it may lead to protests like in Hong Kong.

Prohibition of dealing with US companies: If the Trump administration forbids the company from negotiating with Apple or other American companies, revenues may be severely impaired. This scenario however is unlikely, unless China gets more control over the region.

Rating		
Agency	Rating	Outlook
S&P	AA-	STABLE
Moody's	Aa3	STABLE

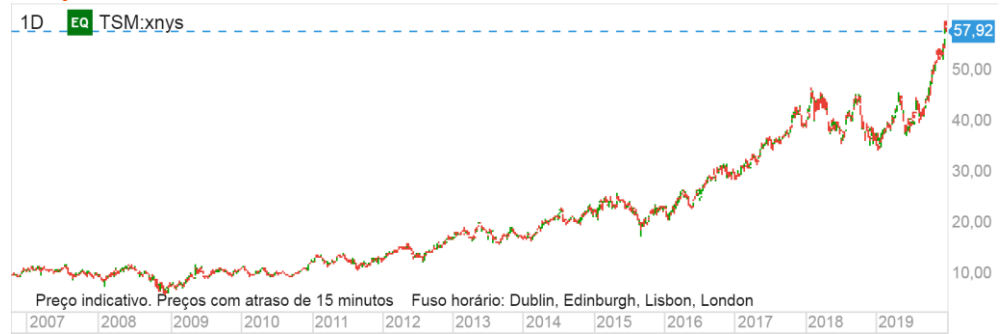
Source: BiG Research

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Graph



Source: BiGlobal Trade (partner Saxo Bank); BiG Research

Calendar

January 11th, 2020: Taiwan elections

January 16th, 2020: 4Q19 earnings

Annex:

Raw material supply:

Raw Materials Supply

Major Materials	Major Suppliers	Market Status	Procurement Strategy
Raw Wafers	FST GlobalWafers SEH Siltronic SUMCO	These 5 suppliers together provide over 90% of the world's raw wafer supply. Each supplier has multiple manufacturing sites in order to meet customer demand, including plants in North America, Asia, and Europe.	<ul style="list-style-type: none"> TSMC's suppliers of silicon wafers are required to pass stringent quality certification procedures. TSMC procures wafers from multiple sources to ensure adequate supplies for volume manufacturing and to appropriately manage supply risk. Raw wafer quality enhancement programs are in place to support TSMC's technology advancement. TSMC regularly reviews the quality, delivery, cost, sustainability and service performance of its wafer suppliers. The results of these reviews are incorporated into subsequent purchasing decisions. A periodic audit of each wafer supplier's quality assurance system ensures that TSMC can maintain the highest quality in its own products. TSMC takes various approaches with suppliers to better manage the cost and supply.
Chemicals	Air Liquide BASF Entegris Fujifilm Electronic Materials Kanto PPC Kuang Ming Merck RASA Shiny Tokuyama Versum Wah Lee	These 12 companies are the major worldwide suppliers of chemicals.	<ul style="list-style-type: none"> Most suppliers have relocated some of their operations closer to TSMC's major manufacturing facilities, thereby significantly improving procurement logistics. All supplied products are regularly reviewed to ensure that TSMC's specifications are met and product quality is satisfactory. TSMC encourages and engages with chemical suppliers to implement innovative green solutions for waste reduction.
Lithographic Materials	3M Azahi Kasei Dow Chemical Fujifilm Electronic Materials JSR Merck Nissan Shin-Etsu Chemical Sumitomo Chemical T.O.K.	These 10 companies are the major worldwide suppliers of lithographic materials.	<ul style="list-style-type: none"> TSMC works closely with suppliers to develop materials that meet all application and cost requirements. TSMC and suppliers periodically conduct programs to improve their quality, delivery, sustainability and green policy, and to ensure continuous progress of TSMC's supply chain. Some major suppliers have relocated or plan to replicate their manufacturing sites closer to TSMC's major manufacturing facilities, thereby significantly improving procurement logistics and reducing supply risks.
Gases	Air Liquide Air Products Central Glass Entegris Linde LienHwa Praxair SK Materials Taiwan Material Technology Taiyo Nippon Sanso Versum	These 10 companies are the major worldwide suppliers of specialty gases.	<ul style="list-style-type: none"> The majority of these suppliers have facilities in multiple geographic locations, which minimizes supply risk for TSMC. TSMC conducts periodic audits to ensure that they meet TSMC's standards.
Slurry, Pad, Disk	3M AGC Cabot Microelectronics Dow Chemical Fujibo Fujifilm Electronic Materials Fujimi Kink Versum	These 9 companies are the major worldwide suppliers of CMP (Chemical Mechanical Polishing) materials.	<ul style="list-style-type: none"> TSMC works closely with suppliers to develop materials that meet all application and cost requirements. TSMC and suppliers periodically conduct programs to improve their quality, delivery, sustainability and green policy, and to ensure continuous progress of TSMC's supply chain. Most suppliers have relocated or plan to replicate some of their manufacturing sites closer to TSMC's major manufacturing facilities, thereby significantly improving procurement logistics and reducing supply risks.

Source: Company data

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