23 March 2020
Equity Research
Asia Pacific | Taiwan

CREDIT SUISSE

Asia Semiconductor Sector

Taiwan Raw Wafers: Another year before demand can catch up to supply

Semiconductor Devices | Sector Forecast

Figure 1: Raw wafer makers' peer valuation comparison

Company	Ticker	Local Price 3/20/2020	Target Local Curcy	Inv'ment Rating	Target upside	Mkt Cap (US$mn)	EPS YoY 2020	EPS YoY 2021	P/E 2020	P/E 2021	P/B 2021	ROE 2021	Dividend yield 2020	Dividend yield 2021
Wafer Makers														
Globalwafers	6488.TWO	$342.50	$450.0	OPFM	31%	$4,943	-5.9%	9.2%	11.7	10.7	2.7	27.4	6.4%	6.0%
Shinetsu	4063.T	$9,075.00	$11,830	NTRL	30%	$34,297	5.5%	2.4%	11.6	11.3	1.2	14.2	2.6%	3.0%
SUMCO	3436.T	$1,076.00	$1,510	NTRL	40%	$2,862	-62.4%	18.3%	26.9	22.8	1.1	6.0	4.6%	4.6%
Siltronic	WAFGn.DE	$54.84	$83.0	NTRL	51%	$1,645	-22.2%	17.9%	9.4	8.0	1.1	14.0	5.5%	6.0%
Wafer Works	6182.TWO	$24.30	$28.5	NTRL	17%	$410	-40.0%	52.9%	16.2	10.6	1.5	11.8	7.2%	4.3%
Formosa SUMCO	3532.TW	$138.00	$105.0	UPFM	-24%	$1,767	-23.6%	65.0%	30.3	18.4	2.8	12.2	3.0%	2.3%
Wafer Maker Median:							**-22.2%**	**17.9%**	**11.7**	**10.7**	**1.2**	**14.0**	**5.5%**	**4.6%**
Wafer Maker Mean:							**-25.0%**	**20.1%**	**15.1**	**12.7**	**1.5**	**14.7**	**5.3%**	**4.8%**

Note: Priced as of 20-Mar-2020. Source: Company data, Credit Suisse estimates

- **Slowing supply not enough to trigger tightness until 2H21.** We update our raw wafer supply-demand model and estimate global 12" raw wafer capacity growth to slow from +8% CAGR in 2017-19 to +3% CAGR in 2020-21E. The demand side in a virus containment scenario would still cyclically rebound from mobile/HPC and memory restocking to +10%/+5% in 2020-21E, implying utilisation to recover from 85-87% in 1Q20E to 95% by 2H21E, and getting back to pricing power only in 2022. For mature nodes, 8" utilisation is low-90% and pricing stable, while 6" utilization is 70-75% and pricing down mildly.
- **Further bare wafer inventory reductions needed to help restore balance.** Although the raw wafer demand should improve, the utilisation recovery could lag as the suppliers reduce output to lower the raw wafer inventory. To draw down 1.5 months inventory at customers, bare wafer shipment growth may only be -2%/+4% YoY in 2020/21E.
- **Pricing on a moderating downtrend, with downside if the coronavirus lingers**. Factoring shipment controls and utilisation still below 90%, we estimate the 12" raw wafer price declines will moderate from -10-15% YoY in 4Q19 to -2-3% YoY by 4Q20. On the downside, coronavirus will impact full year and dampen demand growth to 0%, shipments would decline 10-15%, pricing may be negotiated down another 10-15% for 2021E.
- **LTAs provide resilience.** Globalwafers' sales will be flat with earnings down single digits supported by its new Korea fab from 3Q20 and 80%+ LTA with stable pricing. Formosa SUMCO and WaferWorks have <10% contracted, so would see more pricing pressure. We estimate Formosa SUMCO's sales +5% on memory restocking but earnings down 24% on pricing, and WaferWorks sales flat and earnings down 40% on stable 8" and weak 6".
- **Globalwafers top Taiwan pick, NEUTRAL on Wafer Works and UNDERPERFORM on Formosa SUMCO.** We initiate coverage on Formosa SUMCO with Underperform (TP NT$105.00) based on 8.5x EV/EBITDA (vs 6-19x range) and 14x 2021E P/E with raw wafer spot pricing staying under pressure and valuation high on 2021 earnings, even factoring a potential pricing recovery in 2H21. We also initiate coverage on Wafer Works with Neutral (TP NT$28.50) based on 6x EV/EBITDA (vs. 2-11x range) and 12x 2021 P/E, factoring its high spot market exposure, more competition on 6" from China, and depreciation burden from its 8"/12" expansion. We maintain Outperform on Globalwafers (TP NT$450.00) based on 8.5x EV/EBITDA (vs 4-12x range) with a more stable outlook on high LTA and 7% dividend yield, though near-term is impacted by COVID-19. **Key risk:** softer demand from COVID-19, faster-than-expected China raw wafer capacity ramp.

Research Analysts

Haas Liu
886 2 2715 6365
haas.liu@credit-suisse.com

Randy Abrams, CFA
886 2 2715 6366
randy.abrams@credit-suisse.com

每日免费获取报告

1. 每日微信群内分享7+最新重磅报告；
2. 定期分享华尔街日报、金融时报、经济学人；
3. 和群成员切磋交流，对接优质合作资源；
4. 累计解锁8万+行业报告/案例，7000+工具/模板

申明：行业报告均为公开版，权利归原作者所有，小编整理自互联网，仅分发做内部学习。

手机用户建议先截屏本页，微信扫一扫

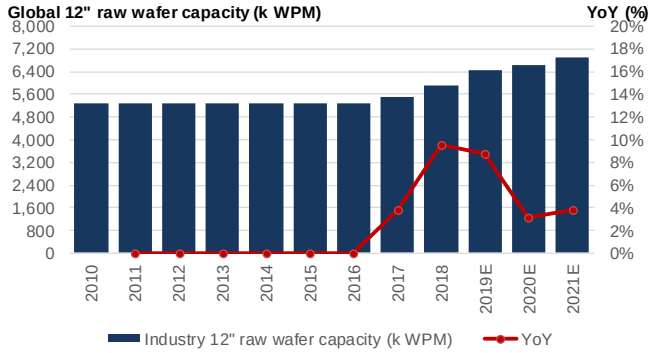
或搜索公众号“尖峰报告”

回复<进群>，加入每日报告分享微信群

限时领取“2020行业资料大礼包”，**关注即可获取**

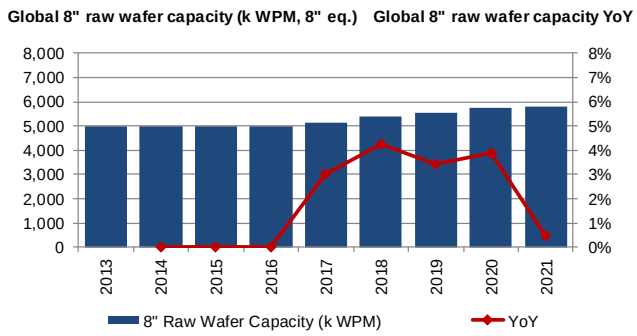
Focus charts and tables

Figure 2: 12" raw wafer capacity growth to slow in 2020-21E



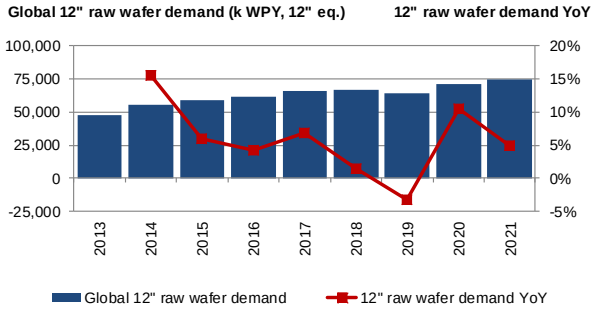
Source: Company data, Credit Suisse estimates

Figure 3: Global 8" raw wafer capacity to slow by 2021E



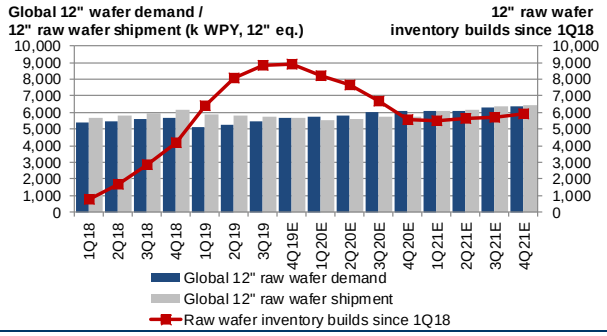
Source: Company data, Credit Suisse estimates

Figure 4: 12" raw wafer demand cyclically rebounding



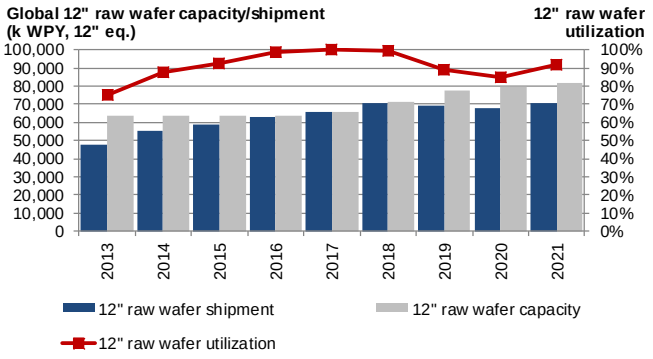
Source: Company data, Credit Suisse estimates

Figure 5: 12" raw wafer inventory needs to deplete in 2020



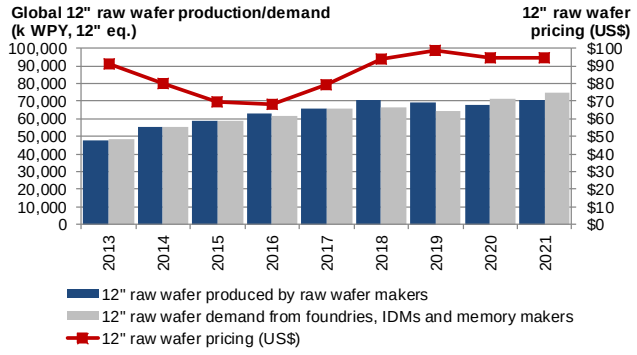
Source: Company data, Credit Suisse estimates

Figure 6: 12" raw wafer UT will take until 2H21 to tighten



Source: Company data, Credit Suisse estimates

Figure 7: Raw wafer pricing may decline modestly in 2020-21E



Source: Company data, Credit Suisse estimates

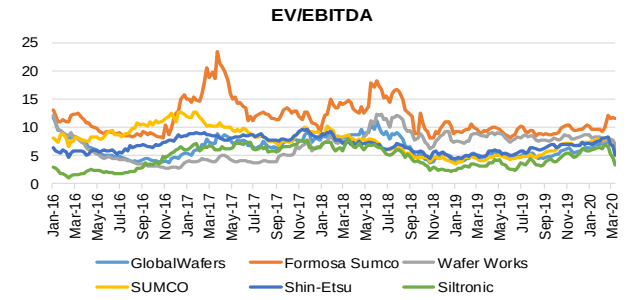
Figure 8: Globalwafers more resilient in a stress scenario

Raw wafer makers' sales	20 Base	20 stress	% downside	21 Base	21 stress	% downside
Globalwafers	$57,005	$50,536	-11%	$63,087	$52,552	-17%
Formosa SUMCO	$12,365	$10,283	-17%	$14,027	$10,765	-23%
Wafer Works	$7,684	$6,322	-18%	$9,467	$7,151	-24%

Raw wafer makers' Earnings	20 Base	20 stress	% downside	21 Base	21 stress	% downside
Globalwafers	$11,864	$10,289	-13%	$13,037	$10,484	-20%
Formosa SUMCO	$1,875	$1,279	-32%	$3,036	$1,573	-48%
Wafer Works	$839	$559	-33%	$1,262	$626	-50%

Source: Company data, Credit Suisse estimates

Figure 9: Raw wafer valuation has been pulling back



Source: Company data, Credit Suisse estimates

Taiwan raw wafers: Another year before demand can catch up to supply

We maintain our view of demand drivers helping the bare wafer sector to gradually recover, although factoring in the consumption impact from the coronavirus outbreak, excess bare wafer inventory at the memory makers, and under-utilisation at the wafer makers, we still do not expect utilisation to tighten until 2H21 and pricing to rebound until 2022. We prefer Globalwafers and maintain an OUTPERFORM with TP of NT$450.00 (reflecting lower earnings from a slower 1H20) due to its better protection with over 80% long-term contracted firm pricing and FCF supporting high yields. We are more conservative on the smaller Taiwan wafer suppliers, Formosa Sumco and Wafer Works, with limited contracts and more exposure to still falling pricing. We initiate coverage on Formosa SUMCO with a NEUTRAL rating (highly exposed to spot market) and Wafer Works with an UNDERPERFORM rating (competition on 6" from China and depreciation from its 8"/12" expansion).

We update our global raw wafer supply-demand model and initiate coverage on Formosa SUMCO with UNDERPERFORM and Wafer Works with NEUTRAL ratings, while maintain OUTPERFORM on GlobalWafers

Raw wafer industry capacity growth to slow in 2020-21

We estimate the 12" raw wafer industry capacity will grow 3% YoY for both 2020 and 2021, mainly driven by Globalwafers and incremental growth from SK Siltron. The 8" capacity will be at a similar CAGR pace of 3-4% in 2020-21 on debottlenecking by major raw wafer suppliers and modest capacity addition by Ferrotec and Wafer Works. Despite still growing capacity, we believe the raw wafer suppliers will continue to keep their utilisation at a lower level to keep raw wafer output more aligned with the inventory depletion and demand growth. Risk from China competition on 8" and 12" may still be at least 2-3 years away due to lack of technology and learning curve, but local players have been ramping production for lower entry barrier 6" wafer, putting the small diameter wafer sector in a structural oversupply.

Global raw wafer capacity growth should be more moderate in 2020-21 following the heavy investment in 2017-19

Product cycles lift demand barring a long virus impact

Compared with low single-digits capacity increase and slower raw wafer shipment growth, raw wafer demand in 2020-21 should be supported by 5G smartphones and data centre, lifting 12" raw wafer demand +10%/+5% in 2020/21E. For 8", despite only mild IDM recovery for automotive/industrial applications, the remaining foundry demand from mobile/consumer offers better drivers, supporting the 8" raw wafer demand to grow mid-single digits YoY in 2020-21E.

Raw wafer demand should also recover with 5G ramp and data centre investment recovery, lowering raw wafer inventory levels and lifting raw wafer makers' utilisation modestly from 2020

Spot pricing still under mild pressure through 2020

Factoring in the shipment controls and utilisation still below 90%, we estimate the 12" raw wafer prices will moderate from 10-15% declines YoY in 4Q19 to 2-3% declines YoY by 4Q20. In a downside case, the coronavirus outbreak will impact full year and dampen demand growth to 0%, shipments would decline 10-15%, and pricing may be negotiated down another 10-15% for 2021, causing a sharper EPS/share price risk. Globalwafers' sales will be flat with earnings down single digits supported by its new Korea fab from 3Q20 and 80%+ LTA with stable pricing. Formosa SUMCO and Wafer Works have <10% contracted, so would see more pricing pressure. We estimate Formosa SUMCO's sales +5% on memory restocking but earnings down 24% on pricing and Wafer Works' sales flat and earnings -40% on stable 8" and weak 6".

Raw wafer pricing should continue to face pressure in 1H20 as utilisation stays below 90% levels before stabilisation in the end of 2020 and a potential recovery in 2H21 as we approach the supply tightness

Globalwafers top Taiwan pick, NEUTRAL on Wafer Works and UNDERPERFORM on Formosa SUMCO

We initiate coverage on Formosa SUMCO with an UNDERPERFORM rating and a target price of NT$105.00 based on 8.5x EV/EBITDA (14x 2021E P/E), with raw wafer spot pricing staying under pressure partially offsetting the shipment recovery in 2020 and valuation already high on 2021 earnings even factoring a potential 2H21 spot pricing recovery. We also initiate coverage on Wafer Works with a NEUTRAL rating and a TP of NT$28.50 based on 6x EV/EBITDA and 12x 2021 P/E, factoring its high spot market exposure, more competition on 6" from China, and depreciation burden from its 8"/12" expansion plan. We maintain OUTPERFORM on Globalwafers with TP of NT$450.00 based on 8.5x EV/EBITDA (vs its 4-12x range) with higher LTA exposure supporting a more stable outlook and 7% dividend yield.

We initiate coverage on Formosa SUMCO with UNDERPERFORM and a TP of NT$105.00, Wafer Works with NEUTRAL and TP of NT$28.50, and maintain OUTPERFORM on Globalwafers

Table of Contents

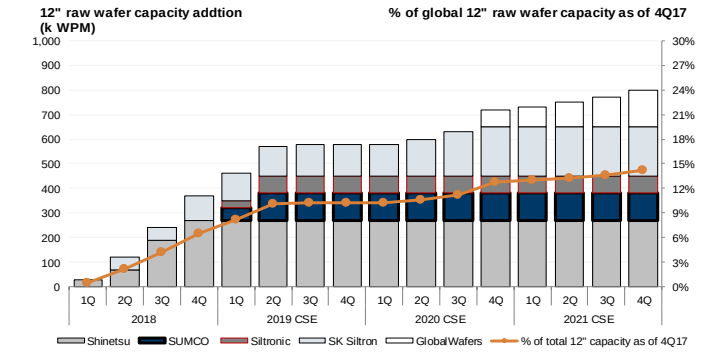
Raw wafer industry capacity growth to slow in 2020-21

We estimate the 12" raw wafer industry capacity will grow 3% YoY for both 2020 and 2021, mainly driven by Globalwafers and incremental growth from SK Siltron. The 8" capacity will be at similar CAGR pace of 3-4% in 2020-21E on debottlenecking by major raw wafer suppliers and modest capacity addition by Ferrotec and Wafer Works. Despite still-growing capacity, we believe raw wafer suppliers will continue to keep their utilisation at a lower level to keep raw wafer output more aligned with the inventory depletion and demand growth. Risk from China competition on 8" and 12" may still be at least 2-3 years away due to lack of technology and learning curve, but local players have been ramping production for lower entry barrier 6" wafer, putting the small diameter wafer sector in a structural oversupply.

Industry capacity expansion for 12" raw wafer to slow down in 2020-21

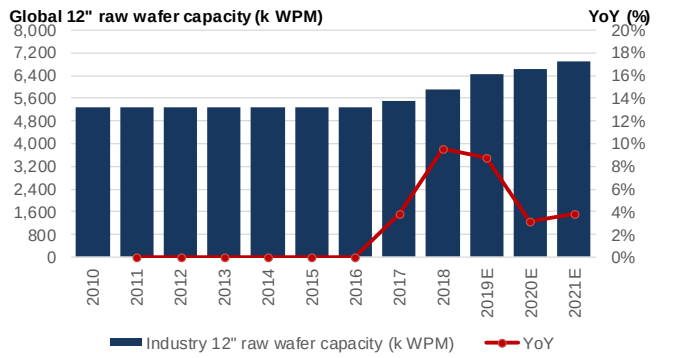
Following a +8%/+9% YoY 12" raw wafer capacity expansion in 2018/19 for the industry, we expect the industry supply increase to slow to 3% CAGR in 2020-21E, as major players adjust the investment plan with utilisation dropping from close to full in 2017-1H18 to 85-90% levels through 2019 due to slowing demand since 2H18. In addition, most of the debottlenecking activities in the existing facilities have been completed.

Figure 10: 12" raw wafer capacity expansion from 2018-21 represents 15% capacity more than 4Q17



Source: Company data, Credit Suisse research

Figure 11: 12" raw wafer capacity should grow at a 3% CAGR



Source: Company data, Credit Suisse research

Based on the recent supply chain feedback, we estimate limited 20k WPM expansion from SK Siltron from 2020 (vs original +50k) and Japanese suppliers will keep their capacity stable. The major 12" raw wafer capacity addition will be from Globalwafers' Korea fab which will start ramping from 3Q20 with full potential of 170-180k WPM capacity, putting global 12" raw wafer capacity on track to grow by 15% from 2018-21.

Semiconductor makers' capacity expansion will accelerate in 2020-21 across logic and memory

For semiconductor makers' capacity, we expect growth, on the other hand, will accelerate to +5%/+4% YoY in 2020/21 following a slower 2019 (+1%), supported by unit and content growth opportunity from 5G infrastructure and smartphone ramp and data centre demand recovery. We discuss the capacity expansion by foundries, memory makers and IDMs below.

Foundries (30-35% of global 12" capacity): The capacity expansion will be the key driver for growth in 2020 (50% of the semiconductor capacity growth) led by TSMC as it builds out to 80k WPM for 5nm ramp in 2021 and 20-30k additional capacity for 7nm to support its 5G and HPC products migrating to that node. Tier 2 foundries, including Samsung and UMC, will also

add capacity to support growing demand on the mature nodes from CIS, ISP, connectivity chipsets and OLED driver IC. In China foundries, SMIC will continue to grow its capacity to support its growth on 55nm, 40nm and 28nm and 14nm ramp, while Hua Hong is also ramping its Wuxi 12" fab for power IC and embedded memory applications.

Figure 12: Global 12" wafer fab capacity to resume mid-single digit growth in 2020-21

12" foundry (12" equivalent)	1Q19	2Q19	3Q19	4Q19E	1Q20E	2Q20E	3Q20E	4Q20E	2013	2014	2015	2016	2017	2018	2019	2020	2021
TSMC	789	769	769	769	789	829	854	854	4,620	5,418	6,345	7,245	8,100	9,024	9,288	9,978	10,293
GlobalFoundries	238	248	248	248	248	248	248	248	1,494	1,560	1,800	2,070	2,310	2,586	2,946	2,976	2,976
Samsung	400	400	400	400	400	400	420	420	1,866	1,740	1,608	4,350	4,335	4,695	4,800	4,920	5,220
UMC	146	148	152	184	188	192	197	198	1,200	1,271	1,364	1,476	1,605	1,733	1,891	2,325	2,481
SMIC	93	97	97	100	102	104	107	111	544	600	627	870	1,112	1,113	1,161	1,272	1,467
Others	108	108	109	77	82	85	86	92	945	1,002	1,080	1,122	1,208	1,275	1,204	1,035	1,195
Foundry 12" capacity (k WPM, 12" equivalent)	**1,508**	**1,574**	**1,701**	**1,705**	**1,723**	**1,714**	**1,801**	**1,805**	**10,669**	**11,591**	**12,824**	**14,511**	**16,063**	**17,455**	**19,464**	**21,128**	**21,851**
QoQ	-1%	4%	8%	0%	1%	-1%	5%	0%		9%	11%	13%	11%	9%	12%	9%	3%
Major 12" IDM (12" equivalent)	**1Q19**	**2Q19**	**3Q19**	**4Q19E**	**1Q20E**	**2Q20E**	**3Q20E**	**4Q20E**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Intel	283	288	293	298	305	312	319	326	2,210	2,337	2,420	2,442	2,629	3,162	3,492	3,792	3,918
Powerchip Technology	143	150	158	165	174	182	192	201	1,170	1,088	1,238	1,238	1,299	1,521	1,848	2,247	2,731
Texas Instruments	107	107	107	107	107	107	107	107	998	1,213	1,257	1,277	1,284	1,284	1,284	1,284	1,284
Sony Semiconductor	74	76	79	81	84	86	89	91	687	449	379	516	694	827	931	1,048	1,180
Winbond Group	24	24	24	24	24	24	24	24	449	452	494	524	378	288	288	288	288
Infineon	26	26	27	28	29	30	30	31	150	116	87	152	230	284	320	360	405
STMicroelectronics	20	20	20	20	20	20	20	20	166	166	166	166	212	240	240	240	240
Renesas Semiconductor Manufacturing	14	14	14	14	14	14	14	14	168	168	168	168	168	168	168	168	168
Others	13	13	13	13	13	13	13	13	144	144	144	146	155	159	159	159	159
IDM 12" capacity (k WPM / WPY, 12" equivalent)	**624**	**635**	**645**	**656**	**668**	**680**	**692**	**706**	**6,142**	**6,132**	**6,352**	**6,628**	**6,862**	**7,213**	**7,681**	**8,236**	**8,897**
QoQ / YoY	2%	2%	2%	2%	2%	2%	2%	2%		0%	4%	4%	4%	5%	6%	7%	8%
NAND supplier 12" capacity (12" equivalent)	**1Q19**	**2Q19**	**3Q19**	**4Q19E**	**1Q20E**	**2Q20E**	**3Q20E**	**4Q20E**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Samsung	465	450	445	440	440	440	435	435	4,020	3,921	4,380	4,980	5,265	5,880	5,400	5,250	5,730
Hynix	245	235	205	205	200	200	200	200	1,680	1,710	2,160	2,550	2,820	3,120	2,670	2,400	2,835
Micron	235	235	235	250	250	250	250	250	2,280	2,805	2,931	2,895	3,060	2,850	2,865	3,000	3,000
Toshiba	400	375	330	500	500	500	500	500	4,380	4,935	5,355	5,880	5,880	5,985	4,815	6,000	6,000
YMTC	10	10	10	20	25	30	40	50	0	0	0	0	0	75	150	435	600
NAND supplier capacity (k WPM / WPY, 12" equivalent)	**1,355**	**1,305**	**1,225**	**1,415**	**1,415**	**1,420**	**1,425**	**1,435**	**12,360**	**13,371**	**14,826**	**16,305**	**17,025**	**17,910**	**15,900**	**17,085**	**18,165**
QoQ / YoY	-11%	-4%	-6%	16%	0%	0%	0%	1%		8%	11%	10%	4%	5%	-11%	7%	6%
DRAM supplier 12" capacity (12" equivalent)	**1Q19**	**2Q19**	**3Q19**	**4Q19E**	**1Q20E**	**2Q20E**	**3Q20E**	**4Q20E**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Samsung	465	460	455	455	465	465	465	465	4,371	4,515	4,356	4,410	4,470	5,070	5,505	5,580	5,685
Hynix	345	350	350	350	340	335	335	335	3,048	3,135	2,916	3,006	3,270	3,945	4,185	4,035	4,185
Micron	350	340	338	335	340	345	345	345	4,197	3,933	3,729	3,840	4,035	4,161	4,089	4,125	4,245
Nanya Tech	73	71	70	70	72	73	75	75	705	633	711	717	714	828	852	885	900
Powerchip	52	46	48	52	49	52	55	54	450	684	660	615	621	657	594	630	648
Winbond	26	26	27	27	27	27	27	27	207	249	312	282	300	306	318	324	324
CXMT	0	0	0	0	1	1	4	4	0	0	0	0	0	0	0	30	48
DRAM supplier capacity (k WPM / WPY, 12" equivalent)	**1,311**	**1,293**	**1,288**	**1,289**	**1,294**	**1,298**	**1,306**	**1,305**	**12,978**	**13,149**	**12,684**	**12,870**	**13,410**	**14,967**	**15,543**	**15,609**	**16,035**
QoQ / YoY	0%	-1%	0%	0%	0%	0%	1%	0%		1%	-4%	1%	4%	12%	4%	0%	3%
Major foundry/IDM/memory 12" capacity (k WPM / WPY)	**1Q19**	**2Q19**	**3Q19**	**4Q19E**	**1Q20E**	**2Q20E**	**3Q20E**	**4Q20E**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
12" capacity																	
Foundry	1,508	1,574	1,701	1,705	1,723	1,714	1,801	1,805	10,669	11,591	12,824	14,511	16,063	17,455	19,464	21,128	21,851
IDM	624	635	645	656	668	680	692	706	6,142	6,132	6,352	6,628	6,862	7,213	7,681	8,236	8,897
NAND	1,355	1,305	1,225	1,415	1,415	1,420	1,425	1,435	12,360	13,371	14,826	16,305	17,025	17,910	15,900	17,085	18,165
DRAM	1,311	1,293	1,288	1,289	1,294	1,298	1,306	1,305	12,978	13,149	12,684	12,870	13,410	14,967	15,543	15,609	16,035
Test wafer	875	875	875	875	875	875	875	875	10,331	10,331	10,331	10,331	10,331	10,451	10,504	10,504	10,504
Others	133	130	128	125	111	111	111	111	2,920	2,920	2,920	2,920	2,695	1,705	1,544	1,332	1,200
Global 12" capacity (k WPM / WPY, 12" equivalent)	**5,806**	**5,811**	**5,863**	**6,065**	**6,086**	**6,098**	**6,211**	**6,237**	**55,399**	**57,493**	**59,936**	**63,564**	**66,386**	**69,701**	**70,635**	**73,894**	**76,651**
QoQ	-2%	0%	1%	3%	0%	0%	2%	0%									
YoY	3%	1%	0%	2%	5%	5%	6%	3%	2%	4%	4%	6%	4%	5%	1%	5%	4%
Global 12" Raw Wafer Capacity (12" equivalent, k WPM / WPY)	**1Q19**	**2Q19**	**3Q19**	**4Q19E**	**1Q20E**	**2Q20E**	**3Q20E**	**4Q20E**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Shinetsu	1,943	1,952	1,960	1,969	1,977	1,986	1,994	2,003	12,682	14,181	15,857	17,732	19,828	21,365	23,471	23,879	24,295
SUMCO	1,642	1,710	1,718	1,726	1,734	1,742	1,751	1,759	11,118	12,432	13,902	15,545	17,382	18,730	20,390	20,958	21,353
Siltronic	930	975	979	984	989	993	998	1,002	6,288	7,031	7,862	8,791	9,831	10,593	11,607	11,946	12,170
SK Siltron	898	912	926	930	931	951	951	951	5,858	6,550	7,325	8,190	9,159	9,869	10,996	11,356	11,450
GlobalWafers + SunEdison	800	804	808	812	816	820	870	900	5,546	6,201	6,934	7,754	8,670	9,343	9,672	10,220	11,372
Mimasu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Others	104	104	105	105	106	106	107	107	723	809	904	1,011	1,130	1,218	1,252	1,277	1,303
12"	**6,317**	**6,457**	**6,496**	**6,526**	**6,553**	**6,599**	**6,671**	**6,723**	**63,600**	**63,600**	**63,600**	**63,600**	**66,000**	**71,118**	**77,387**	**79,636**	**81,943**
QoQ / YoY	2%	2%	1%	0%	0%	1%	1%	1%	0%	0%	0%	0%	4%	8%	9%	3%	3%

Source: Company data, Gartner, SEMI, TrendForce, Credit Suisse estimates

Memory makers (50-55% of global 12" capacity): The capacity growth should also accelerate from late 2020 through 2021, supported by tighter DRAM supply and offset the effective capacity loss during technology migration. We expect the capacity increase from major players in DRAM (Samsung, Micron and Hynix) and NAND (Samsung, Micron, Toshiba and Hynix) to still be the main driver in the segment, while China NAND supplier YMTC will also gradually ramp its output to support domestic demand and the government's initiative on semiconductor production localisation.

IDMs (10-15% of global 12" capacity): The expansion will be keyed by Intel's growth to solve the current supply tightness for its desktop and server CPU on 14nm while preparing for 10nm migration and support its discrete graphic business, lifting its capacity up 8%/3% in 2020/21. Other major IDMs, including TI and ON Semi, in the past year also announced their

plan to expand their capacity to support internal production, while Powerchip in China will also add more 12" capacity to support growth in display driver IC and other applications on mature nodes, supporting +7%/+8% IDM 12" capacity growth.

8" raw wafer capacity expansion will stay mild

Compared with the fast 12" expansion in the past few years, the capacity expansion for 8" raw wafer has been more modest and tracks closely to demand growth. The major expansion since 2017 has been Globalwafers and Ferrotec's partnership in Shanghai at 100k WPM and incremental adds by major suppliers through debottlenecking.

For 2020-21, we estimate global 8" raw wafer capacity supply to grow at 3%/4% YoY in 2020/21, close to the semiconductor makers' capacity expansion. The 8" raw wafer expansion from major suppliers will include Ferrotec's plan in Hangzhou China for 350k WPM by the end of 2021 (6% of industry supply), though the company has turned more conservative on the timeframe due to modest oversupply and additional financing required for its new 12" raw wafer fab in China. Wafer Works also has plans to add 8" capacity in Zhengzhou, though it has been delaying the ramp-up with major plans announced to have been pushed. In addition to the established players, China players (e.g., AST, Zhonghuan) also have ambitious targets on adding 8" raw wafer capacity. However, the production still needs to be proven for both technology and quality over the next few years and will have limited impact on industry supply through 2021.

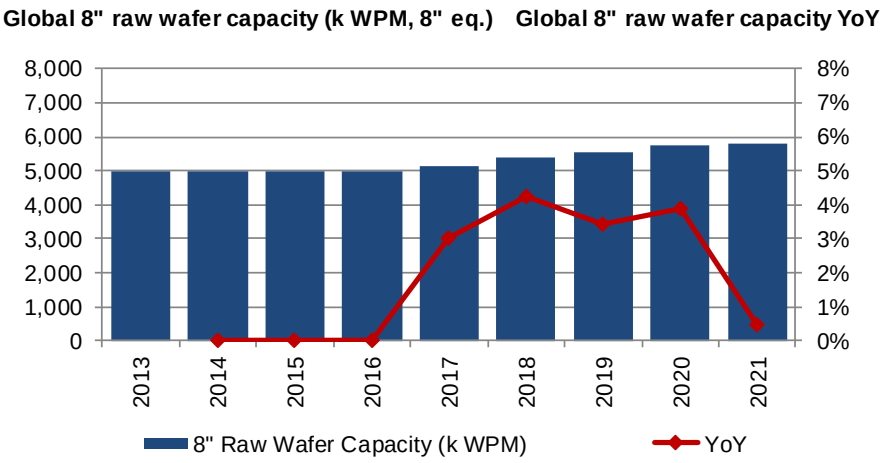
Figure 13: Global 8" wafer fab capacity will grow low single digits

8" foundry 8" equivalent)	1Q19	2Q19	3Q19	4Q19E	1Q20E	2Q20E	3Q20E	4Q20E	2013	2014	2015	2016	2017	2018	2019	2020
TSMC	537	540	543	546	547	550	553	556	5,736	5,886	6,018	6,138	6,258	6,378	6,498	6,618
TowerJazz	147	147	147	147	147	147	147	147	1,424	1,446	1,446	1,750	1,827	1,764	1,764	1,764
Dongbu Hitek	118	118	118	118	118	118	118	118	1,128	1,211	1,373	1,440	1,425	1,416	1,416	1,416
UMC	301	306	309	387	392	395	397	397	3,154	3,210	3,313	3,424	3,457	3,547	3,905	4,745
Samsung	530	530	530	530	530	530	530	530	6,780	6,361	6,361	6,361	6,361	6,361	6,361	6,361
SMIC	212	214	214	214	214	214	214	214	1,503	1,608	1,698	2,037	2,376	2,436	2,566	2,572
Vanguard	203	211	210	210	234	245	254	255	1,626	1,836	2,139	2,247	2,343	2,397	2,502	2,964
CSMC	66	68	69	70	72	73	75	76	458	540	636	627	675	757	819	887
Hua Hong	175	175	177	177	181	181	181	181	1,488	1,533	1,632	1,815	1,944	2,058	2,112	2,172
GlobalFoundries	160	160	160	160	130	130	130	130	1,920	1,920	1,920	1,920	1,920	1,920	1,920	1,560
Others	110	110	110	110	110	110	110	110	1,067	1,080	1,272	1,365	1,334	1,320	1,320	1,320
Major foundry 8" capacity (k WPM / WPY, 8" equivalent)	**2,669**	**2,689**	**2,697**	**2,779**	**2,785**	**2,804**	**2,819**	**2,825**	**27,349**	**27,710**	**29,079**	**30,489**	**31,253**	**31,674**	**32,503**	**33,699**
QoQ / YoY	0%	1%	0%	3%	0%	1%	1%	0%		1%	5%	5%	3%	1%	3%	4%
8" IDM (8" equivalent)	**1Q19**	**2Q19**	**3Q19**	**4Q19E**	**1Q20E**	**2Q20E**	**3Q20E**	**4Q20E**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Infineon	348	348	348	348	348	348	348	348	2,625	3,618	4,176	4,176	4,176	4,176	4,176	4,176
Texas Instruments	271	271	271	271	271	271	271	271	3,185	3,252	3,252	3,252	3,252	3,252	3,252	3,252
Mitsubishi	150	150	150	150	150	150	150	150	1,523	1,755	1,800	1,800	1,800	1,800	1,800	1,800
Renesas Semiconductor Manufacturing	136	136	136	136	136	136	136	136	1,608	1,623	1,632	1,632	1,632	1,632	1,632	1,632
NXP Semiconductors	133	133	133	133	133	133	133	133	1,526	1,526	1,571	1,598	1,598	1,598	1,598	1,598
MagnaChip Semiconductor	117	117	117	117	117	117	117	117	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Rohm	104	104	104	104	104	104	104	104	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248
ON Semiconductor	101	103	105	107	109	111	114	116	895	922	970	1,018	1,073	1,151	1,246	1,349
Others	947	947	947	947	947	947	947	947	12,518	11,851	11,390	12,973	12,273	11,360	11,360	11,360
Major IDM 8" capacity (k WPM, 8" equivalent)	**2,307**	**2,309**	**2,311**	**2,313**	**2,315**	**2,317**	**2,319**	**2,322**	**26,531**	**27,199**	**27,443**	**29,101**	**28,457**	**27,622**	**27,717**	**27,819**
QoQ / YoY	0%	0%	0%	0%	0%	0%	0%	0%		3%	1%	6%	-2%	-3%	0%	0%
Major foundry/IDM/memory 8" capacity (k WPM)	**1Q19**	**2Q19**	**3Q19**	**4Q19E**	**1Q20E**	**2Q20E**	**3Q20E**	**4Q20E**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Foundry	2,669	2,689	2,697	2,779	2,785	2,804	2,819	2,825	27,349	27,710	29,079	30,489	31,253	31,674	32,503	33,699
IDM	2,307	2,309	2,311	2,313	2,315	2,317	2,319	2,322	26,531	27,199	27,443	29,101	28,457	27,622	27,717	27,819
Memory	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Test wafers	719	719	719	719	725	725	725	725	4,965	5,213	6,925	5,738	7,271	8,368	8,622	8,699
Global 8" capacity (k WPM, 8" equivalent)	**5,694**	**5,716**	**5,726**	**5,811**	**5,825**	**5,846**	**5,863**	**5,871**	**58,844**	**60,122**	**63,447**	**65,328**	**66,981**	**67,663**	**68,842**	**70,217**
QoQ	0%	0%	0%	2%	0%	0%	0%	0%		2%	6%	3%	3%	1%	2%	2%
YoY	1%	1%	1%	2%	3%	2%	3%	1%								
Global 8" Raw Wafer Capacity (8" equivalent, k WPM / WPY)	**1Q19**	**2Q19**	**3Q19**	**4Q19E**	**1Q20E**	**2Q20E**	**3Q20E**	**4Q20E**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
8"	5,555	5,555	5,555	5,555	5,770	5,770	5,770	5,770	60,000	60,000	60,000	60,000	61,800	64,440	66,660	69,240
Global capacity/ raw wafer capacity	**1Q19**	**2Q19**	**3Q19**	**4Q19E**	**1Q20E**	**2Q20E**	**3Q20E**	**4Q20E**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
8"	103%	103%	103%	105%	101%	101%	102%	102%	98%	100%	106%	109%	108%	105%	103%	101%

Source: Company data, Gartner, SEMI, TrendForce, Credit Suisse estimates

For the 8" semiconductor players, we expect industry capacity growth to also stay modest due to limited equipment supply for new capacity ramp up. The capacity increase for one player is through acquiring the fabs or second-hand equipment from others (e.g., Vanguard's acquisition of GlobalFoundries' Singapore fab earlier this year) or debottlenecking. We estimate the capacity for global 8" semiconductor makers to only grow at a 2% CAGR in 2020-21, following a similar trend to that in 2017-19.

Figure 14: Global 8” raw wafer capacity should be limited in 2020-21



Source: Company data, Credit Suisse estimates

China competition on 8” and 12” still a few years away

Although China has stayed aggressive on building the local semiconductor ecosystem since 2014 across foundries, IC design, back-end and equipment/material, we believe its current progress in the raw wafer sector is limited to 6” and below, while it will take an additional 2-3 years for the technology to catch up on 8” raw wafer production and 3-5 years on 12”. The local supply chain has been planning the capacity ramp schedule and made investments but we believe most of the new 8” and 12” raw wafer capacity additions in China will still come from its overseas peers. We estimate the raw wafer capacity addition in China will add 7%/2% of global 8”/12” raw wafer capacity by the end of 2021, already reflected in our global raw wafer supply-demand model.

Figure 15: 8” raw wafer capacity growth in China will add 7% of global supply by the end of 2021, mainly driven by overseas players’ expansion

8" raw wafer capacity expansion in China (k WPM)				Planned	Planned progress			Effective
Company	Projects	Location	Investment (RMB bn)	8" capacity	End of 2019	End of 2020	End of 2021	End of 2021
AST	Chongqing	Chongqing	5	500	0	50	150	15
ChangFong	Sichuan	Sichuan	5	100	0	0	0	0
GRINM	Phase 1	Dezhou	1.8	150	0	0	30	0
Zhonghuan	Phase 1	Wuxi	10	750	0	150	300	30
ZJJRH	Quzhou	Quzhou	5	400	0	100	200	20
Ferrotec	HanZhou JV	Hanzhou	6	350	0	180	350	150
	Phase 1	Ningxia	3.1	150	0	0	0	0
	Phase 2	Ningxia	6	350	0	0	0	0
WaferWorks	Zhengzhou	Zhengzhou	5.7	200	101	150	200	200
Total China - domestic				1,900	0	300	680	65
Total China - overseas				1,050	101	330	550	350
Total China				**2,950**	**101**	**630**	**1230**	**415**
% of global capacity				**51%**	**2%**	**11%**	**21%**	**7%**

Source: Company data, Credit Suisse estimates

Our recent update from the supply chain suggests that China players have been aggressive on building facilities to grow their raw wafer capacity to lift self-sufficiency, with key local players including Zhonghuan Huanxin, Zing Semi and AST. Based on Zhonghuan’s plan in 2019, the company plans to invest Rmb20 bn on its Yixin mega fab, with a maximum of 1mn WPM 8” capacity (300-350k in fab 1, 2 and fab 3 each for phase 1) and 600k WPM 12” capacity (150-200k WPM in Phase 1 and another 300-400k WPM in Phase 2). The 8” capacity in the Yixin fab will start sampling from 3Q19 while 12” capacity will start sampling from early 2020 to reach its target of 500k WPM 8” capacity and 150k WPM 12” capacity by end-2020. Zing

Semi, on the other hand, only focuses on 12" raw wafer expansion and targets to have 300k WPM in its Shanghai facilities by the end of 2020 and has room for another 300k WPM.

The total raw wafer capacity expansion plan from Zhonghuan and Zing Semi could add as much as 15%/20% to current global 8"/12" capacity, if they can successfully ramp the projects, putting the industry at a risk of severe oversupply. However, we believe the production yield, technology and qualification remain the gap for local companies to compete in the global market. We note the companies' production yield and quality on 8" raw wafers are still a few years behind their overseas peers. For 12" raw wafer plans, the companies have been pushing the timing of qualification and production due to low yield and worsening ROI from the industry pricing erosion since 2H18.

Figure 16: China players are aggressive on 12" raw wafer supply but effective capacity will be limited

12" raw wafer capacity expansion in China (k WPM)				Planned	Planned progress			Effective
Company	Projects	Location	Investment (RMB bn)	12" capacity	End of 2019	End of 2020	End of 2021	End of 2021
Anhui Yixin	Anhui	Anhui	3	150	0	0	0	0
AST	Shanghai	Shanghai	10	300	0	50	150	15
	Chongqing	Chongqing	5	50	0	0	0	0
	Chengdu	Chengdu	5	500	0	0	0	0
ChangFong	Sichuan	Sichuan	5	400	0	0	0	0
Eswin Silicon Wafer	Xian	Xian	11	500	0	0	0	0
GRINM	Phase 2	Dezhou	6.2	300	0	0	0	0
Sino Crystal Jiaxing	Phase 1	Jiaxing	6	400	0	0	0	0
	Phase 2	Jiaxing	5	600	0	0	0	0
TSI Semiconductor	Guanxi	Guanxi	20	1,200	0	0	0	0
Zing Semi	Phase 1	Shanghai	2.3	150	150	150	150	30
	Phase 2	Shanghai	4.5	450	50	150	250	15
Zhonghuan	Phase 1	Wuxi	10	150	0	20	150	15
	Phase 2	Wuxi	10	350	0	0	50	0
ZJJRH	Quzhou	Quzhou	5	150	0	0	0	0
Ferrotec	HanZhou JV	Hanzhou	6	200	0	30	30	30
	Phase 2	Ningxia	6	200	0	0	0	0
WaferWorks	Zhengzhou	Zhengzhou	5.7	200	0	10	45	45
Total China - domestic				5,650	200	370	750	75
Total China - overseas				600	0	40	75	75
Total China				**6,250**	**200**	**410**	**825**	**150**
% of global capacity				**89%**	**3%**	**6%**	**12%**	**2%**

Source: Company data, Credit Suisse estimates

Our feedback across the supply chain also noted that the relatively low technology reliability and limited track record of China raw wafer makers keep them away from winning orders from major foundries, IDMs and memory makers. For the domestic market, their raw wafers will only be used for testing purpose in the next 2-3 years, while it will take a few additional years for local players to secure sizeable 8" and 12" raw wafer orders as reliable second or third sources for their customers.

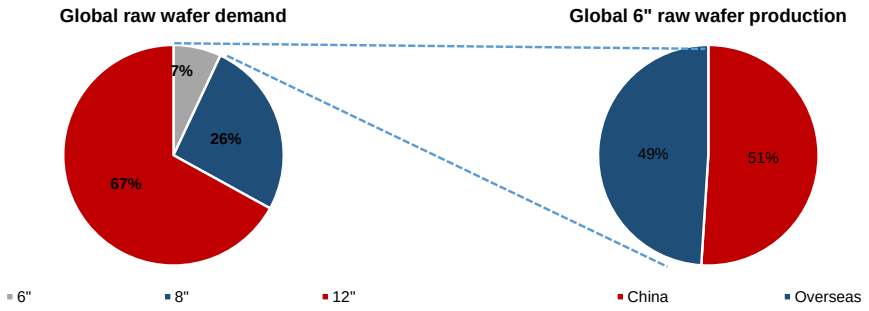
Higher risk on 6" raw wafer supply-demand outlook

Compared with the higher technology barrier and more consolidated 8" and 12" raw wafer supply, the 6" raw wafer industry has been more fragmented and oversupply has persisted even during the past upcycle for the 8" and 12" raw wafer from 2H16-18. The 6" raw wafer demand has also been declining due to continued IDM outsourcing and migration from 6" and below to 8"/12" for both logic IDMs and specialty process manufacturing for more efficient cost structure. The investment from major raw wafer suppliers on 6" equipment addition and debottlenecking has also been limited due to deteriorating ROI.

However, with the initiative to support domestic semiconductor industry growth, China players have been adding excess 6" raw wafer capacity and improving the quality and production yield in the past three years. Compared with the 8" and 12" raw wafer industry with a more balanced supply-demand outlook, we believe the 6" raw wafer industry will continue to stay in oversupply

structurally and the fierce competition from Chinese players will further drag down the pricing outlook for players with higher 6" exposure.

Figure 17: China is growing its importance in supplying 6" raw wafers



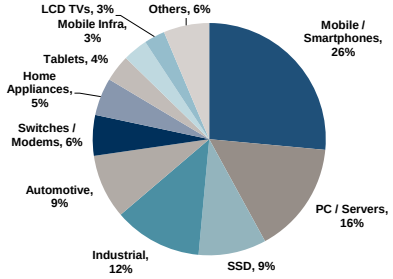
Source: Company data, Credit Suisse estimates

With most of 6" and below equipment having been fully depreciated for major raw wafer suppliers, we expect them to continue to shift their focus to 8" and 12", while keeping their 6" business at a stable level through only taking high-margin automotive/industrial business from their IDM customers, sustaining the sales and margins outlook.

Product cycles lift demand barring a long virus impact

Compared with low single-digits capacity increase and slower raw wafer shipment growth, raw wafer demand in 2020-21 should be supported by 5G smartphones and data centre, lifting 12" raw wafer demand +10%/+5% in 2020/21. For 8", despite only mild IDM recovery (40-45% of 8" raw wafer consumption) for broad-based automotive/industrial applications, the remaining foundry demand from mobile/consumer offers better drivers, supporting 8" raw wafer demand to grow mid-single digits YoY in 2020-21. In the event the coronavirus outbreak impacts the full year and dampens demand growth to 0%, shipments would need to decline 10-15% to keep inventory from building and pricing may drop another 10-15% for 2021 on the drop to sub-80% utilisation, causing a sharper EPS/share price risk.

Figure 18: Demand drivers for wafers (all sizes)—phones and computing is over 50% of demand



Source: Company data, Credit Suisse estimates

Following a slow 2019, we expect a positive outlook for 2020-21 growth drivers from: (1) 5G ramps (CS at 250/500 mn for 2020/21) led by Apple, China, and also lifting infrastructure spend, (2) IoT momentum continuing from wearables and audio, (3) data centre demand staying robust, (4) auto/industrial semis improving after undershipping demand the past year, (5) high-end graphics refresh coupled with new game console launches and even modest bitcoin activity resuming, (6) inventory down from peak, and (7) the US tariffs on China tech imports on hold. The positive outlook showed up in good 4Q sales, above seasonal 1Q20 outlook and a low base in 1H19 sets up easy growth compares in 2020, particularly with product cycle tailwinds. We would still monitor Huawei risks from further restrictions/export weakness but see other drivers as offsets. In addition, the coronavirus spread into 2H20 across the US and Western Europe may also impact the magnitude of the build for these products.

Figure 19: Semis 2H20 should rebound with a virus containment
(in mn, unless otherwise stated)

Asian Upstream sales	1Q19	2Q19	3Q19	4Q19	1Q20	2Q20	3Q20	4Q20	2013	2014	2015	2016	2017	2018	2019	2020
Foundry	$9,189	$10,126	$12,127	$13,335	$12,836	$13,051	$13,808	$13,820	$26,913	$32,857	$34,430	$38,977	$42,332	$43,996	$44,776	$53,514
QoQ	-22.4%	10.2%	19.8%	10.0%	-3.7%	1.7%	5.8%	0.1%	15.0%	22.1%	4.8%	13.2%	8.6%	3.9%	1.8%	19.5%
Back-end	$4,749	$4,857	$6,046	$6,089	$5,367	$5,539	$6,333	$6,412	$15,691	$17,647	$18,101	$18,965	$21,085	$21,652	$21,742	$23,651
QoQ	-19.3%	2.3%	24.5%	0.7%	-11.9%	3.2%	14.3%	1.2%	8.7%	12.5%	2.6%	4.8%	11.2%	2.7%	0.4%	8.8%
Upstream sales (US$)	13,938	14,983	18,173	19,424	18,203	18,590	20,141	20,231	$42,604	$50,504	$52,531	$57,942	$63,418	$65,648	$66,518	$77,165
QoQ	-21.4%	7.5%	21.3%	6.9%	-6.3%	2.1%	8.3%	0.4%	12.6%	18.5%	4.0%	10.3%	9.5%	3.5%	1.3%	16.0%

Semi Customer sales	1Q19	2Q19	3Q19	4Q19	1Q20	2Q20	3Q20	4Q20	2013	2014	2015	2016	2017	2018	2019	2020
Fabless/IDM Customers	11,672	12,218	12,592	12,340	11,723	13,130	14,837	14,688	$40,564	$42,932	$42,398	$44,562	$48,379	$51,845	$48,822	$54,378
QoQ	-7.3%	4.7%	3.1%	-2.0%	-5.0%	12.0%	13.0%	-1.0%	4.6%	5.8%	-1.2%	5.1%	8.6%	7.2%	-5.8%	11.4%

Downstream units	1Q19	2Q19	3Q19	4Q19	1Q20	2Q20	3Q20	4Q20	2013	2014	2015	2016	2017	2018	2019	2020
Smartphone units	313.0	332.2	358.3	359.5	320.1	338.2	369.0	374.6	1,019	1,303	1,438	1,544	1,465	1,403	1,363	1,402
QoQ	-16.1%	6.1%	7.9%	0.3%	-11.0%	5.7%	9.1%	1.5%	40.5%	27.9%	10.3%	7.3%	-5.1%	-4.3%	-2.8%	2.9%
TV units	66.8	68.1	70.2	71.6	68.0	70.7	72.8	72.8	205	225	221	230	267	278	277	284
QoQ	-4.0%	2.0%	3.0%	2.0%	-5.0%	4.0%	3.0%	0.0%	0.7%	10.1%	-1.8%	3.7%	16.1%	4.2%	-0.4%	2.8%
Tablet units	44.7	43.8	45.2	47.4	41.7	40.9	42.1	44.2	259	274	242	228	201	195	181	169
QoQ	-12.0%	-2.0%	3.0%	5.0%	-12.0%	-2.0%	3.0%	5.0%	63.3%	5.9%	-11.6%	-5.9%	-11.9%	-2.7%	-7.2%	-6.7%
PC units	57.7	63.6	69.2	69.8	59.2	62.1	66.3	66.8	316	307	281	258	255	254	260	254
QoQ	-13.7%	10.2%	8.7%	0.9%	-15.2%	5.0%	6.7%	0.7%	-10.9%	-2.8%	-8.4%	-8.4%	-1.0%	-0.5%	2.6%	-2.2%
Total Demand Units (mn)	482.2	507.7	542.8	548.3	489.0	512.0	550.3	558.4	1,799	2,110	2,183	2,259	2,188	2,129	2,081	2,110
QoQ	-13.9%	5.3%	6.9%	1.0%	-10.8%	4.7%	7.5%	1.5%	24.8%	17.3%	3.5%	3.5%	-3.1%	-2.7%	-2.3%	1.4%

Source: Company data, Credit Suisse estimates

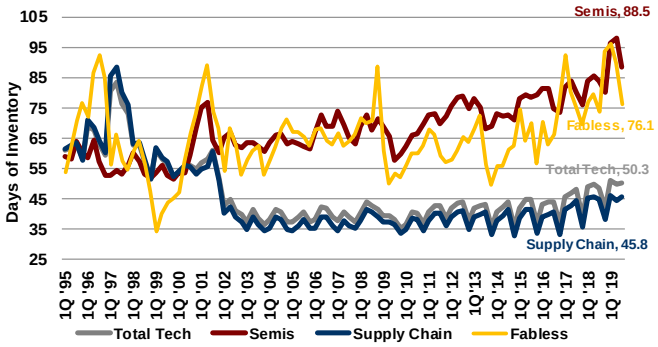
Inventory down from peak levels, though not lean

Inventory for the global tech industry was up 3% QoQ exiting 3Q19, slightly better than the past five-year average of +7% QoQ. Despite the modest improvement, total tech inventory days remain at higher levels across both semiconductor and downstream due to mixed demand the past year, buffer built up by China due to the trade barrier uncertainty and anticipatory build ahead of feared December tech tariffs, an earlier Chinese New Year, and 5G ramps in 2020.

Tech inventory still at the upper end of its 3Q average

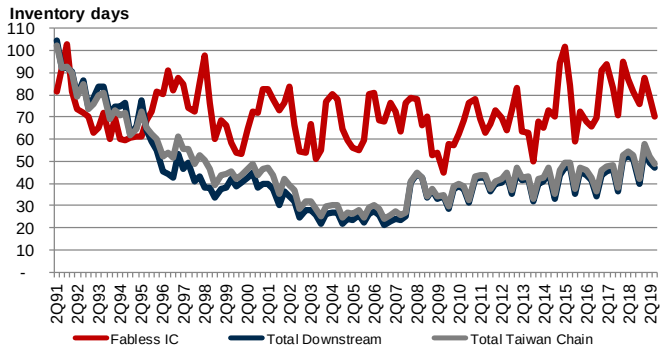
For the semiconductor industry, inventory declined ten days QoQ (much better than the seasonal two days decline) to 89 days in 3Q19, though still above the 3Q average of 78 days. Inventory has been structurally moving higher as semi companies carry more of it for customers and also carry more buffer due to longer advanced node cycle times. Fabless companies have still depleted inventory by 20 days from the peak in 1Q19 to 76 days exiting 3Q19, near the middle of its 55-95 day range from better smartphone, graphics and PC demand. IDM inventory was also down 8 days to 113 days but still at the upper half of its range.

Figure 20: Semiconductor inventory lower, tech inventory still a bit elevated



Source: Company data, Credit Suisse estimates

Figure 21: Taiwan inventory lower across sectors



Source: Company data, Credit Suisse estimates

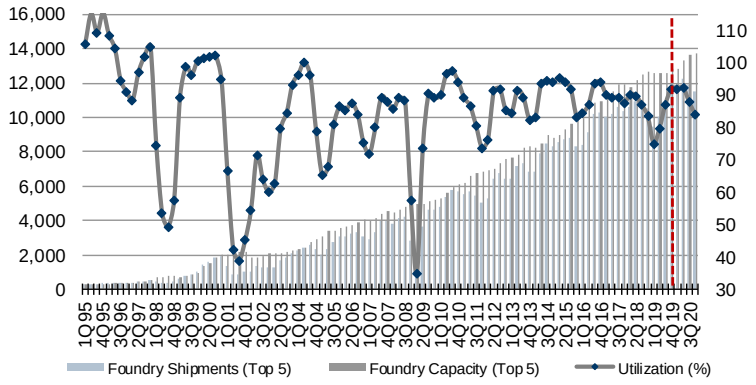
Overall foundry capacity getting tighter

Foundry sector utilisation had a sharp rebound through 2019 from a trough in the 70-75% range in 1Q19 to 95% by 4Q19 which we expect will hold through 3Q20. A couple of areas stand out:

TSMC's advanced capacity and SMIC/UMC's mature capacity running tight, Vanguard also tight on 0.11/0.18 on mobile power management and large panel driver IC demand

1. **TSMC 7/5nm.** TSMC's 7nm is seeing ramp of 5G across Qualcomm, Huawei and Mediatek and AMD's processor ramp and its 5nm which is booked by Huawei and Apple for its 50k wafer capacity. TSMC's incremental 15-20k capacity for 7nm will also not be online until mid-year so is also constraining its shipments on that node through 1H.
2. **SMIC and UMC mature nodes.** The other area of tightness is the mature nodes for SMIC and UMC at 40nm and above. UMC's capex light strategy has not allowed it to add any capacity over the past few years and has secured high share on TDDI and good connectivity and power management business tied to smartphones. SMIC has also held back on its lagging edge capacity due to the sharp correction in early 2019, so its capacity is also running full. We believe SMIC will run through 1Q20 at its higher GMs on the fully mature capacity but it will likely see some compression as it ramps 14nm and brings on depreciation. UMC will still have underutilised 28nm through 1H20, although it has secured some OLED driver ICs from Novatek and Anupass and has the relatively low margin Samsung ISP business to finally lift its 28nm utilisation in 2H20.

Figure 22: Foundry utilisation should stay above 90% in 4Q19 through 1H20



Source: Company data, Credit Suisse estimates

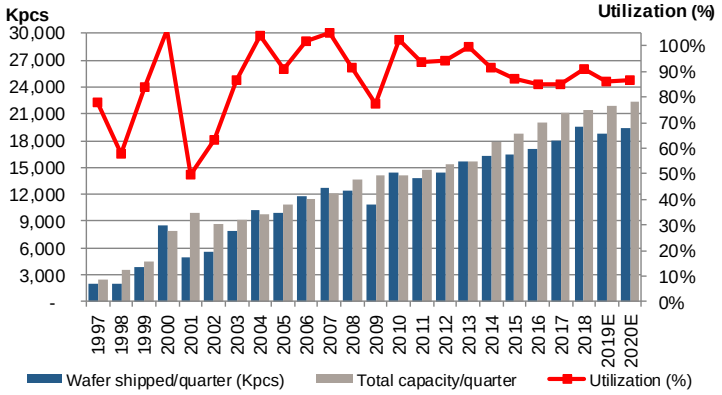
8" foundry only selectively tight due to new fabs

8" utilisation dipping mildly, new supply may keep it from returning as tight

8" foundry capacity is tight at SMIC and UMC as noted above and getting tighter at TSMC as some of the ultra-thin driver ICs move back to 8", and power management for 5G and some of the smaller front camera CMOS image sensors tie up more capacity. Vanguard is seeing selective tightness, with 0.11/0.18 tight on mobile power management and large panel driver IC demand, although lower-end analog/discretes and some dampened IDM outsourcing after their slowdown in the past year is keeping 0.35/0.50 micron mature nodes more under-utilised.

The industry 8" capacity, though, is not as tight as feared, as many IDMs are coming off a full year slowdown and are thus at lower utilisation. In Asia, Vanguard has a newly acquired 8" Singapore fab from GlobalFoundries and Hua Hong (which is building out a 40k 12" fab in Wuxi) would double its capacity for revenue over three years. We believe the new capacity coming on stream will keep overall foundry industry 8" capacity utilisation at 85-90% and limit the tightness seen in late 2017 or 2013-14.

Figure 23: 8" utilisation still in the 85-90%, not yet as tight as prior upcycles



Source: Company data, Credit Suisse estimates

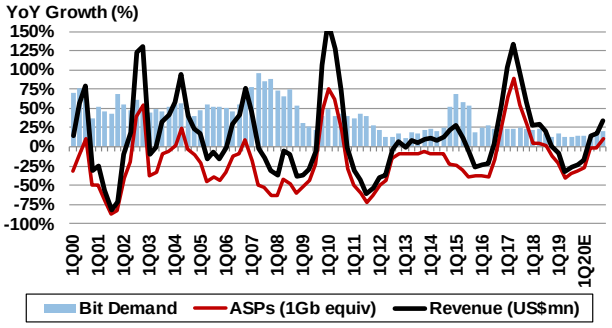
Memory supply-demand in better shape

Memory supply-demand improving in both NAND and DRAM, supporting prices starting to rise in 1Q20

We believe the improving DRAM supply-demand landscape is supported in the near term by growing mobile and server demand, with Trendforce now projecting prices flat-to-up QoQ in 1Q20. The major DRAM companies have stayed conservative on capex, with bit growth purely from node migration partially offset by some net wafer declines at both Samsung and Hynix due to more process steps required on 1X/1Y and some conversion of capacity to CMOS image sensors. Trendforce forecasts tightness in 2020 based on only 12-13% supply growth vs 18% demand growth, potentially setting up for price hikes continuing through the year. NAND flash is also now getting to stable pricing as Hynix and Samsung inventories have depleted and

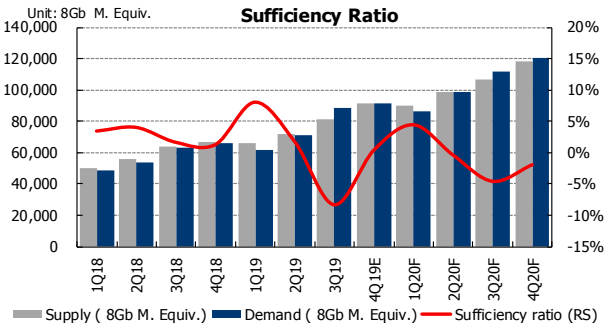
Toshiba/Western Digital inventories are leaner after summer power outage. For 2020, market participants expect more tightness in 2020 as elasticity is stimulating rising penetration and higher densities across mobile, data centre and SSDs.

Figure 24: DRAM may tilt back to tightness in 2Q20



Source: Trendforce, Credit Suisse estimates

Figure 25: NAND also moving back to tightness

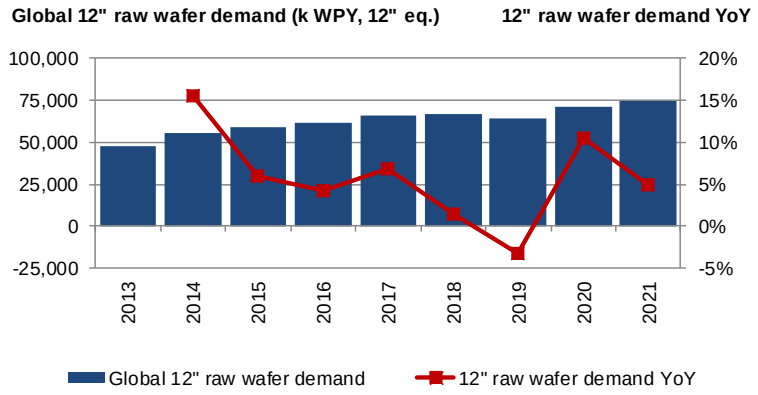


Source: Trendforce, Credit Suisse estimates

Raw wafer demand should also grow along with the semiconductor industry in 2020-21

With multiple applications drivers lifting the unit and content growth opportunity for raw wafer, we expect global 12" raw wafer demand to grow 10% YoY in 2020 which should extend the strength into 2021 for another 5% growth.

Figure 26: 12" raw wafer demand should recover in 2020-21



Source: Company data, Credit Suisse estimates

Our bottom-up analysis shows the key drivers supporting raw wafer demand recovery in 2020-21 including (1) **strong demand for 12" advanced nodes:** We believe TSMC's wafer shipment in the advanced nodes (16nm and below) will grow at a CAGR of 30% to 5.5 mn units from 2019-21 (8-9% of the global 12" raw wafer demand), on higher semiconductor content in 5G smartphones, its share gains in Qualcomm for mobile modem and AMD for high-end desktop and server business and a diversifying opportunity in high performance computing applications, (2) **tighter mature 12" foundry supply:** We estimate the demand for the mature 12" nodes will grow at a CAGR of 12% to 14.7 mn wafers from 2019-21 (20-25% of 12" raw wafer demand), with some applications migrating from 8" to 12" (e.g., smart card, power discrete) and content growth opportunities (e.g., CMOS image sensor, image signal processor, Bluetooth and connectivity chipsets).

For the memory makers, most of the wafer shipments will come from higher utilisation following the production adjustment in 2019 and incremental wafer capacity expansion to offset the output loss during technology migration. We estimate the wafer shipment for DRAM and NAND will grow at a CAGR of 6% to 32.3 mn units from 2019-21, representing 50% of global

12" raw wafer demand. The modest unit recovery and continued semiconductor content growth for automotive/industrial applications should also lift IDMs' utilisation, supporting raw wafer shipments to grow at a CAGR of 5% from 2019-21, close to global semiconductor growth.

Figure 27: 12" demand recovery will lower raw wafer inventory level and lift utilisation

Demand by major foundries/IDMs/memory makers	1Q19	2Q19	3Q19	4Q19E	1Q20E	2Q20E	3Q20E	4Q20E	2018	2019	2020	2021
TSMC mature (through 28nm)	384	401	430	433	450	427	468	481	5,895	4,944	5,479	5,451
TSMC advanced (16nm and below)	112	147	189	215	213	221	250	257	1,780	1,987	2,820	3,370
Intel	283	288	293	298	305	312	319	326	3,162	3,492	3,792	4,433
UMC	103	129	137	164	168	178	196	196	1,438	1,599	2,215	2,383
SMIC	57	83	83	87	81	89	96	96	892	931	1,084	1,233
GlobalFoundries	214	223	223	223	223	223	223	223	2,327	2,651	2,678	2,678
Samsung (DRAM)	465	460	455	455	465	465	485	485	5,070	5,505	5,700	5,820
Samsung (NAND)	465	450	445	440	440	440	460	460	5,880	5,400	5,400	5,520
Samsung (System LSI)	240	320	320	320	320	360	380	372	3,756	3,600	4,296	4,452
Toshiba (NAND)	300	281	264	400	500	500	500	500	5,985	3,736	6,000	6,000
SK Hynix (DRAM)	345	350	350	350	340	335	335	350	3,945	4,185	4,080	4,200
SK Hynix (NAND)	245	165	205	205	200	200	200	215	3,120	2,459	2,445	2,580
Micron (DRAM)	350	323	321	318	340	345	345	345	4,161	3,937	4,125	4,245
Micron (NAND)	235	223	223	238	250	250	250	250	2,850	2,757	3,000	3,000
Nanya	73	67	67	67	68	69	71	71	828	820	841	900
JHCC	0	0	0	0	1	1	4	4	0	0	30	48
YMTC	10	10	10	20	25	30	40	50	75	150	435	600
Huali	35	35	35	35	35	35	35	35	420	420	420	420
Test	875	875	875	875	875	875	875	875	10,451	10,504	10,504	10,504
IDMs and other foundries	194	255	377	337	297	251	304	287	3,000	3,489	3,416	3,828
Powerchip	143	150	158	165	174	182	192	201	1,521	1,848	2,247	2,731
Hua Hong JV	0	0	0	3	7	10	10	15	0	8	126	255
Total 12" raw wafer demand (k WPM)	**5,129**	**5,236**	**5,461**	**5,647**	**5,777**	**5,800**	**6,039**	**6,095**	**66,554**	**64,421**	**71,133**	**74,650**
YoY	-5%	-5%	-2%	-1%	13%	11%	11%	8%	1%	-3%	10%	5%
QoQ	-10%	2%	4%	3%	2%	0%	4%	1%				
Global 12" Raw Wafer Capacity (12" equivalent, k WPM / WPY)	**6,317**	**6,457**	**6,496**	**6,526**	**6,553**	**6,599**	**6,671**	**6,723**	**71,118**	**77,387**	**79,636**	**81,943**
YoY	11%	11%	8%	5%	4%	2%	3%	3%	8%	9%	3%	3%
12" foundry/memory/IDM capacity (k WPM / WPY)	**5,806**	**5,811**	**5,863**	**6,065**	**6,086**	**6,098**	**6,211**	**6,237**	**69,701**	**70,635**	**73,894**	**76,651**
YoY	3%	1%	0%	2%	5%	5%	6%	3%	5%	1%	5%	4%
Global 12" Raw Wafer shipment (12" equivalent, k WPM / WPY)	**5,872**	**5,780**	**5,715**	**5,679**	**5,536**	**5,608**	**5,715**	**5,737**	**70,757**	**69,138**	**67,790**	**70,508**
YoY	4%	-1%	-4%	-7%	-6%	-3%	0%	1%	7%	-2%	-2%	4%
Raw wafer inventory builds (k wafer)	**2,230**	**1,630**	**763**	**95**	**-723**	**-577**	**-969**	**-1,073**	**4,203**	**4,717**	**-3,343**	**-4,142**
Raw wafer inventory builds since 1Q18 (k wafer)	**6,433**	**8,063**	**8,825**	**8,920**	**8,202**	**7,640**	**6,764**	**5,839**	**4,203**	**8,920**	**5,839**	**2,357**

Source: Company data, Credit Suisse estimates

By application, we expect global smartphone units (mobile is 30% of raw wafer consumption) to grow mildly in 2020 following the decline since 2018, mainly driven by the 4G to 5G upgrade cycle. The demand for automotive and industrial applications (20% of raw wafer consumption) should also recover modestly from the correction since mid-2018. On computing applications, (30% of raw wafer consumption), data centre demand reacceleration and stable PC demand should lift the 12" raw wafer demand.

Raw wafer inventory depletion under way in 2020

Compared with tech supply chain inventory levels which should decline to more normalised levels in 3Q19, we have been more cautious on raw wafer inventory levels. Based on our analysis, we believe raw wafer inventory levels on the customers' balance sheet are still high, at 1.5 months (vs the normal 1 month and 0.5 months during the raw wafer supply shortage in 2017), as they have been honoring the LTA in a slow demand environment from 2H18. With raw wafer makers providing flexibility to their customers on the LTA shipment schedule, we believe raw wafer inventory levels on the customers' balance sheet have peaked out in 4Q19 and should decline to normal levels in 4Q20.

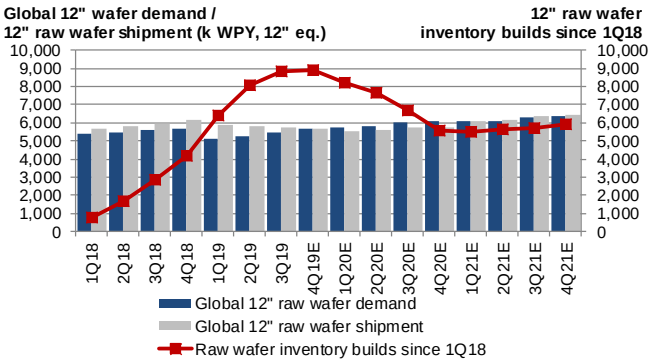
Although the total raw wafer inventory levels is high, we note most of the excess inventory is on polished wafers for memory makers as the recovery only started from late 2019. Memory demand recovery should drive higher utilisation, accelerating raw wafer consumption through 2020 and putting the inventory back to normal levels by year-end. In contrast to high raw wafer inventory levels on memory makers' balance sheet, the epi wafer levels for foundries are leaner on the demand recovery from mid-2019 while they have more flexibility on the LTA shipment provided by their suppliers. The expectations for a solid 2020 business across 12" and 8" have also led to raw wafer supply tightness which started from early 2020.

For Globalwafers, with its high LTA exposure, we believe the company's utilisation for 12" polished raw wafer is at 88-92% levels, while its capacity for 8" and 12" epi wafer should run at a close to full level. For other suppliers with less LTA exposure, the utilisation may stay lower, with 12" polished wafer utilisation at low 80% levels and 12" epi wafer at 90-95% levels, putting the 12" raw wafer utilisation at 85-90% of the industry in 2020. The lower utilisation should lead to a 2% decline in raw wafer shipment, below our expectation for +10% YoY for demand, allowing raw wafer inventory depletion.

Leaner inventory in 2021 supports higher utilisation

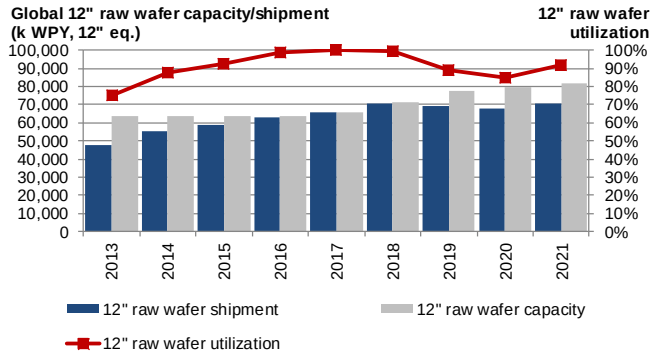
With raw wafer inventory levels falling back to normal one-month levels across foundries and growth drivers extending their momentum into 2021 for both 5G smartphone and data centre, IDMs and memory makers by the end of 2020, we expect the raw wafer production output to track closer to the 5% YoY demand growth in 2021, lifting utilisation up to the low 90% levels for the 12" raw wafer industry and mid 90% for 8" raw wafer industry.

Figure 28: 12" raw wafer inventory should be back to normal one-month level by 2H20



Source: Company data, Credit Suisse research

Figure 29: 12" raw wafer utilisation should improve with better demand and slower capacity/production growth



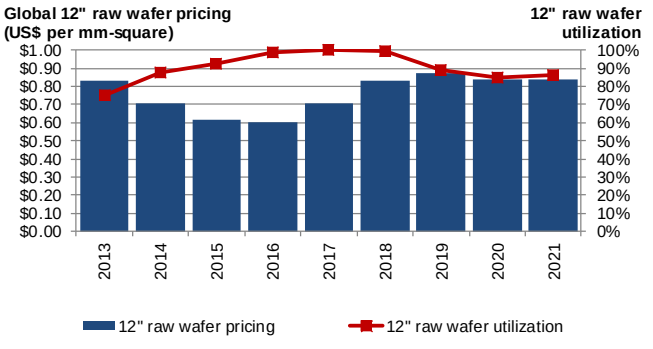
Source: Company data, Credit Suisse research

Outside Taiwan, Siltronic who has only 60% LTA exposure (vs Globalwafers and SUMCO's 80%+) is faring worse than peers and has revised down its full-year expectation for sales and margins for the third time YTD, indicating a softening demand outlook.

Spot pricing still under mild pressure through 2020

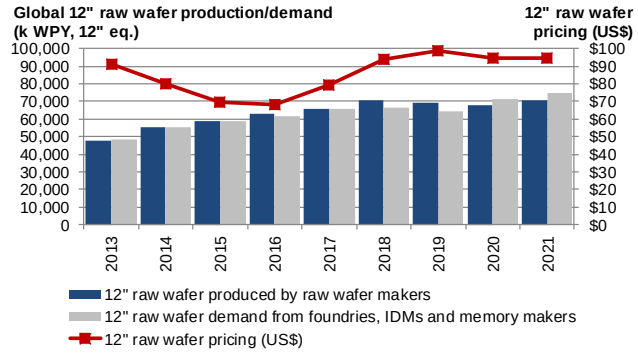
On wafer pricing assumptions, we expect a 1-2% QoQ decline in 1Q20 before limited drop from 2Q20. Despite a more stable sequential trend through 2020, the full-year pricing for 8" and 12" raw wafers should decline by 5% YoY in 2020 due to the higher base in 1H19. We believe the pricing should stay stable into 1H21 before a mild recovery in 2H21 when the industry utilisation improves close to 95% levels where raw wafer makers should gain more bargaining power on the pricing and customers are more willing to sign new LTAs. Factoring the shipment controls and utilisation still below 90%, we estimate the 12" raw wafer price declines will moderate from -10-15% YoY in 4Q19 to -2-3% YoY by 4Q20. In a downside case, the coronavirus outbreak will impact full year and dampen demand growth to 0%, shipments would need to decline 10-15%, pricing may be negotiated down another 10-15% for 2021.

Figure 30: 12" raw wafer pricing should still decline mildly before stabilisation in 2021



Source: Company data, Credit Suisse research

Figure 31: Smaller gap between raw wafer production vs its customers should support raw wafer pricing outlook



Source: Company data, Credit Suisse research

For Taiwan raw wafer suppliers, we believe Globalwafers will outperform its 2nd tier peers supported by its high LTA exposure for both 8" and 12" polished for its memory customers and epi wafers for foundries and IDMs. The company also has a long-term strategy to secure as much long-term agreements as it can by accepting a lower pricing to smooth its earnings outlook through the cycles.

For 2nd tier suppliers, the business outlook will be more mixed, with Formosa SUMCO who produces 8" and 12" raw wafers for Greater China and Southeast Asia customers also see utilisation recovery supported by both better business outlook for its logic and memory customers. However, due to much less LTA exposure, the company's growth and margins outlook should still swing along with the spot pricing. Wafer Works, which has a high exposure to 6" raw wafers, should see rising competition from Chinese domestic players' aggressive capacity expansion plan, offsetting the modest business recovery in its 8" business. The growing capex requirement for the company's plan to ramp its 12" fab in Shanghai and capacity expansion in its 8" epi fab in Shanghai will further add pressure on its business outlook in 2020-21.

Stress test on the industry outlook if coronavirus outbreak duration extends

For the tech supply chain, our original base case has already factored a 1H20 impact but containment that allows 2H20 drivers from 5G China/iPhone, game console, new GPU launches, IoT, data centre investment and industrial recovery to trigger a rebound. However, we believe the risk now of weaker US/Europe demand and easing of capacity tightness could lower build assumptions and ease capacity, also triggering inventory adjustments and cuts to semi company orders through 2Q20.

Figure 32: Stress test if virus continues to impact demand in 2020—raw wafer shipment and pricing face pressure

Raw wafer industry supply/demand model	2018	2019	2020	2021	20 Base	20 stress	21 Base	21 stress
Global 12" raw wafer capacity (k WPY)	**5,927**	**6,449**	**6,636**	**6,829**	**6,636**	**6,636**	**6,829**	**6,829**
YoY	7.8%	8.8%	2.9%	2.9%	2.9%	2.9%	2.9%	2.9%
Global 12" wafer capacity (k WPY)	**5,808**	**5,886**	**6,158**	**6,388**	**6,158**	**6,158**	**6,388**	**6,388**
YoY	5.0%	1.3%	4.6%	3.7%	4.6%	4.6%	3.7%	3.7%
Global 12" raw wafer shipment (k WPY)	**5,896**	**5,762**	**5,649**	**6,249**	**5,649**	**5,069**	**6,249**	**5,668**
YoY	5.0%	1.3%	4.6%	10.6%	-1.9%	-12.0%	10.6%	11.8%
Global 12" raw wafer demand (k WPY)	**5,546**	**5,368**	**5,928**	**6,221**	**5,928**	**5,368**	**6,221**	**5,668**
YoY	1.4%	-3.2%	10.4%	4.9%	10.4%	0.0%	4.9%	5.6%
Global 12" raw wafer sufficiency	**102.0%**	**109.6%**	**107.8%**	**106.9%**	**107.8%**	**107.8%**	**106.9%**	**106.9%**
Global 12" raw wafer utilization	**99.5%**	**89.3%**	**85.1%**	**91.5%**	**85.1%**	**76.4%**	**91.5%**	**83.0%**
Raw Wafer Pricing (US$ per sq inch)	**$0.83**	**$0.87**	**$0.83**	**$0.83**	**$0.83**	**$0.75**	**$0.83**	**$0.68**
Raw Wafer Pricing YoY	**18%**	**5%**	**-5%**	**0%**	**-5%**	**-15%**	**0%**	**-9%**

Source: Company data, Credit Suisse estimates

For the raw wafer sector, we highlight the potential downside risk if the demand continues to drag in 2020. In the worst-case scenario, we assume the wafer demand from foundries, memory makers and IDMs to only stay flat YoY (vs base case +10% YoY), slowing down the inventory depletion and dampening raw wafer shipments -12% YoY in 2020 (vs base case -2%). With lower utilisation, we expect raw wafer pricing to face more pressure and potentially decline by 15% (vs base case -5%) in 2020.

Figure 33: Stress test shows Globalwafers with higher LTA exposure is less vulnerable than Formosa SUMCO and Wafer Works

Raw wafer makers' sales	2018	2019	2020	2021	20 Base	20 stress	% downside	21 Base	21 stress	% downside
Globalwafers	$59,064	$58,094	$57,005	$63,087	$57,005	$50,536	-11%	$63,087	$52,552	-17%
Formosa SUMCO	$16,358	$11,635	$12,365	$14,027	$12,365	$10,283	-17%	$14,027	$10,765	-23%
Wafer Works	$9,205	$7,603	$7,684	$9,467	$7,684	$6,322	-18%	$9,467	$7,151	-24%

Raw wafer makers' Earnings	2018	2019	2020	2021	20 Base	20 stress	% downside	21 Base	21 stress	% downside
Globalwafers	$13,657	$13,424	$11,864	$13,037	$11,864	$10,289	-13%	$13,037	$10,484	-20%
Formosa SUMCO	$5,580	$2,311	$1,875	$3,036	$1,875	$1,279	-32%	$3,036	$1,573	-48%
Wafer Works	$1,909	$1,280	$839	$1,262	$839	$559	-33%	$1,262	$626	-50%

Source: Company data, Credit Suisse estimates

Under this scenario, Formosa SUMCO and Wafer Works should be vulnerable, with 15-20% sales downside and 30-35% earnings risk in 2020 due to their high spot market exposure which could see fast swings in demand and pricing if demand changes. Globalwafers' business should be more stable for both shipment and pricing due to its LTA protection but earnings power would still be at risk down to NT$22-24, with 10-15% sales and earnings downside in the stress case.

Stocks: Globalwafers top Taiwan pick, Neutral on Wafer Works and Underperform on Formosa SUMCO

We initiate coverage on **Wafer Works** with a NEUTRAL rating and TP of NT$28.50 based on 6x EV/EBITDA (vs its 2-11x range) and 12x 2021 P/E. Wafer Works is currently trading at 11x 2021 CS earnings estimates, close to our target and reflecting our view of a relatively muted earnings outlook dragged by higher depreciation and more competition on 6" raw wafer from its China peers, offsetting the demand recovery and its shipment growth for 8" and 12" wafers.

We initiate coverage on **Formosa SUMCO** with an UNDERPERFORM rating and TP of NT$105.00 based on 8.5x EV/EBITDA, the lower half of the average of its 6-19x range and 14x 2021 P/E. Formosa SUMCO is currently trading at 30x/18x 2020/21 CS earnings estimates. We believe the stock share price reflects the positive expectation for an improving demand outlook in 2020-21 though it has more downside risk if the semiconductor supply chain is negatively impacted by the supply chain disruption from the extended coronavirus outbreak. The valuation based on current share price is also high even reflecting a potential 2H21 spot price recovery.

We maintain OUTPERFORM on **Globalwafers** with a TP of NT$450.00 based on 8.5x EV/EBITDA, the upper half of its 4-12x range, and implying 13.7x 2021 cash adjusted EPS (15.5x P/E) and 5-6% dividend yield in 2020-21. The stock has underperformed its semiconductor peers only +10% since our downgrade in April 2019. However, we believe the improving pricing outlook, high utilisation even with a new fab ramp in 2021, and solid dividend should lift the share price.

Figure 34: Raw wafer makers' peer valuation comparison

Company	Ticker	Local Price 3/20/2020	Target Local Curcy	Inv'ment Rating	Target upside	Mkt Cap (US$mn)	EPS YoY 2020	EPS YoY 2021	P/E 2020	P/E 2021	P/B 2021	ROE 2021	Dividend yield 2020	Dividend yield 2021
Wafer Makers														
Globalwafers	6488.TWO	$342.50	$450.0	OPFM	31%	$4,943	-5.9%	9.2%	11.7	10.7	2.7	27.4	6.4%	6.0%
Shinetsu	4063.T	$9,075.00	$11,830	NTRL	30%	$34,297	5.5%	2.4%	11.6	11.3	1.2	14.2	2.6%	3.0%
SUMCO	3436.T	$1,076.00	$1,510	NTRL	40%	$2,862	-62.4%	18.3%	26.9	22.8	1.1	6.0	4.6%	4.6%
Siltronic	WAFGn.DE	$54.84	$83.0	NTRL	51%	$1,645	-22.2%	17.9%	9.4	8.0	1.1	14.0	5.5%	6.0%
Wafer Works	6182.TWO	$24.30	$28.5	NTRL	17%	$410	-40.0%	52.9%	16.2	10.6	1.5	11.8	7.2%	4.3%
Formosa SUMCO	3532.TW	$138.00	$105.0	UPFM	-24%	$1,767	-23.6%	65.0%	30.3	18.4	2.8	12.2	3.0%	2.3%
Wafer Maker Median:							**-22.2%**	**17.9%**	**11.7**	**10.7**	**1.2**	**14.0**	**5.5%**	**4.6%**
Wafer Maker Mean:							**-25.0%**	**20.1%**	**15.1**	**12.7**	**1.5**	**14.7**	**5.3%**	**4.8%**

Source: Company data, the BLOOMBERG PROFESSIONAL™ service consensus estimates, Credit Suisse estimates

Sector risks

- **Swing in semiconductor demand**. Semiconductor demand has been improving since late 2019 supported by the expectation of the 5G upgrade cycle lifting both unit and content growth, data centre investment recovery, AI and IoT are still growing. We expect the semiconductor industry to continue to grow at least in line with global GDP in the next few years, supporting the increase in raw wafer demand. However, we would highlight a potential risk for raw wafer pricing and demand if the industry growth slows down from macro uncertainty (e.g., prolonged coronavirus impact and trade war).
- **Customers' wafer price erosion.** Raw wafer suppliers so far could still raise raw wafer pricing as it is down meaningfully from the peak and is only a small portion of its customers' cost. However, a potential risk is that more fierce competition between its customers could lead to a sharp decline in their pricing. This could cap the raw wafer price upside and limit the company's revenue growth.

- **More aggressive capacity expansion from competitors.** The competitive landscape so far is still benign with top suppliers only adding incremental capacity. However, if its competitors are trying to gain market share and start expanding capacity aggressively, this could lead to another downturn of raw wafer pricing. Although the risk is low in the near term due to technology difficulty, we would be cautious on China raw wafer makers' development as the Chinese government is aggressively pushing to build up the semiconductor ecosystem. Similar to TFT-panel, steel and other commodity industries, China's competition could add significant capacity with subsidy from the local governments, disrupting the industry landscape. For Wafer Works, the risk would be higher on 6" due to the lower entry barrier and given that Chinese raw wafer makers have been expanding their capacity.

CREDIT SUISSE

Formosa SUMCO

Taiwan Raw Wafers: Business may see risk from oversupply and soft spot pricing environment

Semiconductor Devices

3532.TW

Target price (12M, NT$)
105.00

Underperform[V]

- Erratum: We updated the databox to reflect the recently reported 4Q19 financials. **SUMCO's proxy in Taiwan with a Greater China focus.** We initiate coverage on Formosa SUMCO with an UNDERPERFORM rating and a target price of NT$105 based on 8.5x EV/EBITDA (14x 2021 P/E) and supported by CS HOLT®, at NT$102. Formosa SUMCO is a subsidiary of SUMCO representing 15% of the parent's shipments focusing on 8" and 12" raw wafer supply for foundries and memory makers in China and Taiwan from legacy nodes through 10nm. Due to the industry pricing drop and lower utilisation, we estimate sales will decelerate from +23% CAGR from 2016-18 to +5%/+13% in 2020/21 following -29% in 2019, with GMs dropping to 23% in 2020 from the 34% peak level in 2018.
- **2020 business stays muted as coronavirus looms.** Similar to other raw wafer suppliers with high spot price exposure, Formosa SUMCO's quarterly sales have been volatile, dropping 44% from 3Q18-3Q19 following an 80% increase from 4Q15-3Q18, due to the spot price for raw wafers decline and lower shipment. Despite shipment improving from 4Q19 on inventory restocking across 8" and 12" foundries and improving memory supply-demand, the continued oversupply in 2020 and its limited LTA protection will continue to pressure pricing, offsetting the 18% rise in shipments and taking sales only +5% in 2020 (-29% in 2019) with GMs down to 23% (vs. 43% in 2018 and 28% in 2019).
- **Spot pricing recovery may not start until 2H21.** Compared with Globalwafers' resilient business outlook in 2020 with LTA protection through 2021, Formosa SUMCO's sales could be more volatile as its pricing and utilisation track close to the spot market. Based on our industry view for a more balanced industry supply-demand in 2021, we model a mild pricing improvement from 2H21 for Formosa SUMCO and 95%+ utilisation, supporting sales to grow 14% YoY and GMs improving to 30%, on its high foundry and memory exposure which should still see a solid outlook in 2H20-21 beyond the near-term slowdown.
- **Stock at premium and coronavirus could lead to downside in spot market.** Formosa SUMCO reported 2019 EPS NT$5.48 and we model 2020/21E EPS of NT$4.55/ NT$7.50 on our expectations of +5%/+13% sales growth and margin erosion from peak level, with raw wafer spot pricing staying under pressure partially offsetting the shipment recovery. Our valuation is based on 8.5x EV/EBITDA, at the lower half of the long-term 6-19x range and implying 14x 2021 P/E, as risk toward the downside in the spot market due to coronavirus. **Key risks** include: a better recovery for foundries and memory makers.

Price (20 Mar 20, NT$)	138.00
Upside/downside (%)	-23.9
Mkt cap (NT$/US$ mn)	53,523 / 1,768
Enterprise value (NT$ mn)	47,307
Number of shares (mn)	387.85
Free float (%)	87.3
52-wk price range (NT$)	150-98.30
ADTO-6M (US$ mn)	7.4

[V] = Stock Considered Volatile (see Disclosure Appendix)

Research Analysts

Haas Liu
886 2 2715 6365
haas.liu@credit-suisse.com

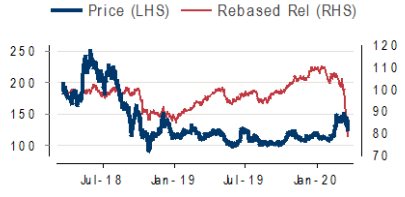
Randy Abrams, CFA
886 2 2715 6366
randy.abrams@credit-suisse.com

Financial and valuation metrics

Year	12/18A	12/19E	12/20E	12/21E
Revenue (NT$ mn)	16,358.1	11,636.0	12,229.0	13,872.6
EBITDA (NT$ mn)	8,284.6	4,870.9	4,396.2	5,924.7
EBIT (NT$ mn)	6,179.9	2,619.4	2,122.3	3,545.8
Net profit (NT$ mn)	5,580.5	2,125.8	1,762.9	2,910.1
EPS (CS adj.) (NT$)	9.41	5.48	4.55	7.5
Chg. from prev. EPS (%)	n.a.	0.0	0.0	0.0
Consensus EPS (NT$)	n.a.	-	-	-
EPS growth (%)	225.5	(41.8)	(17.1)	65.1
P/E (x)	14.7	25.2	30.4	18.4
Dividend yield (%)	1.0	6.5	2.8	2.3
EV/EBITDA (x)	5.6	9.6	11.1	7.9
P/B (x)	3.76	2.62	3.11	2.84
ROE (%)	25.7	10.1	9.4	16.1
Net debt/equity (%)	(33.8)	(32.5)	(28.2)	(34.4)

Source: Company data, Refinitiv, Credit Suisse estimates

Share price performance

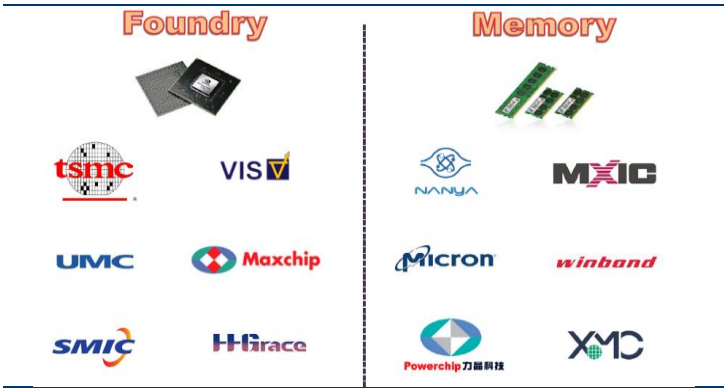


The price relative chart measures performance against the TAIWAN SE WEIGHTED INDEX which closed at 9,234.09 on 20/03/20. On 20/03/20 the spot exchange rate was NT$30.27/US$1

Performance	1M	3M	12M
Absolute (%)	(4.2)	20.0	18.5
Relative (%)	17.3	42.8	31.4

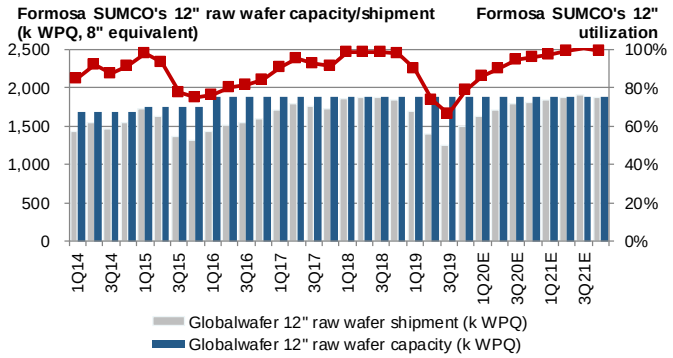
Focus charts and table

Figure 35: Formosa SUMCO's customer base



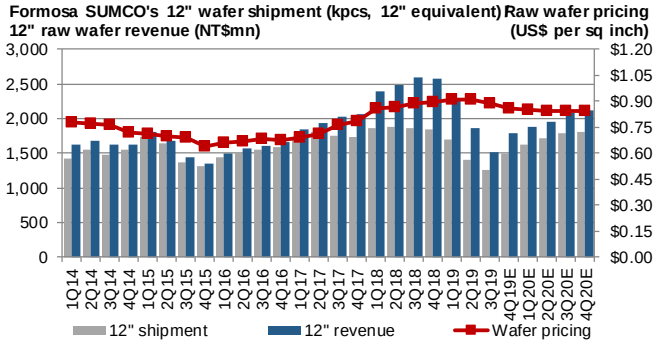
Source: Company

Figure 36: Formosa SUMCO's 12" shipment could improve along with improving foundry/memory outlook



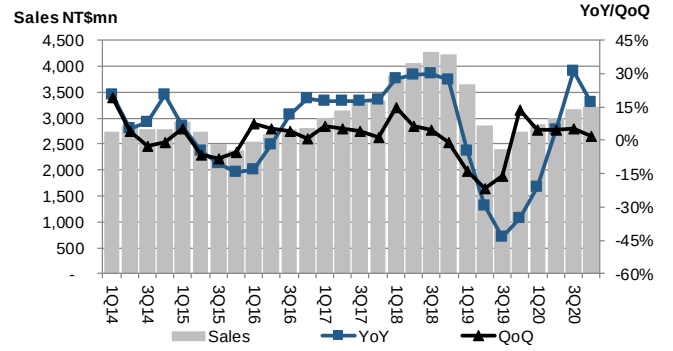
Source: Company data, Credit Suisse estimates

Figure 37: Formosa SUMCO's 12" revenue outlook won't reach its peak level in 2018 on lower raw wafer price



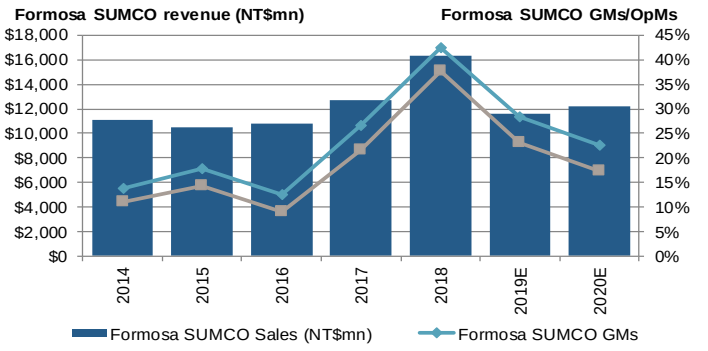
Source: Company data, Credit Suisse estimates

Figure 38: Formosa SUMCO's revenue may not recover YoY until 2H20



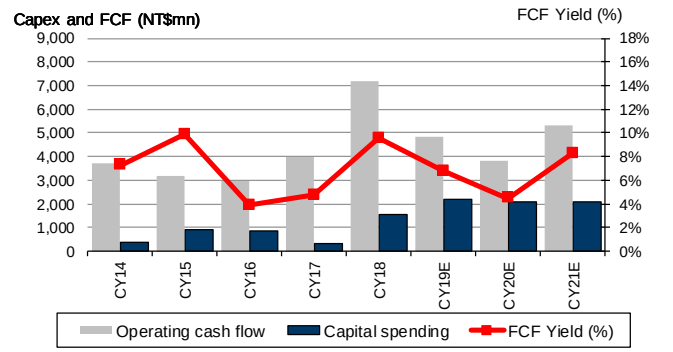
Source: Company data, Credit Suisse estimates

Figure 39: Formosa SUMCO's profitability has peaked in 2018



Source: Company data, Credit Suisse estimates

Figure 40: Disciplined capex should sustain FCF in a soft pricing environment



Source: Company data, Credit Suisse estimates

Figure 41: Formosa SUMCO 4Q19-2Q20 and 2019-21 estimates CS vs. Street

	4Q19		1Q20		2Q20		2019		2020		2021	
(NT$ mn)	CS	Street	CS	Street	CS	Street	CS	Street	CS	Street	CS	Street
Sales	**2,736**	**2,634**	**2,870**	**2,911**	**2,998**	**3,262**	**11,635**	**11,533**	**12,229**	**13,187**	**13,873**	**14,861**
Chg (%)	14.0	9.7	4.9	6.4	4.5	12.1	-28.9	6.8	5.1	13.3	13.4	12.7
GM (%)	**20.9**	**23.5**	**20.0**	**23.7**	**21.1**	**26.9**	**28.4**	**N/A**	**22.6**	**27.8**	**30.5**	**N/A**
OpM (%)	**15.5**	**17.8**	**14.7**	**N/A**	**15.9**	**N/A**	**23.0**	**23.6**	**17.4**	**23.5**	**25.6**	**31.3**
Net Inc.	365	381	361	447	363	584	2,311	2,327	1,765	2,450	2,911	3,641
EPS (NT$)	**0.94**	**0.98**	**0.93**	**1.15**	**0.94**	**1.51**	**5.96**	**6.00**	**4.55**	**6.32**	**7.50**	**9.39**

Source: Company data, the BLOOMBERG PROFESSIONAL™ service consensus estimates, Credit Suisse estimates

Formosa SUMCO (3532.TW / 3532 TT)

Price (20 Mar 2020): **NT$138.00** Target Price: **NT$105.00**

Analyst: **Haas Liu**

Rating: **Underperform [V]**

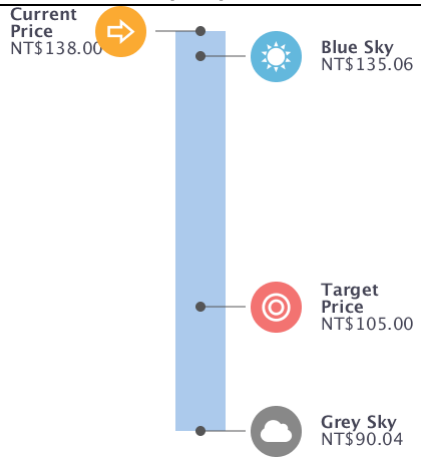
Income Statement (NT$ mn)	12/18A	12/19E	12/20E	12/21E
Sales revenue	**16,358**	**11,636**	**12,229**	**13,873**
Cost of goods sold	9,394	8,379	9,442	9,603
EBITDA	**8,285**	**4,871**	**4,396**	**5,925**
EBIT	**6,180**	**2,619**	**2,122**	**3,546**
Net interest expense/(inc.)	(74)	(90)	(53)	(55)
Recurring PBT	**6,408**	**2,669**	**2,176**	**3,601**
Profit after tax	**5,580**	**2,126**	**1,763**	**2,910**
Reported net profit	**5,580**	**2,126**	**1,763**	**2,910**
Net profit (Credit Suisse)	**5,580**	**2,126**	**1,763**	**2,910**
Balance Sheet (NT$ mn)	**12/18A**	**12/19E**	**12/20E**	**12/21E**
Cash & cash equivalents	7,350	6,625	4,843	6,495
Current receivables	2,858	1,974	2,276	2,532
Inventories	2,760	2,891	2,873	2,913
Other current assets	609	224	208	235
Current assets	**13,577**	**11,714**	**10,201**	**12,175**
Property, plant & equip.	10,893	10,872	10,850	10,850
Investments	0	0	0	0
Intangibles	0	0	0	0
Other non-current assets	302	230	290	290
Total assets	**24,773**	**22,816**	**21,341**	**23,315**
Current liabilities	**2,565**	**1,948**	**2,385**	**2,680**
Total liabilities	**2,999**	**2,421**	**4,149**	**4,448**
Total debt	0	0	0	0
Shareholders' equity	**21,773**	**20,395**	**17,192**	**18,868**
Minority interests	0	0	0	0
Total liabilities & equity	**24,773**	**22,816**	**21,341**	**23,315**
Cash Flow (NT$ mn)	**12/18A**	**12/19E**	**12/20E**	**12/21E**
EBIT	**6,180**	**2,619**	**2,122**	**3,546**
Net interest	74	90	53	55
Tax paid	(827)	(543)	(413)	(691)
Working capital	0	0	0	0
Other cash & non-cash items	153	(40)	0	0
Operating cash flow	**5,580**	**2,126**	**1,763**	**2,910**
Capex	0	0	0	0
Free cash flow to the firm	**5,580**	**2,126**	**1,763**	**2,910**
Investing cash flow	**0**	**0**	**0**	**0**
Equity raised	0	0	0	0
Dividends paid	(1,613)	(3,491)	(1,488)	(1,234)
Financing cash flow	**(1,613)**	**(3,491)**	**(1,488)**	**(1,234)**
Total cash flow	**3,967**	**(1,365)**	**275**	**1,676**
Adjustments	0	0	0	0
Net change in cash	**3,967**	**(1,365)**	**275**	**1,676**
Per share	**12/18A**	**12/19E**	**12/20E**	**12/21E**
Shares (wtd avg.) (mn)	593	388	388	388
EPS (Credit Suisse) (NT$)	**9.41**	**5.48**	**4.55**	**7.50**
DPS (NT$)	1.36	9.00	3.84	3.18
Operating CFPS (NT$)	9.41	5.48	4.55	7.50
Earnings	**12/18A**	**12/19E**	**12/20E**	**12/21E**
Growth (%)				
Sales revenue	28.7	(28.9)	5.1	13.4
EBIT	124.7	(57.6)	(19.0)	67.1
EPS	225.5	(41.8)	(17.1)	65.1
Margins (%)				
EBITDA	50.6	41.9	35.9	42.7
EBIT	37.8	22.5	17.4	25.6
Valuation (x)	**12/18A**	**12/19E**	**12/20E**	**12/21E**
P/E	14.7	25.2	30.4	18.4
P/B	3.76	2.62	3.11	2.84
Dividend yield (%)	1.0	6.5	2.8	2.3
EV/sales	2.8	4.0	4.0	3.4
EV/EBITDA	5.6	9.6	11.1	7.9
EV/EBIT	7.5	17.9	22.9	13.3
ROE analysis (%)	**12/18A**	**12/19E**	**12/20E**	**12/21E**
ROE	25.7	10.1	9.4	16.1
ROIC	37.8	14.8	13.2	23.2
Credit ratios	**12/18A**	**12/19E**	**12/20E**	**12/21E**
Net debt/equity (%)	(33.8)	(32.5)	(28.2)	(34.4)
Net debt/EBITDA (x)	(0.89)	(1.36)	(1.10)	(1.10)

Source: Company data, Refinitiv, Credit Suisse estimates

Company Background

Formosa SUMCO is a subsidiary established by Formosa Plastic Corporation, Asia Pacific Investment and Komatsu Electronic Metals as "Formosa Komatsu Silicon Corporation" in 1995

Blue/Grey Sky Scenario



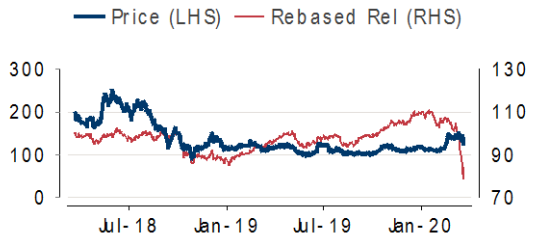
Our Blue Sky Scenario (NT$) **135.06**

Our blue sky scenario value of NT$135.05 implies 18x 2021 P/E on the back of faster-than-expected demand recovery across its foundry and memory customers and a more balanced supply-demand for 8" and 12" to lift raw wafer pricing in 2021.

Our Grey Sky Scenario (NT$) **90.04**

Our grey sky scenario of NT$90.03 implies 9x 2021 P/E value due to slower-than-expected tech end-market demand recovery, dragging the outlook for its memory and foundry customers. The spot price could also continue its downward trend if the industry stays oversupply.

Share price performance



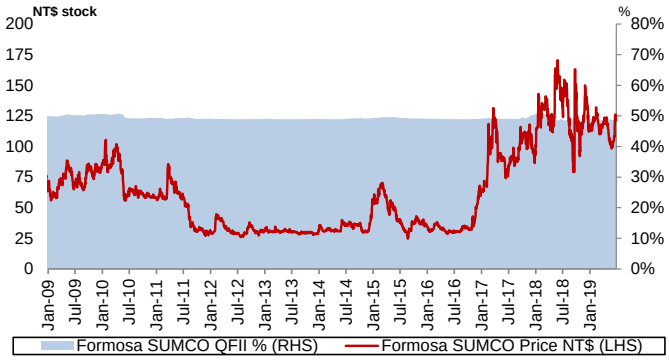
The price relative chart measures performance against the TAIWAN SE WEIGHTED INDEX which closed at 9,234.09 on 20-Mar-2020
On 20-Mar-2020 the spot exchange rate was NT$30.27/US$1

Business stabilising with more balanced 8" and 12" supply-demand though fairly valued

Formosa SUMCO is a subsidiary established by Formosa Plastic Corporation, Asia Pacific Investment and Komatsu Electronic Metals as "Formosa Komatsu Silicon Corporation" in 1995. In 2006, SUMCO acquired 51% equity in Komatsu Electronic Metals and Formosa Komatsu changed its name to Formosa SUMCO. Komatsu Electronic Metals licensed the raw wafer manufacturing technology to Formosa SUMCO, with the 8" facility in Mailiao having started ramping up from 1998. Formosa SUMCO licensed the 12" raw wafer technology from its parent company in 2005 and started 12" raw wafer production from 2006.

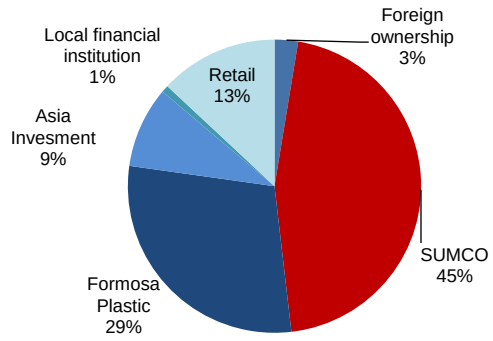
In 2006, Formosa SUMCO listed on the emerging board in Taiwan and subsequently listed on the main board in 2007. Currently, SUMCO Techxiv, a subsidiary under SUMCO, owns 45% of Formosa SUMCO.

Figure 42: Formosa SUMCO's foreign ownership



Source: Company data, Credit Suisse estimates

Figure 43: Formosa SUMCO's management ownership



Note: As at 2019. Source: Company data, Credit Suisse estimates

Formosa SUMCO has been transforming from a company producing both semiconductor wafers and components for solar battery production in its early years to a dedicated semiconductor raw wafer provider since 2009 due to continued loss in the solar battery market. The company currently has 320k 8" WPM capacity and 280k WPM 12" WPM capacity, representing 6%/4% market share in the global 8"/12" raw wafer market.

Figure 44: Formosa SUMCO's milestone

Time	Event
Dec-95	Formosa Plastics signed wafer technology licensing agreement with Komatsu Electronic Metals
Dec-96	Formosa SUMCO's Mailiao facility started construction
Mar-99	Mailiao facility started mass production
Feb-05	Formosa SUMCO signed 12" raw wafer licensing agreement with Komatsu
Aug-05	Formosa SUMCO started 12" facility construction
Sep-06	Formosa SUMCO went public offering
Oct-06	SUMCO acquired Komatsu Eletronic Metals
Jan-07	Renamed as "Formosa SUMCO" from "Formosa Komatsu"
Dec-07	Formosa SUMCO started listing on main board
Apr-15	Formosa SUMCO set up Japan subsidiary

Source: Company data, Credit Suisse estimates

Support from SUMCO gives the company access to tier 1 foundries and memory customers

With its production base in Taiwan and technology support from its parent company SUMCO, Formosa SUMCO can provide production support and high quality wafers to its major customers in Greater China and Southeast Asia in the mature and advanced nodes. The company has 85% revenue (80% for 8" and 90% for 12") from its Taiwan customers with the customer base including major foundries (TSMC, UMC and Vanguard) and memory makers (Micron/Inotera, Nanya Tech, Macronix and Powerchip). In the past few years, Formosa SUMCO has also been adding its footprint in China to capture the fast-growing opportunity there following the Chinese government's initiative to support local semiconductor supply chain, with revenue from its China customers growing from low single digits to 10% in the past few years to support local foundries including SMIC and Hua Hong and emerging memory players (e.g. YMTC).

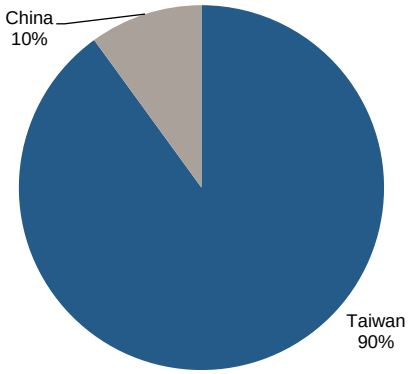
Figure 45: Formosa SUMCO's operating metrics

NT$ mn, 8" equivalent	1Q18	2Q18	3Q18	4Q18	1Q19	2Q19E	3Q19E	4Q19E	2016	2017	2018	2019E	2020E
8" raw wafer capacity	*960*	*960*	*960*	*960*	*960*	*960*	*960*	*960*	*3,840*	*3,840*	*3,840*	*3,840*	*3,840*
12" raw wafer capacity	*1,890*	*1,890*	*1,890*	*1,890*	*1,890*	*1,890*	*1,890*	*1,890*	*7,560*	*7,560*	*7,560*	*7,560*	*7,560*
Capacity (8" WPQ / WPY)	**2,850**	**2,850**	**2,850**	**2,850**	**2,850**	**2,850**	**2,850**	**2,850**	**11,400**	**11,400**	**11,400**	**11,400**	**11,400**
Sequential change (%)	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*5%*	*0%*	*0%*	*0%*	*0%*
8" raw wafer shipment	*957*	*969*	*959*	*962*	*899*	*764*	*741*	*778*	*3,694*	*3,594*	*3,847*	*3,181*	*3,468*
12" raw wafer shipment	*1,864*	*1,872*	*1,868*	*1,850*	*1,703*	*1,396*	*1,326*	*1,393*	*6,100*	*6,990*	*7,454*	*5,818*	*6,408*
Shipment (8" WPM. Kpcs)	**2,821**	**2,840**	**2,827**	**2,812**	**2,601**	**2,160**	**2,067**	**2,171**	**9,793**	**10,584**	**11,300**	**8,999**	**9,875**
Sequential change (%)	*7%*	*1%*	*0%*	*-1%*	*-7%*	*-17%*	*-4%*	*5%*	*1%*	*8%*	*7%*	*-20%*	*10%*
Utilization rate (%)	**99%**	**100%**	**99%**	**99%**	**91%**	**76%**	**73%**	**76%**	**86%**	**93%**	**99%**	**79%**	**87%**
ASP (US$, 8" equivalent)	**$46.2**	**$48.1**	**$49.2**	**$48.7**	**$45.5**	**$43.5**	**$41.0**	**$38.7**	**$34.2**	**$39.5**	**$48.0**	**$42.3**	**$37.4**
Sequential change (%)	*10%*	*4%*	*2%*	*-1%*	*-7%*	*-4%*	*-6%*	*-6%*	*0%*	*15%*	*22%*	*-12%*	*-12%*
Revenue (US$ mn)	**130**	**137**	**139**	**137**	**118**	**94**	**85**	**84**	**335**	**418**	**543**	**381**	**370**
FX rate (NT$)	29.3	29.7	30.7	30.8	30.8	30.8	30.8	30.8	32.1	32.5	32.5	32.3	31.8
Other Revenue (NT$ mn)	3,819	4,059	4,262	4,218	3,643	2,891	2,613	2,587	10,794	12,713	16,358	11,733	11,388
Total Revenue (NT$ mn)	**3,819**	**4,059**	**4,262**	**4,218**	**3,643**	**2,891**	**2,613**	**2,587**	**10,794**	**12,713**	**16,358**	**11,733**	**11,388**
Capex (NT$ mn)	**572**	**357**	**396**	**208**	**460**	**650**	**590**	**500**	**872**	**331**	**1,533**	**2,200**	**2,100**
Capex/revenue (%)	*15%*	*9%*	*9%*	*5%*	*13%*	*22%*	*23%*	*19%*	*8%*	*3%*	*9%*	*19%*	*18%*
Gross margin (%)	**39.1%**	**43.7%**	**45.4%**	**41.8%**	**38.0%**	**35.3%**	**31.3%**	**29.1%**	**12.6%**	**26.7%**	**42.6%**	**33.9%**	**30.1%**
Operating margin (%)	34.3%	39.1%	40.5%	36.9%	33.1%	30.3%	26.3%	24.4%	8.9%	21.6%	37.8%	29%	26%

Source: Company data, Credit Suisse estimates

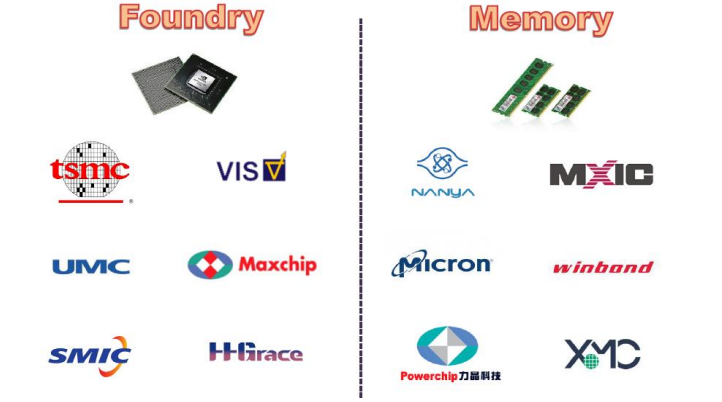
Formosa SUMCO's customer concentration is high, with top four customers contributing 56% of its revenue in 2019 (vs. 62% in 2018). The company has a high exposure in memory market, with Micron/Inotera as one of its top customers representing 13% of its sales in 2019 (vs. 28% in 2018), 10% revenue from Nanya Tech, 18% for its parent company (vs. 15% in 2018).

Figure 46: Formosa SUMCO's revenue mainly comes from Taiwan and China



Note: 90% from Taiwan and 10% from China is end-demand; for the direct customer exposure, it is 82% in Taiwan and 18% in Japan in 2019.
Source: Company data, Credit Suisse estimates

Figure 47: Formosa SUMCO has foundries and memory customers



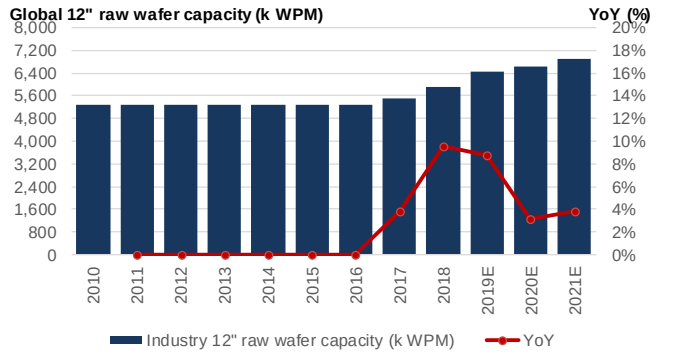
Source: Company

Similar to the major raw wafer makers, Formosa SUMCO's polished, annealed and epi wafer portfolio can support both the advanced and mainstream applications. On 8", the company's wafers are mostly used for the display driver IC, power management IC in foundries and niche memory production. On 12", the company's wafers are mostly for DRAM and logic chipset production. However, the company has limited exposure in the most advanced nodes for its foundry customers (e.g. 7nm and below) as SUMCO directly supplies the wafers.

With a long-term manufacturing record and continued support from SUMCO, Formosa SUMCO has built a strong relationship with its foundry and memory customers on 8" and 12" raw wafer supply in Taiwan. Despite concerns on the potential competition from China raw wafer suppliers, the company still has an edge on manufacturing technology and fab management through its parent company SUMCO.

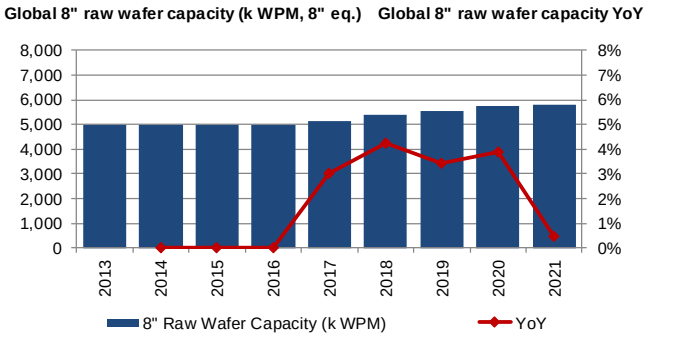
Raw wafer industry capacity expansion will be milder

Figure 48: 12" raw wafer capacity growth should slow to low single digits in 2020-21



Source: Company data, Credit Suisse research, 12" equivalent

Figure 49: Global 8" raw wafer capacity should be limited in 2020-21



Source: Company data, Credit Suisse research, 8" equivalent

As we highlighted in the industry section, both 8" and 12" raw wafer demand is recovering supported by mild shipment growth and higher semiconductor content in 5G smartphones, data centre investment re-acceleration in 2020 following a slow 2019 and a modest recovery in broad-based automotive/industrial applications with leaner inventory levels. For 8" raw wafer supply, the capacity expansion has been milder vs. 12" in the past few years, putting supply-demand into balance faster compared with 12". On 12", with most of the capacity expansion finished by the end of 2019 and suppliers' adjusting their fab output to 85-90%, the demand recovery should support raw wafer inventory depletion and lift the 12" raw wafer industry utilisation back to 90% levels from 2H20-21, with epi wafer for logic foundries outperforming polished wafers for memory makers due to tighter supply and leaner inventory.

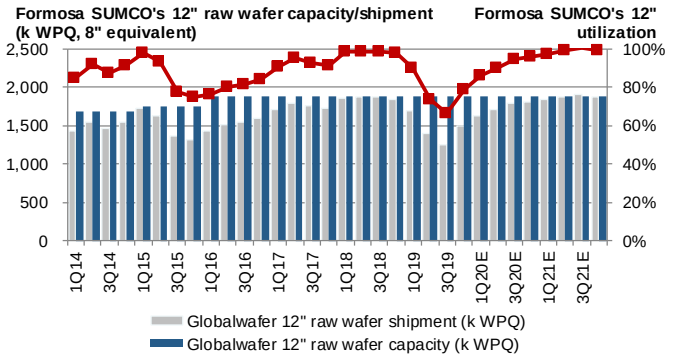
Formosa SUMCO's 8" raw wafer business should see improvement in line with the industry with its high exposure across Asia foundries, lifting the shipment growth through 2020. On the 12" business, with the company's high revenue contribution from its US and Taiwan memory customers and limited exposure in the advanced nodes for its logic customers, the recovery could be more modest in 1H20 as its 12" customers are still depleting the raw wafer inventory to a more normal level. However, the growth should accelerate in 2H20 supported by DRAM supply shortage. We model the company's 8" and 12" raw wafer shipments to grow by 15-20% YoY in 2020 following a 20-25% decline in 2019, lifting its utilisation to 90-95%. The company's raw wafer shipment could grow another 5-10% YoY in 2021 on the back of continued strength for logic and memory demand.

Demand improvement should support higher utilisation and stabilise the pricing outlook

Compared with Globalwafers, Formosa SUMCO has limited capacity secured by LTA. With the collapse of spot price for raw wafers from mid-2018 due to a demand slowdown and inventory

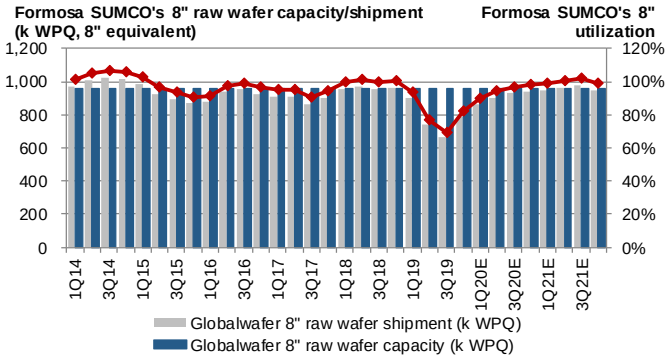
overbuilds, the company's quarterly sales declined by 44% from 3Q18-3Q19, much worse compared with Globalwafers' -6%, following a 43% surge from early-2016 through 1H18. Formosa SUMCO's 4Q19 sales improved by 14% QoQ (though they still declined by 35% as SUMCO allocated some orders to support the company's business) while the spot pricing trend also stabilised with improving tech end-market demand and customers' early pull-in in the year-end.

Figure 50: Formosa SUMCO's 12" shipment could improve along with improving foundry/memory outlook



Source: Company data, Credit Suisse estimates

Figure 51: Formosa SUMCO's 8" shipment could improve along with improving foundry outlook

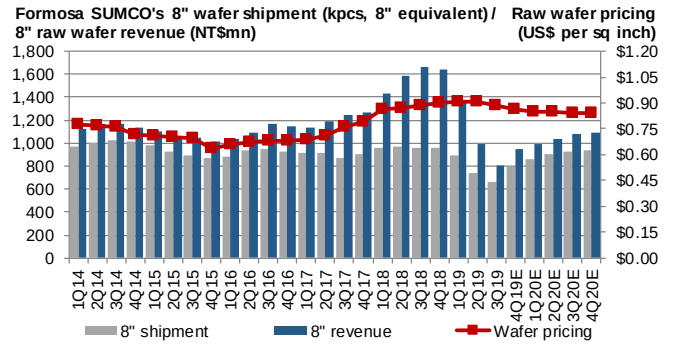


Source: Company data, Credit Suisse estimates

As discussed in the industry section, our base case assumes the raw wafer makers will continue to adjust their production plan, with industry utilisation for 8" and 12" raw wafer only improving mildly to 85-90% in 2020 (vs. 85% in 2019) despite a solid tech end-market demand outlook, sufficient to stabilise the spot price.

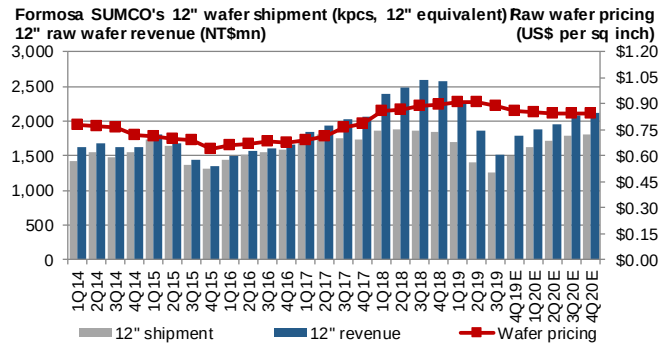
On wafer pricing assumptions, we expect a 1-2% QoQ decline in 1Q20 before a limited drop from 2Q20. Despite a more stable sequential trend through 2020, the full year pricing for 8" and 12" raw wafers should decline by 5% YoY in 2020 due to the higher base in 1H19. We believe the pricing should stay stable into 1H21 before a mild recovery in 2H21 when the industry utilisation improves close to 95% levels where raw wafer makers should gain more bargaining power on the pricing and customers are more willing to sign new LTAs.

Figure 52: Formosa SUMCO's 8" revenue recovery will be moderated by still lower spot price



Source: Company data, Credit Suisse estimates

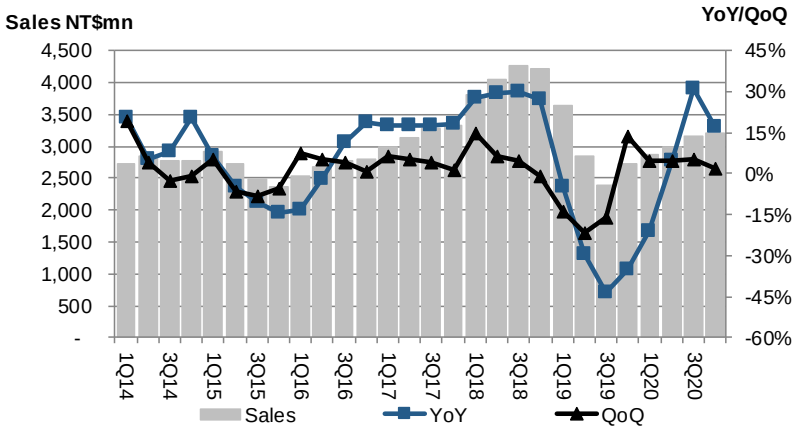
Figure 53: Formosa SUMCO's 12" revenue outlook won't reach its peak level in 2018 on lower raw wafer price



Source: Company data, Credit Suisse estimates

For Formosa SUMCO, we expect raw wafer pricing to decline by 10-15% YoY in 2020, with a stable sequential trend though a tougher compare vs. 1H19. The company's pricing trend could be stable through 2020 or could see a mild improvement from 2H21 with its flexible spot pricing strategy which allows it to benefit from the industry upcycle when the fabs are running at high utilisation.

Figure 54: Formosa SUMCO's revenue may not recover YoY until 2H20



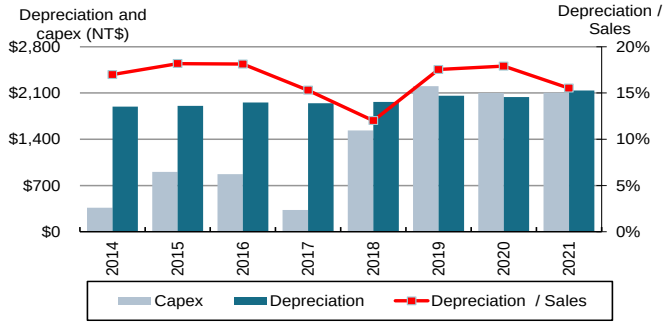
Source: Company data, Credit Suisse estimates

We model Formosa SUMCO's sales to see mild QoQ growth through 2020 and expect Formosa SUMCO's sales to see YoY recovery from 2Q20, supporting a 5% YoY sales growth in 2020. The business could further accelerate to 10-15% YoY sales growth supported by higher utilisation and a potential pricing recovery from 2H21.

Margins decline could continue from lower wafer pricing

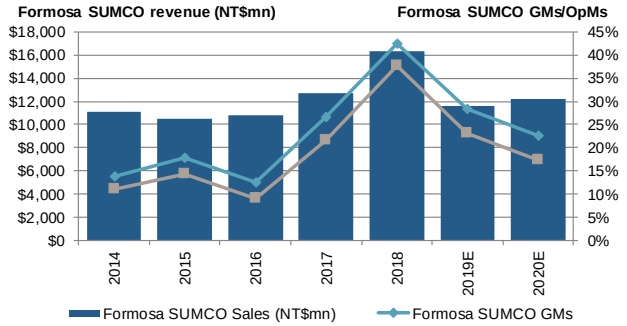
Formosa SUMCO's GMs hit a record high at 45% in 3Q18 but have dropped by 26.7% to 18.7% in 3Q19 due to both lower utilisation and spot pricing. On stabilising shipment and pricing outlook, we expect the company's GMs to stay at 20-25% levels from 4Q19-4Q20, putting 2019/20 GMs at risk, which could significantly decline to 28.4%/22.6% from the peak level of 42.6% in 2018 before a modest improvement to 30% in 2021 on further utilisation recovery. Looking on the bright side, the company historically has stringent control on opex in the industry down cycle and could lower opex/sales from 5% in 2017-18 back to 4% in 2020.

Figure 55: Depreciation will stay flat on conservative capex plan



Source: Company data, Credit Suisse estimates

Figure 56: Formosa SUMCO's profitability has peaked in 2018



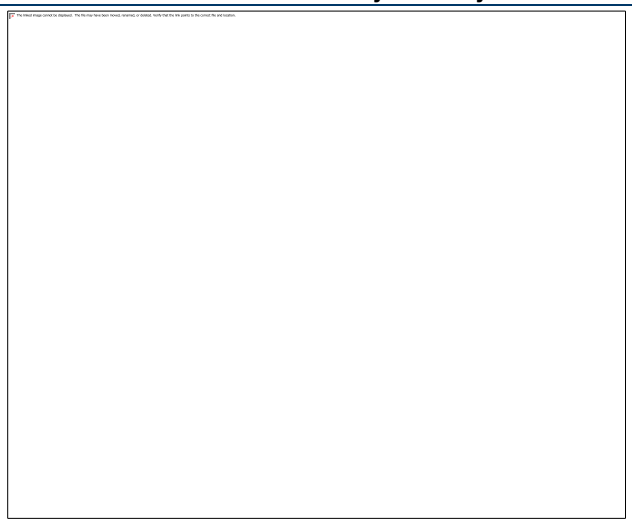
Source: Company data, Credit Suisse estimates

Unleveraged balance should sustain through the downturn

Formosa SUMCO's balance sheet has been healthy due to limited capacity expansion. The company has no debt position since 2Q15 and has also grown its net cash position on the back of better industry supply, with NT$7.4 bn net cash as of end-2019 (NT$12.40 net cash per share in 4Q19 vs. NT$2.0 per share in 2014). Despite still challenging business outlook, we

believe the company should be able to generate cash on limited capex requirement for the maintenance of existing equipment.

Figure 57: Formosa SUMCO's balance sheet stays healthy



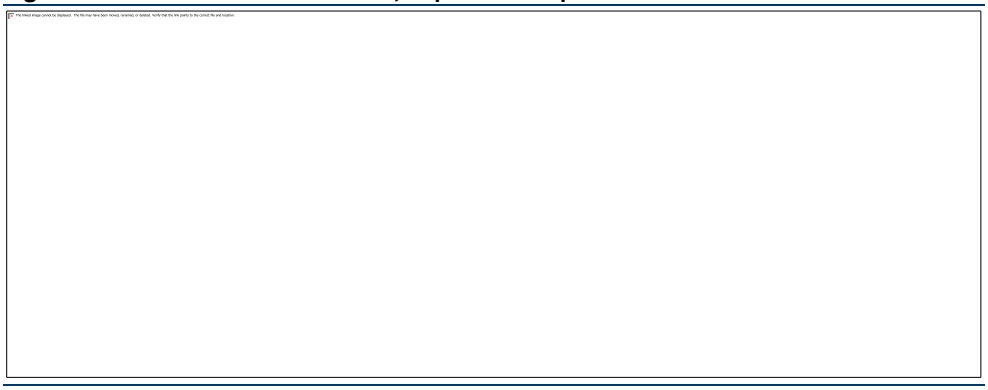
Source: Company data, Credit Suisse estimates

One thing to note is Formosa SUMCO's inventory level has stayed at 103 days exiting 2029 at the high-end of its range though it should decline back to normal range through 2020.

Positive FCF should support the high dividend policy with conservative expansion plan

Formosa SUMCO's operating cash flow has been improving steadily since 2016 from NT$3.0 bn in 2016 to NT$7.2 bn in 2018 from sales and margins improvement. However, on worsening raw wafer demand and pricing trend, the company's annual operating cash flow run rate declined to NT$4.4 bn in 2019. We expect the operating cash flow to further decline to NT$4.2 bn in 2020 before business recovers.

Figure 58: Formosa SUMCO's FCF, capex and depreciation



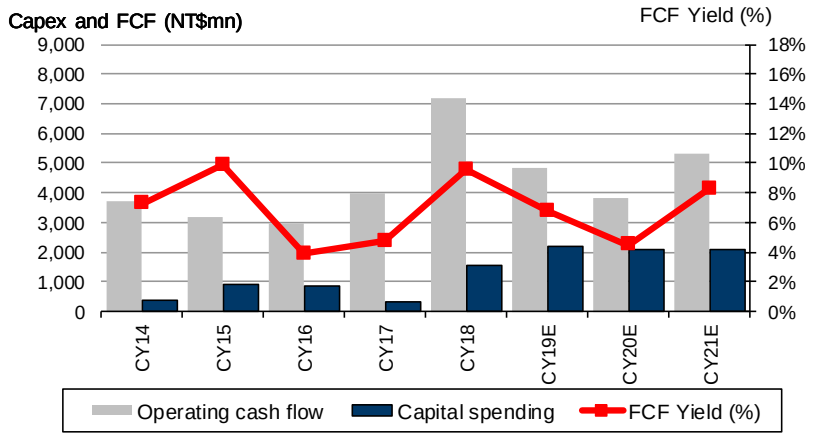
Source: Company data, Credit Suisse estimates

Formosa SUMCO's capex has been more stable compared with its peers as the company has been conservative on adding equipment. The company has been adding capacity through de-bottlenecking in the past two years rather than acquiring new equipment, keeping annual capex at ~NT$1.5 bn in 2018-19. We expect the annual capex to stay similar at NT$2.0-2.5 bn over the next few years as the company's focus should be on improving utilisation in its existing facilities amid the industry oversupply. With limited capacity expansion plans, the company generated NT$3.2 bn FCF in 2019 (NT$8.17 per share) and we estimate the company can still generate NT$2.0 bn free cash flow in 2020 (NT$5.43 per share).

With a clean balance sheet and healthy free cash flow, the company announced to pay NT$3.5 cash dividend for 2019 earnings, representing 64% payout (down from 96% in 2019) and implying 2% dividend payout. Based on 70-80% payout, we estimate the company to pay cash dividend per share to be at NT$3.50/NT$5.50 for 2020/21 earnings, with its free cash flow sufficient to fund the dividend..

With a clean balance sheet and healthy free cash flow, the company announced it would pay NT$3.5 cash dividend for 2019 earnings, representing a 64% payout (down from 96% in 2019) and implying a 2% dividend payout. Based on 70-80% payout, we estimate the company to pay cash dividend per share at NT$3.50/NT$5.50 for 2020/21 earnings, with its free cash flow sufficient to fund the dividend.

Figure 59: Disciplined capex should sustain FCF in a soft pricing environment



Source: Company data, Credit Suisse estimates

Sales and profitability dropping in 2019-20 from a high level

The company reported its 4Q19 sales up 14% QoQ (-35% YoY) on improving foundry demand and better DRAM supply-demand landscape from late 2019. With higher utilisation more than offsetting continued spot price pressure, GMs also improved by 50 bp QoQ to 19.2% in 4Q19, but the forex loss dragged EPS to NT$0.46 in 4Q19.

For full year, on a lower revenue scale and dampened margins profile, Formosa SUMCO's sales dropped by 29% while GMs also declined by 14.6% YoY to 28%, taking EPS from NT$9.41 in 2018 to NT$5.48 in 2019. For 2020, we expect Formosa SUMCO's EPS to further decline to NT$4.55 based on low 90% full-year utilisation and 11% full-year blended wafer pricing decline. The street is higher but the stock is not well covered and has not reflected the lower 2H19 and early 2020 pricing level in estimates.

Figure 60: Formosa SUMCO 4Q19-2Q20 and 2019-21 estimates CS vs. Street

	4Q19		1Q20		2Q20		2019		2020		2021	
(NT$ mn)	Actual	Street	CS	Street	CS	Street	Actual	Street	CS	Street	CS	Street
Sales	2,736	2,634	2,870	2,911	2,998	3,262	11,636	11,533	12,229	13,187	13,873	14,861
Chg (%)	14.0	9.7	4.9	6.4	4.5	12.1	-28.9	6.8	5.1	-19.4	13.4	12.7
GM (%)	19.2	23.5	19.5	23.7	21.0	26.9	28.0	N/A	22.8	27.8	30.8	N/A
OpM (%)	13.5	17.8	14.0	N/A	15.5	N/A	22.5	23.6	17.4	23.5	25.6	31.3
Net Inc.	180	381	346	447	352	584	2,126	2,327	1,763	2,450	2,910	3,641
EPS (NT$)	0.46	0.98	0.89	1.15	0.91	1.51	5.48	6.00	4.55	6.32	7.50	9.39

Source: Company data, the BLOOMBERG PROFESSIONAL™ service consensus estimates, Credit Suisse estimates

CREDIT SUISSE

Formosa SUMCO's earnings could stay low if demand and spot pricing fail to recover as expected

We sensitise the 12" raw wafer pricing trend vs Formosa SUMCO's revenue growth, margins and earnings power. The company's 12" business contributes 60-70% of its revenue and the rest is from 8". As a second-tier player, Formosa SUMCO has limited LTA with customers and its utilisation can swing sharply depending on the supply-demand for the industry.

Our base case assumes that 12" raw wafer price stabilises from late-2019 supported by improving demand from 12" foundries and memory makers following the correction since 2H18. The following are key assumptions for 2020.

1. **Formosa SUMCO's 12" raw wafer price down 10% YoY in 2020.** We assume the 12" raw wafer price would decline 10% YoY for Formosa SUMCO in 2020 due to tougher compare in 1H19 from a higher base despite the stabilisation being on a sequential basis since late 2019.
2. **Formosa SUMCO 12" raw wafer shipment.** We assume Formosa SUMCO's utilisation for 12" raw wafer capacity will improve mildly from 77% in 2019 to 92% in 2020, with shipments up 15% YoY supported by improving demand from memory makers and foundries on the mature nodes while its parent company will also allocate some orders to Formosa SUMCO.
3. **EPS.** Formosa SUMCO's EPS could decline 22% YoY to NT$4.55 in our base case.
4. **Valuation and implied share price.** With demand improving in 2020, although pricing would still decline from 2019 levels, we use 8.5x EV/EBITDA, in line with the average of its 6-19x range and implying 14x 2021 P/E. The share price is valued at NT$105, based on our base case assumption.

Figure 61: Formosa SUMCO's sensitivity analysis indicates limited earnings upside

Raw wafer industry supply/demand model	2017	2018	2019	2020	2021	20 Base	20 Bull	20 Bear	21 Base	21 Bull	21 Bear
Global 12" raw wafer capacity (k WPM)	**5,500**	**5,927**	**6,449**	**6,636**	**6,829**	**6,636**	**6,636**	**6,636**	**6,829**	**6,829**	**6,829**
YoY	3.8%	7.8%	8.8%	2.9%	2.9%	2.9%	2.9%	2.9%	2.9%	2.9%	2.9%
Global 12" wafer capacity (k WPM)	**5,532**	**5,808**	**5,886**	**6,158**	**6,388**	**6,158**	**6,458**	**6,158**	**6,388**	**6,688**	**6,388**
YoY	4.4%	5.0%	1.3%	4.6%	3.7%	4.6%	9.7%	4.6%	3.7%	3.6%	3.7%
Global 12" wafer shipment (k WPM)	**5,500**	**5,896**	**5,762**	**5,649**	**6,249**	**5,649**	**5,949**	**5,449**	**6,249**	**6,549**	**6,049**
YoY	4.4%	5.0%	1.3%	4.6%	10.6%	4.6%	3.3%	-5.4%	10.6%	10.1%	11.0%
Global 12" raw wafer demand (k WPM)	**5,467**	**5,546**	**5,368**	**5,928**	**6,221**	**5,928**	**6,308**	**5,628**	**6,221**	**6,721**	**5,921**
YoY	6.9%	1.4%	-3.2%	10.4%	4.9%	10.4%	17.5%	4.8%	4.9%	6.5%	5.2%
Global 12" raw wafer sufficiency	**99.4%**	**102.0%**	**109.6%**	**107.8%**	**106.9%**	**107.8%**	**102.8%**	**107.8%**	**106.9%**	**102.1%**	**106.9%**
Global 12" raw wafer utilization	**100.0%**	**99.5%**	**89.3%**	**85.1%**	**91.5%**	**85.1%**	**89.6%**	**82.1%**	**91.5%**	**95.9%**	**88.6%**

Formosa SUMCO P&L	2017	2018	2019	2020	2021	20 Base	20 Bull	20 Bear	21 Base	21 Bull	21 Bear
12" wafer capacity (k WPM)	***280***	***280***	***280***	***280***	***280***	***280***	***280***	***280***	***280***	***280***	***280***
12" wafer shipment (k WPM)	***259***	***276***	***217***	***257***	***278***	***257***	***260***	***238***	***278***	***280***	***252***
12" utilization	**92.5%**	**98.6%**	**77.3%**	**91.8%**	**99.2%**	**91.8%**	**93.0%**	**85.0%**	**99.2%**	**100.0%**	**90.0%**
12" wafer pricing (per wafer)	**$83**	**$101**	**$95**	**$86**	**$91**	**$86**	**$88**	**$85**	**$91**	**$95**	**$85**
Formosa SUMCO 12" raw wafer sales	$7,882	$10,036	$7,453	$8,025	$9,176	$8,025	$8,297	$7,286	$9,176	$9,635	$7,753
Formosa SUMCO 8" raw wafer sales	$4,831	$6,322	$4,105	$4,204	$4,697	$4,204	$4,204	$4,204	$4,697	$4,697	$4,697
Formosa SUMCO Total Sales (NT$mn)	**$12,713**	**$16,358**	**$11,558**	**$12,229**	**$13,873**	**$12,229**	**$12,500**	**$11,489**	**$13,873**	**$14,332**	**$12,450**
COGs	$9,319	$9,394	$8,333	$9,470	$9,642	$9,470	$9,577	$9,389	$9,642	$9,883	$9,365
Gross Profits (NT$mn)	**$3,395**	**$6,964**	**$3,225**	**$2,759**	**$4,230**	**$2,759**	**$2,923**	**$2,100**	**$4,230**	**$4,449**	**$3,084**
Gross Margin	***26.7%***	***42.6%***	***27.9%***	***22.6%***	***30.5%***	***22.6%***	***23.4%***	***18.3%***	***30.5%***	***31.0%***	***24.8%***
Total Operating Exp	$645	$784	$629	$629	$683	$629	$643	$591	$683	$705	$613
Income from Operations (NT$mn)	**$2,750**	**$6,180**	**$2,596**	**$2,130**	**$3,548**	**$2,130**	**$2,281**	**$1,509**	**$3,548**	**$3,743**	**$2,472**
% of Sales	***21.6%***	***37.8%***	***22.5%***	***17.4%***	***25.6%***	***17.4%***	***18.2%***	***13.1%***	***25.6%***	***26.1%***	***19.9%***
EBITDA (NT$mn)	***$4,830***	***$8,282***	***$4,842***	***$4,425***	***$5,947***	***$4,425***	***$4,575***	***$3,804***	***$5,842***	***$6,038***	***$4,766***
Non-op	-$135	$228	$204	$49	$54	$49	$49	$49	$54	$54	$54
Pretax Income (NT$mn)	**$2,615**	**$6,408**	**$2,799**	**$2,179**	**$3,601**	**$2,179**	**$2,329**	**$1,558**	**$3,601**	**$3,797**	**$2,525**
Income Taxes Exp. /(Gains)	$372	$827	$551	$415	$691	$415	$443	$296	$685	$722	$480
Tax Rate	*14.2%*	*12.9%*	*19.7%*	*19.0%*	*19.2%*	*19.0%*	*19.0%*	*19.0%*	*19.0%*	*19.0%*	*19.0%*
Net Income (NT$mn)	**$2,243**	**$5,580**	**$2,249**	**$1,765**	**$2,911**	**$1,765**	**$1,886**	**$1,261**	**$2,916**	**$3,075**	**$2,045**
GAAP EPS (NT$)	**$2.89**	**$9.41**	**$5.80**	**$4.55**	**$7.50**	**$4.55**	**$4.86**	**$3.25**	**$7.52**	**$7.93**	**$5.27**
EPS accretive						*0.0%*	*6.9%*	*-28.5%*	*0.2%*	*5.6%*	*-29.7%*
Weighted Share Count (mn)	775.7	592.9	387.8	387.8	387.8	387.8	387.8	387.8	387.8	387.8	387.8

Source: Company data, Credit Suisse estimates

Our bull case assumes that semiconductor growth rebounds better than expected, supporting a stronger 12" demand rebound across foundries, memory makers and IDMs for the unit and content growth in 5G, data centre and broad-based automotive/industrial applications with the following.

1. **Formosa SUCMO's 12" raw wafer price down mid to high single digits YoY in 2020.** We assume Formosa SUMCO's 12" raw wafer pricing should be down 7% YoY as the industry utilisation recovers back to 90% levels (vs. 85% in our base case assumption), supporting a stable sequential trend in 2020 (vs. down mildly QoQ in our base case).
2. **Formosa SUMCO' 12" raw wafer shipment.** We assume Formosa SUMCO's utilisation for 12" raw wafer capacity would improve more meaningfully from 77% in 2019 to 93% in 2020 with shipment up 20% YoY on stronger 12" demand from its foundry and memory customers.
3. **EPS.** Formosa SUMCO's EPS could decline 16% YoY to NT$4.86 in our bull case.
4. **Valuation and implied share price.** With better industry demand recovery and a potential stabilisation in pricing in 2020 in our bull case, we use 13.5x EV/EBITDA (vs. its 6-19x range) and implying 21x 2021 P/E. The share price is valued at NT$135, based on our bull case assumption.

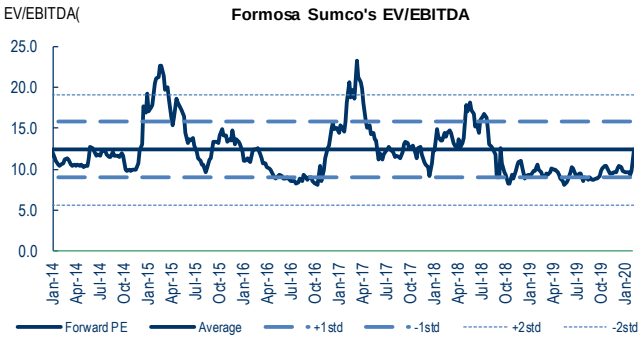
Our bear case assumes that raw wafer price declines worse than expected in 2020 due to macro uncertainty (e.g. softer-than-expected tech end-market demand recovery due to the extended coronavirus impact) with key assumptions below.

1. **Formosa SUMCO's 12" raw wafer price down low to mid-teens YoY in 2020.** We assume the raw wafer price would decline 10-15% YoY for Formosa SUMCO as other suppliers are more aggressively on spot pricing to keep their utilisation at a reasonable level.
2. **Formosa SUMCO's 12" raw wafer shipment.** We assume Formosa SUMCO's utilisation for 12" raw wafer capacity will improve more modestly to 85% in 2020 from 75% in 2019 with shipment up 10% YoY due to slower demand.
3. **EPS.** Formosa SUMCO's EPS could decline by 44% YoY to NT$3.25 in our bear case.
4. **Valuation and implied share price.** With industry demand and pricing trending softer than expected, we use 9x EV/EBITDA (vs. its 6-19x range), implying 17x 2021 P/E. The share price is valued at NT$90, based on our bear case assumption.

Initiating coverage with UNDERPERFORM at NT$105 target price

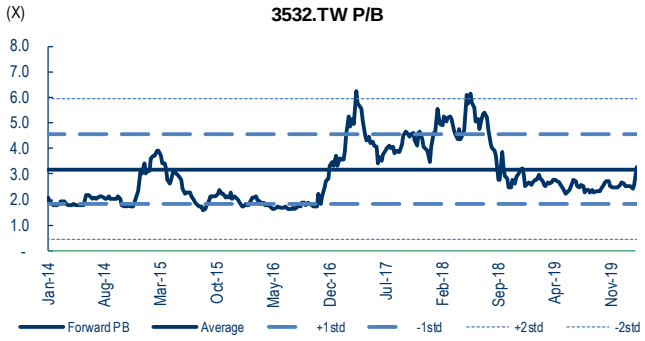
We are initiating coverage on Formosa SUMCO with an UNDERPERFORM rating and a TP of NT$105 based on 8.5x EV/EBITDA, the lower half of the average of its 6-19x range and 14x 2021 P/E. Formosa SUMCO is currently trading at 30x/18x 2020/21 CS earnings estimates. We believe the stock share price reflects the positive expectation for an improving demand outlook in 2020-21 though it has more downside risk if the semiconductor supply chain is negatively impacted by the supply chain disruption from the extended coronavirus outbreak. The valuation based on current share price is also high even reflecting a potential 2H21 spot price recovery.

Figure 62: Formosa SUMCO's stock is in line with its average 12.5x EV/EBITDA now



Source: SEMI, Credit Suisse estimates

Figure 63: Formosa SUMCO's P/B is also back to average



Source: Company data, Credit Suisse estimates

Stock trading at a premium over its peers

Formosa SUMCO is trading at 30x/18x 2020/21 EPS, a premium over its peers of 15x/15x. Its EV/EBITDA is also higher compared with its peers at 10.6x/7.6x. We believe the valuation premium for the company reflects the positive expectations for a faster raw wafer spot pricing recovery from 2020 along with the improving foundry and memory cycle. With high spot market exposure, the company could have more business uncertainty compared with other major raw wafer suppliers with higher LTA protection.

Figure 64: Formosa SUMCO's valuation is already at a premium over its peers

Company	Ticker	Local Price 3/20/2020	Target Local Curcy	Inv'ment Rating	Target upside	Mkt Cap (US$mn)	EPS YoY 2020	EPS YoY 2021	P/E 2020	P/E 2021	P/B 2021	ROE 2021	Dividend yield 2020	Dividend yield 2021
Wafer Makers														
Globalwafers	6488.TWO	$342.50	$450.0	OPFM	31%	$4,943	-5.9%	9.2%	11.7	10.7	2.7	27.4	6.4%	6.0%
Shinetsu	4063.T	$9,075.00	$11,830	NTRL	30%	$34,297	5.5%	2.4%	11.6	11.3	1.2	14.2	2.6%	3.0%
SUMCO	3436.T	$1,076.00	$1,510	NTRL	40%	$2,862	-62.4%	18.3%	26.9	22.8	1.1	6.0	4.6%	4.6%
Siltronic	WAFGn.DE	$54.84	$83.0	NTRL	51%	$1,645	-22.2%	17.9%	9.4	8.0	1.1	14.0	5.5%	6.0%
Wafer Works	6182.TWO	$24.30	$28.5	NTRL	17%	$410	-40.0%	52.9%	16.2	10.6	1.5	11.8	7.2%	4.3%
Formosa SUMCO	3532.TW	$138.00	$105.0	UPFM	-24%	$1,767	-23.6%	65.0%	30.3	18.4	2.8	12.2	3.0%	2.3%
Wafer Maker Median:							**-22.2%**	**17.9%**	**11.7**	**10.7**	**1.2**	**14.0**	**5.5%**	**4.6%**
Wafer Maker Mean:							**-25.0%**	**20.1%**	**15.1**	**12.7**	**1.5**	**14.7**	**5.3%**	**4.8%**

Source: Company data, the BLOOMBERG PROFESSIONAL™ service consensus estimates, Credit Suisse estimates

We also used CS HOLT®, a CS valuation tool that derives a stock price based on a company's cash flow return on investment (CFROI®) and asset growth.

Figure 65: Formosa SUMCO's CS HOLT valuation

FORMOSA SUMCO TECHNOLOGY CORPORATION (3532)

Semiconductors
Market Cap: 55.5 TWD

Price: 143.00 (17 Mar, 2020)
Warranted Price: 102.08 TWD (-29%)

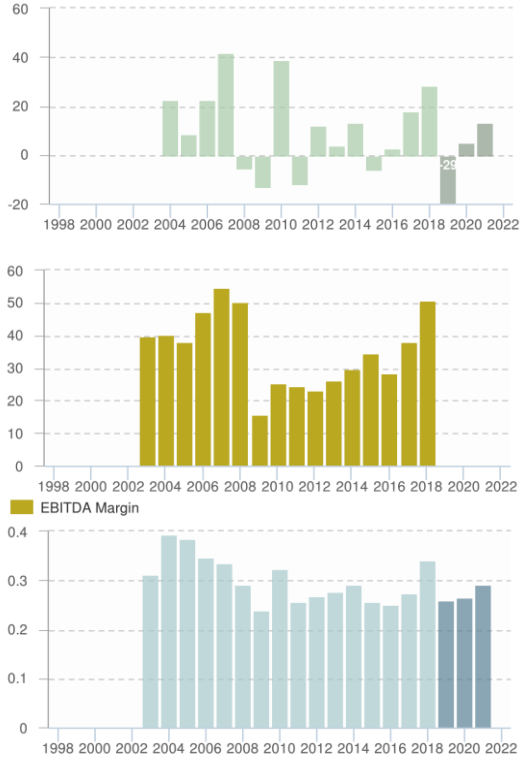
Sales, Margins & Turns Inputs

	2018	2019	2020	2021
Sales Growth %	28.7	-28.9	5.1	13.4
EBITDA %	50.7	42.3	36.2	42.9
Effective Tax Rate %	12.9	19.7	19.0	19.2
Asset Turns	0.34	0.26	0.27	0.29
CFROI %	14.9	7.3	6.1	9.1
Real Asset Growth %	4.5	-6.6	1.9	2.9
Discount Rate	5.88	6.95		

Warranted Valuation

Warranted Valuation	Amount (MM)	Per Share
+ PV Cash Flow Existing Assets	36,136	93.17
+ NPV Cash Flow Future Investments	157	0.40
+ Market Value Investments	NA	0
Total Economic Value	36,293	93.58
- Market Value of Debt & Equivalents	422	1.09
- Market Value of Minority Interest	0	0
Partial Year Adjustment	3,722	9.60
Warranted Equity Value	**39,593**	**102.08**
Winddown Value/Share		**92.08**
Winddown Ratio		1.55
Shares Outstanding	388	downside -29%

Sales, Margins & Turns



Note: North American companies only. Metrics shown are gross investment base weighted. Warranted valuation figures in millions of TWD

Source: Company data, Credit Suisse estimates

We would note the valuation tool warrants an NT$102.1 share price based on our modelled sales growth, margin assumptions and investment plans through 2021. The figure above shows our key assumptions.

Key risks:

Swing in semiconductor demand, customers' wafer pricing erosion and potential competition

We note several core risks that could materially impact the investment thesis and our view on the stock:

- **Swing in semiconductor demand**. Semiconductor demand has been improving since late 2019 supported by the expectation for a 5G upgrade cycle lifting both unit and content growth, data centre investment recovery, AI and IoT are still growing. We expect the semiconductor industry to continue growing at least in line with global GDP in the next few years, supporting the increase in raw wafer demand. However, we would highlight a potential risk for raw wafer pricing and demand if industry growth slows down due to macro uncertainty (e.g. prolonged coronavirus impact and trade war).
- **Customers' wafer price erosion.** Raw wafers suppliers so far could still raise raw wafer pricing as it is still down meaningfully from the peak levels and is only a small portion of its customers' cost. However, a potential risk is that more fierce competition between its

customers could lead to a sharp decline in their pricing. This could cap the raw wafer price upside and limit the company's revenue growth.

- **More aggressive capacity expansion from competitors.** The competitive landscape so far is still benign with top suppliers only adding incremental capacity. However, if its competitors are trying to gain market share and start expanding capacity aggressively, this could lead to another downturn of raw wafer pricing. Although the risk is low in the near term due to technology difficulty, we would be cautious on China raw wafer makers' development as China's government is pushing aggressively to build up the semiconductor ecosystem. Similar to TFT-panel, steel and other commodity industry, China competition could add significant capacity with subsidy from local governments, disrupting the industry landscape.

Profile of Formosa SUMCO's senior management

Takashi Fukushima, General President. Mr Takashi Fukushima is the General President of Formosa SUMCO and also the Chairman of JFST. Mr Fukushima holds a bachelor's degree in mechanical engineering from Kagoshima University.

Rong-Xiang Zhao, VP. Mr Rong-Xiang Zhao is the Vice President of Formosa SUMCO responsible for all operations and management business of the company. Prior to this role, Mr Zhao was the manager of Formosa Plastics. He holds an MBA degree from National Taiwan University.

Mitsuru Ikenoue, VP. Mr Mitsuru Ikenoue is the Vice President of Formosa SUMCO responsible for the production and management business of the factory. He holds a bachelor's degree in industrial chemistry from Miyazaki University.

Mitsuru Ichikawa, CFO. Mr Mitsuru Ichikawa is the CFO of Formosa SUMCO. He holds a bachelor's degree in business from Chuo University.

Ke-Shu Lai, Accounting supervisor. Mr Ke-Shu Lai is the accounting supervisor of Formosa SUMCO. He holds a bachelor's degree in accounting from Chinese Culture University.

Financial summary

Figure 66: Formosa SUMCO's income statement

NT$ mn	1Q19	2Q19	3Q19	4Q19	1Q20	2Q20	3Q20	4Q20	2014	2015	2016	2017	2018	2019E	2020E	2021E
Net sales	**3,643**	**2,857**	**2,400**	**2,736**	**2,870**	**2,998**	**3,152**	**3,209**	**11,147**	**10,488**	**10,794**	**12,713**	**16,358**	**11,635**	**12,229**	**13,873**
Sequential change (%)	*-13.6%*	*-21.6%*	*-16.0%*	*14.0%*	*4.9%*	*4.5%*	*5.2%*	*1.8%*								
YoY change (%)	*-4.6%*	*-29.6%*	*-43.7%*	*-35.1%*	*-21.2%*	*4.9%*	*31.3%*	*17.3%*	*13.0%*	*-5.9%*	*2.9%*	*17.8%*	*28.7%*	*-28.9%*	*5.1%*	*13.4%*
Cost of goods sold	2,257	1,960	1,952	2,164	2,295	2,365	2,415	2,395	9,596	8,613	9,430	9,319	9,394	8,333	9,470	9,642
Gross profits	**1,385**	**897**	**449**	**572**	**575**	**633**	**738**	**814**	**1,551**	**1,875**	**1,365**	**3,395**	**6,964**	**3,303**	**2,759**	**4,230**
Gross margin (%)	*38.0%*	*31.4%*	*18.7%*	*20.9%*	*20.0%*	*21.1%*	*23.4%*	*25.4%*	*13.9%*	*17.9%*	*12.6%*	*26.7%*	*42.6%*	*28.4%*	*22.6%*	*30.5%*
Sales and marketing	127	98	87	91	94	97	101	101	156	201	199	420	552	404	393	437
% of sales	*3.5%*	*3.4%*	*3.6%*	*3.3%*	*3.3%*	*3.2%*	*3.2%*	*3.2%*	*1.4%*	*1.9%*	*1.8%*	*3.3%*	*3.4%*	*3.5%*	*3.2%*	*3.2%*
General and administrative	54	58	56	57	57	59	60	60	168	184	204	225	232	225	236	246
% of sales	*1.5%*	*2.0%*	*2.3%*	*2.1%*	*2.0%*	*2.0%*	*1.9%*	*1.9%*	*1.5%*	*1.8%*	*1.9%*	*1.8%*	*1.4%*	*1.9%*	*1.9%*	*1.8%*
Research and development	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0
% of sales	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*
Other operating expenses	*0.0%*	*0.0%*	*0.0%*						0	0	0	0	0	0	0	0
Total operating expense	181	157	143	148	152	156	160	161	324	386	403	645	784	629	629	683
Income from operations	**1,204**	**740**	**305**	**424**	**423**	**478**	**577**	**653**	**1,227**	**1,489**	**961**	**2,750**	**6,180**	**2,673**	**2,130**	**3,548**
% of sales	*33.1%*	*25.9%*	*12.7%*	*15.5%*	*14.7%*	*15.9%*	*18.3%*	*20.3%*	*11.0%*	*14.2%*	*8.9%*	*21.6%*	*37.8%*	*23.0%*	*17.4%*	*25.6%*
Depreciation	556	562	570	558	569	579	579	568	2,026	2,039	2,093	2,080	2,102	2,246	2,295	2,400
Amortization	0	0	0	0	0	0	0	0	79	72	42	11	3	2	2	2
EBITDA	**1,760**	**1,303**	**876**	**982**	**992**	**1,057**	**1,156**	**1,221**	**3,309**	**3,582**	**3,086**	**4,841**	**8,285**	**4,921**	**4,427**	**5,949**
% of sales	*48.3%*	*45.6%*	*36.5%*	*35.9%*	*34.6%*	*35.3%*	*36.7%*	*38.1%*	*29.7%*	*34.2%*	*28.6%*	*38.1%*	*50.6%*	*42.3%*	*36.2%*	*42.9%*
Non operating income	55	92	41	15	12	13	13	11	58	46	-56	-135	228	203	49	54
Investment gains (loss)	-	0	-	-	-	-	-	-	0	0	0	0	0	0	0	0
Pretax income	**1,259**	**832**	**346**	**439**	**435**	**490**	**591**	**663**	**1,285**	**1,535**	**905**	**2,615**	**6,408**	**2,877**	**2,179**	**3,601**
% of sales	*34.6%*	*29.1%*	*14.4%*	*16.1%*	*15.2%*	*16.4%*	*18.7%*	*20.7%*	*11.5%*	*14.6%*	*8.4%*	*20.6%*	*39.2%*	*24.7%*	*17.8%*	*26.0%*
Income taxes exp. /(gains)	216	217	59	75	74	127	100	113	199	257	175	372	827	566	415	691
Tax rate (%)	*17.1%*	*26.0%*	*17.1%*	*17.0%*	*17.0%*	*26.0%*	*17.0%*	*17.0%*	*15.4%*	*16.7%*	*19.3%*	*14.2%*	*12.9%*	*19.7%*	*19.0%*	*19.2%*
Parent Net Income	**1,044**	**616**	**287**	**365**	**361**	**363**	**490**	**550**	**1,087**	**1,278**	**730**	**2,243**	**5,580**	**2,311**	**1,765**	**2,911**
Minority int.	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0
Net income	**1,044**	**616**	**287**	**365**	**361**	**363**	**490**	**550**	**1,087**	**1,278**	**730**	**2,243**	**5,580**	**2,311**	**1,765**	**2,911**
% of sales	*28.7%*	*21.5%*	*11.9%*	*13.3%*	*12.6%*	*12.1%*	*15.6%*	*17.2%*	*9.8%*	*12.2%*	*6.8%*	*17.6%*	*34.1%*	*19.9%*	*14.4%*	*21.0%*
Net income before extraordinaries	**1,044**	**616**	**287**	**365**	**361**	**363**	**490**	**550**	**1,087**	**1,278**	**730**	**2,243**	**5,580**	**2,311**	**1,765**	**2,911**
Dividend to common share holders	-	-	3,491	-	-	-	1,617	-	233	776	853	520	807	3,491	1,617	1,235
Extraordinaries (ASML sale)									0	0	0	0	0	0	0	0
Net income after extraordinaries	**1,044**	**616**	**287**	**365**	**361**	**363**	**490**	**550**	**1,087**	**1,278**	**730**	**2,243**	**5,580**	**2,311**	**1,765**	**2,911**
Pro Forma EPS (NT$)	**1.76**	**0.79**	**0.74**	**0.94**	**0.93**	**0.94**	**1.26**	**1.42**	**1.40**	**1.65**	**0.94**	**2.89**	**9.41**	**5.96**	**4.55**	**7.50**
GAAP EPS (NT$)	**2.69**	**1.59**	**0.74**	**0.94**	**0.93**	**0.94**	**1.26**	**1.42**	**1.40**	**1.65**	**0.94**	**2.89**	**9.41**	**5.96**	**4.55**	**7.50**
Adjusted share count	388	388	388	388	388	388	388	388	776	776	776	776	593	388	388	388

Source: Company data, Credit Suisse estimates

Figure 67: Formosa SUMCO's cash flow statement

NT$ mn	1Q19	2Q19	3Q19	4Q19E	1Q20E	2Q20E	3Q20E	4Q20E	2013	2014	2015	2016	2017	2018	2019E	2020E	2021E
Net income	**1,044**	**616**	**287**	**365**	**361**	**363**	**490**	**550**	314	1,087	1,278	730	2,243	5,580	2,311	1,765	2,911
Depreciation & amortization	556	563	571	558	569	579	579	569	2,080	2,105	2,111	2,135	2,091	2,105	2,248	2,296	2,401
Dec (inc)-A/R	192	598	11	124	-101	-110	-100	-33	-103	-33	213	-180	-526	-729	926	-344	-255
Dec (inc)-inventory	67	-97	-8	216	-204	-132	-82	98	-169	332	-543	221	-279	-415	178	-319	-24
Inc (Dec)-A/P	-236	-57	-58	111	27	15	10	-4	212	-24	-58	-11	-81	149	-241	48	-1
LT investment loss (gain)	0	0	0	0	0	0	0	0	0	10	8	0	0	0	0	0	0
Investment disposal loss (gain)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Others	-283	-268	101	-139	180	203	203	-194	375	252	198	88	560	511	-589	392	266
Operating cash flow	**1,340**	**1,355**	**904**	**1,234**	**832**	**918**	**1,101**	**986**	**2,708**	**3,728**	**3,207**	**2,984**	**4,007**	**7,201**	**4,833**	**3,838**	**5,298**
Sale(Pur) of ST inv.	0	0	0						0	0	0	0	0	0	0	0	0
Sale(Pur) of LT inv.	-900	0	900	0	0	0	0	0	0	0	-300	300	0	0	0	0	0
Sale of FA	0	0	1						0	0	0	0	0	0	1	0	0
Capital spending	**-460**	**-706**	**-487**	**-547**	**-525**	**-525**	**-525**	**-525**	**-352**	**-365**	**-907**	**-872**	**-331**	**-1,533**	**-1,850**	**-2,100**	**-2,102**
Others	400	0	0	-51	0	0	0	0	0	0	-11	-1	0	-401	349	-2	-2
Investing cash flow	**-960**	**-706**	**414**	**-598**	**-525**	**-525**	**-525**	**-525**	**-353**	**-365**	**-1,218**	**-573**	**-331**	**-1,935**	**-1,500**	**-2,102**	**-2,103**
Inc (Dec) of debt	0	0	0	0	0	0	0	0	-2,509	-951	-691	0	0	0	0	0	0
Bonds issued (redeemed)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Treasury stock dec(inc)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Proceed from new issue	0	0	0	0	0	0	0	0	0	0	0	0	0	-3,878	0	0	0
Dividend paid	0	0	-3,491	0	0	0	-1,617	0	-78	-233	-776	-853	-520	-1,613	-3,491	-1,617	-1,235
Others	0	-1	-1	-2,185	12	3	-4	17	-13	4	6	8	8	9	-2,187	28	2
Financing cash flow	**0**	**-1**	**-3,491**	**-2,185**	**12**	**3**	**-1,621**	**17**	**-2,600**	**-1,179**	**-1,461**	**-845**	**-512**	**-5,483**	**-5,678**	**-1,590**	**-1,233**
Exchange influence	-5	-25	0						-5	-1	22	48	44	-42	-30	0	0
Change in cash flow	**374**	**624**	**-2,173**	**-1,549**	**319**	**396**	**-1,046**	**477**	**-249**	**2,183**	**550**	**1,613**	**3,209**	**-259**	**-2,375**	**146**	**1,961**
Cash - beginning	7,350	7,724	8,348	6,175	4,763	5,039	5,381	4,281	321	72	2,245	2,788	4,401	2,982	6,041	4,401	7,610
Cash - end	7,724	8,348	6,175	4,626	4,945	5,340	4,295	4,772	72	2,245	2,788	4,401	7,610	6,041	9,405	7,610	7,350
Operating cash per share (NT$)	3.45	3.49	2.33	3.18	2.15	2.37	2.84	2.54	3.49	4.81	4.13	3.85	5.17	12.14	12.46	9.89	13.66
Free cash flow per share (NT$)	2.27	1.67	1.07	1.77	0.79	1.01	1.49	1.19	3.04	4.34	2.96	2.72	4.74	9.56	8.59	4.48	8.24

Source: Company data, Credit Suisse estimates

Figure 68: Formosa SUMCO's balance sheet

NT$ mn	1Q19	2Q19	3Q19	4Q19	1Q20	2Q20	3Q20	4Q20	2013	2014	2015	2016	2017	2018	2019E	2020E	2021E
Cash and marketable securities	8,624	9,248	6,175	4,763	5,039	5,381	4,281	4,715	72	2,245	3,088	4,401	7,610	7,350	4,763	4,715	6,378
Inventories	2,692	2,789	2,797	2,581	2,785	2,917	2,998	2,901	2,039	1,744	2,287	2,066	2,345	2,760	2,581	2,901	2,925
Account receivables	2,666	2,068	2,057	1,933	2,034	2,144	2,244	2,276	1,578	1,635	1,422	1,602	2,129	2,858	1,933	2,276	2,532
Other current assets	202	221	263	175	204	193	210	208	157	146	197	97	144	609	175	208	235
Total current asset	**14,184**	**14,326**	**11,292**	**9,452**	**10,062**	**10,634**	**9,734**	**10,101**	**3,845**	**5,770**	**6,994**	**8,165**	**12,227**	**13,577**	**9,452**	**10,101**	**12,070**
LT investment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fixed assets	10,959	11,150	11,204	11,055	11,055	11,055	11,055	11,055	17,321	15,482	14,797	13,226	11,813	10,893	11,055	11,055	11,055
Intangible assets	-	-	-	-	-	-	-	-	67	34	-	0	0	-	-	-	-
Other LT assets	338	290	239	290	290	290	290	290	670	685	367	334	195	302	290	290	290
Total non-current assets	**11,298**	**11,440**	**11,443**	**11,345**	**11,345**	**11,345**	**11,345**	**11,345**	**18,059**	**16,201**	**15,164**	**13,560**	**12,008**	**11,195**	**11,345**	**11,345**	**11,345**
Total assets	**25,482**	**25,766**	**22,734**	**20,797**	**21,407**	**21,979**	**21,078**	**21,445**	**21,905**	**21,971**	**22,158**	**21,726**	**24,235**	**24,773**	**20,797**	**21,445**	**23,414**
Accounts payable	455	398	340	451	478	492	503	499	701	691	634	623	543	692	451	499	498
ST interest bearing liabilities	-	-	-	-	-	-	-	-	951	345	-	-	-	-	-	-	-
Other current liabilities	1,750	4,952	1,694	1,466	1,675	1,868	2,088	1,892	503	669	1,062	750	1,610	1,874	1,466	1,892	2,185
Total current liabilities	**2,206**	**5,350**	**2,033**	**1,917**	**2,153**	**2,360**	**2,590**	**2,390**	**2,155**	**1,705**	**1,695**	**1,374**	**2,153**	**2,565**	**1,917**	**2,390**	**2,682**
LT liabilities	-	-	-	-	-	-	-	-	691	345	-	-	-	-	-	-	-
Other LT liabilities	457	460	459	1,765	1,777	1,780	1,776	1,793	278	283	333	351	410	434	1,765	1,793	1,794
Total LT liabilities	**457**	**460**	**459**	**1,765**	**1,777**	**1,780**	**1,776**	**1,793**	**969**	**629**	**333**	**351**	**410**	**434**	**1,765**	**1,793**	**1,794**
Total liabilities	**2,663**	**5,811**	**2,493**	**3,681**	**3,930**	**4,140**	**4,366**	**4,183**	**3,124**	**2,334**	**2,029**	**1,724**	**2,563**	**2,999**	**3,681**	**4,183**	**4,476**
									-	-	-	-	-	-	-	-	-
Share capital	3,878	3,878	3,878	3,878	3,878	3,878	3,878	3,878	7,757	7,757	7,757	7,757	7,757	3,878	3,878	3,878	3,878
Share premium & other reserves	7,262	7,820	7,820	7,820	7,820	7,820	7,820	7,820	6,696	6,728	6,837	6,964	7,037	7,262	7,820	7,820	7,820
Retained earnings	11,649	8,216	8,503	5,377	5,738	6,101	4,974	5,524	4,327	5,151	5,511	5,254	6,866	10,606	5,377	5,524	7,200
Preferred stocks	0	0	0						0	-	-	-	-	-	-	-	-
Treasury stock	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-
Other equity	29	40	40	40	40	40	40	40	0	0	25	26	11	27	40	40	40
Total equity	**22,819**	**19,955**	**20,242**	**17,116**	**17,477**	**17,839**	**16,712**	**17,263**	**18,781**	**19,636**	**20,129**	**20,001**	**21,672**	**21,773**	**17,116**	**17,263**	**18,938**
Minority interest	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3,965**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Total liabilities & equity	**25,482**	**25,766**	**22,734**	**20,797**	**21,407**	**21,979**	**21,078**	**21,445**	**25,870**	**21,971**	**22,158**	**21,726**	**24,235**	**24,773**	**20,797**	**21,445**	**23,414**

Source: Company data, Credit Suisse estimates

CREDIT SUISSE

Wafer Works

Growing investment on capacity and China competition risk the 2020-21 outlook

6182.TWO

Target price (12M, NT$)
28.50

Neutral[V]

Semiconductor Devices

- **Initiate with NEUTRAL.** We initiate coverage on Wafer Works with a NEUTRAL rating and NT$28.5 target price based on 6x EV/EBITDA and 12x 2021 P/E. Wafer Works is a 6" and 8" raw wafer supplier with a niche focus on power semiconductor for foundries and IDMs. However, due to a limited recovery for automotive/industrial demand, we expect Wafer Works' sales to decelerate from 30% CAGR from 2016-18 to flat YoY in 2020 before reacceleration in 2021, as mild raw wafer shipment growth is offset by continued pricing pressure for small diameter wafer and hike in depreciation.
- **Business stays at a low level before a 2021 recovery.** Wafer Works' quarterly sales have dropped by 36%, since the peak in 3Q18 through 4Q19, due to slower 6" and 8" demand on inventory correction, production halt in its Shanghai fab for relocation and raw wafer pricing erosion. The business is more stable in 1Q20 for 8" on improving foundry demand but 6" outlook stays soft due to still cautious builds for automotive/industrial applications outlook on macro uncertainty, keeping pricing in a mild downward trend. We expect the company's sales to be flat YoY in 2020, with 8" shipment growth moderated by soft 6" and lower YoY pricing. Sales should grow 23%, supported by improving broad-based demand on both 6" and 8" and 8% contribution from its 12" Zhengzhou fab full-year ramp up.
- **Margins recovery capped by growing China competition and rising depreciation.** Although the wafer shipment should be better from 2H20, the higher capex for the 8" capacity expansion, 12" fab ramp-up will lift is depreciation burden while pricing pressure may keep the company's GMs at 30-35% levels in 2020-21. The growing competition from China peers' addition for small diameter raw wafer capacity will also drag its pricing for 6" wafer (20% of its sales), despite its effort to shift its focus to 8"/12" with higher entry barrier.
- **Muted 2020-21 business outlook and worsening FCF may cap shares.** We model 2019/20/21E EPS of NT$2.50/NT$1.50/NT$2.30 on our expectations of +0%/+23% sales YoY in 2020/21. Our NT$28.5 target price is based on 7.5x EV/EBITDA (vs 2-11x long-term average), implying 15x 2021 P/E. The company's plan to list its China operation along with its cash should be sufficient to fund its 8" and 12" capex, though it may need to lower its dividend due to limited FCF generation. **Key risks:** faster-than-expected broad-based demand recovery and slower capacity ramp-up from China competition.

Price (20 Mar 20, NT$)	24.30
Upside/downside (%)	17.3
Mkt cap (NT$/US$ mn)	12,415 / 409.81
Enterprise value (NT$ mn)	14,036
Number of shares (mn)	510.90
Free float (%)	87.3
52-wk price range (NT$)	41.15-22.55
ADTO-6M (US$ mn)	11.1

[V] = Stock Considered Volatile (see Disclosure Appendix)

Research Analysts

Haas Liu
886 2 2715 6365
haas.liu@credit-suisse.com

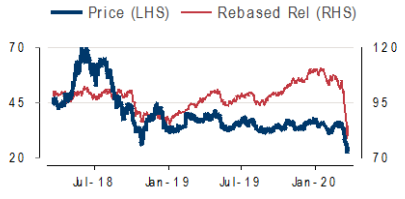
Randy Abrams, CFA
886 2 2715 6366
randy.abrams@credit-suisse.com

Financial and valuation metrics

Year	12/18A	12/19E	12/20E	12/21E
Revenue (NT$ mn)	9,205.3	7,602.7	7,599.7	9,362.7
EBITDA (NT$ mn)	3,119.9	2,314.2	2,250.4	3,247.9
EBIT (NT$ mn)	2,239.1	1,367.4	1,018.1	1,507.3
Net profit (NT$ mn)	1,908.9	1,279.7	768.4	1,174.6
EPS (CS adj.) (NT$)	3.8	2.5	1.5	2.3
Chg. from prev. EPS (%)	n.a	n.a	n.a	n.a
Consensus EPS (NT$)	n.a.	2.66	2.79	3.35
EPS growth (%)	463.4	(34.1)	(40.0)	52.9
P/E (x)	6.4	9.7	16.2	10.6
Dividend yield (%)	1.6	10.3	7.2	4.3
EV/EBITDA (x)	4.0	6.0	6.5	4.5
P/B (x)	1.3	1.55	1.58	1.46
ROE (%)	23.7	14.7	9.7	14.4
Net debt/equity (%)	0.8	12.6	18.5	17.4

Source: Company data, Refinitiv, Credit Suisse estimates

Share price performance



The price relative chart measures performance against the TAIWAN SE WEIGHTED INDEX which closed at 9,234.09 on 20/03/20. On 20/03/20 the spot exchange rate was NT$30.29/US$1

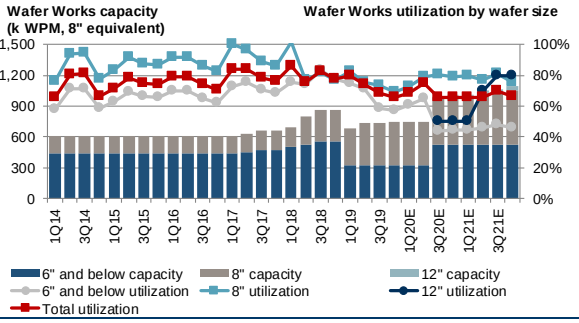
Performance	1M	3M	12M
Absolute (%)	(31.2)	(32.3)	(33.9)
Relative (%)	(9.7)	(9.5)	(20.9)

Focus charts and table

Figure 69: Wafer Works' customer base

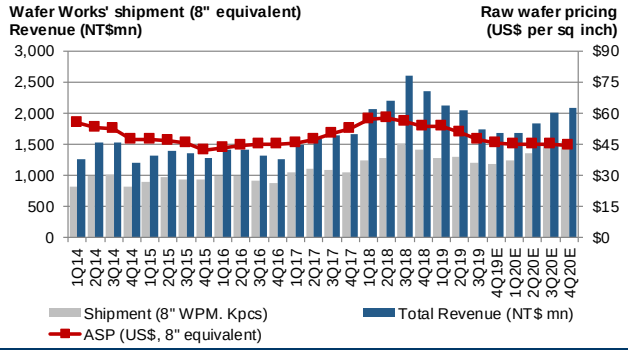
Source: Company data

Figure 70: Wafer Works' utilisation recovery will be mild



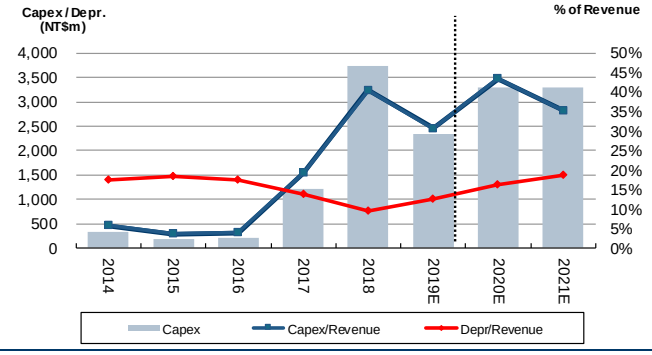
Source: Company data, Credit Suisse estimates

Figure 71: Wafer Works' shipment to recover in 2020 but pricing under pressure



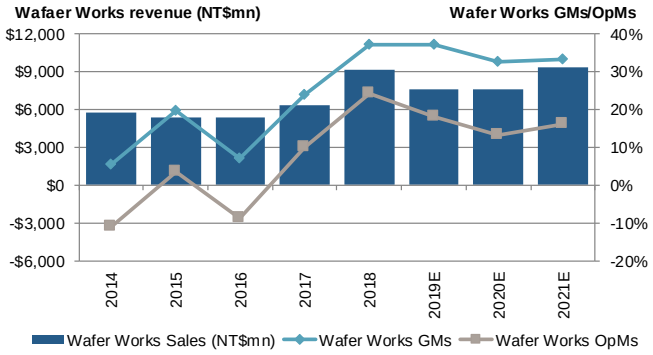
Source: Company data, Credit Suisse estimates

Figure 72: Growing depreciation could limit margin improvement even if demand recovers from 2020



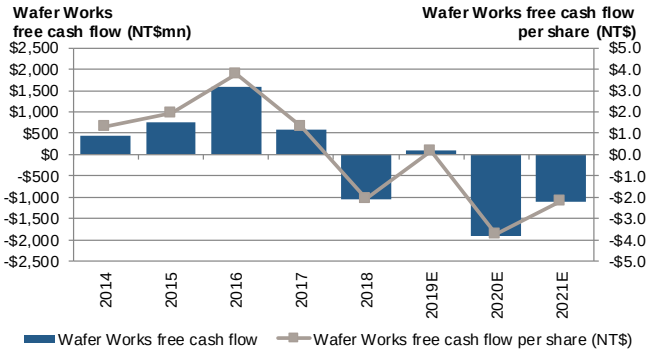
Source: Company data, Credit Suisse estimates

Figure 73: Wafer Works should be able to keep its 30-35%/15-20% GMs/OpMs profitability profile



Source: Company data, Credit Suisse estimates

Figure 74: Wafer Works may need to raise funds to support its capex plan



Source: Company data, Credit Suisse estimates

Figure 75: Wafer Works' 4Q19-2Q20 and 2019-21 estimates—CS vs. Street

	4Q19		1Q20		2Q20		2019		2020		2021	
(NT$ mn)	CS	Street	CS	Street	CS	Street	CS	Street	CS	Street	CS	Street
Sales	**1,672**	**1,713**	**1,690**	**1,820**	**1,829**	**2,018**	**7,603**	**7,604**	**7,600**	**8,443**	**9,363**	**10,808**
Chg (%)	-4.4	-2.0	1.0	8.8	8.2	10.9	-17.4	-17.4	0.0	11.0	23.2	28.0
GM (%)	**33.0**	**32.7**	**31.0**	**30.6**	**32.5**	**32.0**	**37.3**	**37.2**	**32.8**	**33.9**	**33.5**	**36.7**
OpM (%)	**9.3**	**10.0**	**9.8**	**9.8**	**12.4**	**12.2**	**18.0**	**18.2**	**13.4**	**16.2**	**16.1**	**22.3**
Net Inc.	112	190	120	169	161	312	1,280	1,358	768	1,427	1,175	1,711
EPS (NT$)	**0.22**	**0.37**	**0.23**	**0.33**	**0.31**	**0.61**	**2.50**	**2.68**	**1.50**	**2.79**	**2.30**	**3.35**

Source: Company data, the BLOOMBERG PROFESSIONAL™ service consensus estimates, Credit Suisse estimates

Wafer Works (6182.TWO / 6182 TT)

Price (20 Mar 2020): **NT$24.30** Target Price: **NT$28.50**

Analyst: **Haas Liu**
Rating: **Neutral**

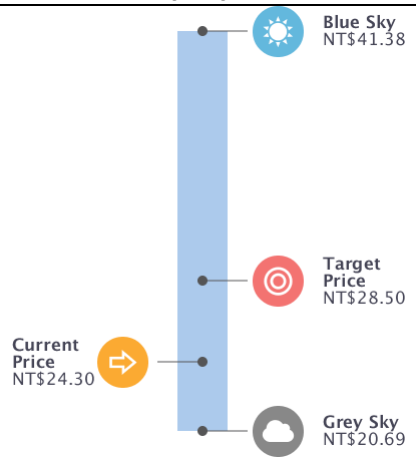
Income Statement (NT$ mn)	12/18A	12/19E	12/20E	12/21E
Sales revenue	**9,205**	**7,603**	**7,600**	**9,363**
Cost of goods sold	5,790	4,770	5,104	6,225
EBITDA	**3,120**	**2,314**	**2,250**	**3,248**
EBIT	**2,239**	**1,367**	**1,018**	**1,507**
Net interest expense/(inc.)	74	100	102	105
Recurring PBT	**2,376**	**1,597**	**916**	**1,402**
Profit after tax	**2,274**	**1,350**	**768**	**1,175**
Reported net profit	**1,909**	**1,280**	**768**	**1,175**
Net profit (Credit Suisse)	**1,909**	**1,280**	**768**	**1,175**
Balance Sheet (NT$ mn)	**12/18A**	**12/19E**	**12/20E**	**12/21E**
Cash & cash equivalents	3,757	4,126	3,457	3,463
Current receivables	2,124	1,724	2,181	2,691
Inventories	1,967	1,534	1,924	2,389
Other current assets	1,266	806	1,003	1,253
Current assets	**9,115**	**8,190**	**8,565**	**9,795**
Property, plant & equip.	8,345	10,621	10,621	10,621
Investments	94	92	92	92
Intangibles	7	26	26	26
Other non-current assets	1,923	2,124	2,124	2,124
Total assets	**19,484**	**21,052**	**21,427**	**22,658**
Current liabilities	**3,208**	**4,288**	**4,713**	**5,217**
Total liabilities	**6,646**	**9,305**	**9,807**	**10,401**
Total debt	3,865	5,601	5,601	5,601
Shareholders' equity	**9,397**	**7,985**	**7,858**	**8,495**
Minority interests	3,441	3,762	3,762	3,762
Total liabilities & equity	**19,484**	**21,052**	**21,427**	**22,658**
Cash Flow (NT$ mn)	**12/18A**	**12/19E**	**12/20E**	**12/21E**
EBIT	**2,239**	**1,367**	**1,018**	**1,507**
Net interest	(74)	(100)	(102)	(105)
Tax paid	(102)	(247)	(148)	(227)
Working capital	0	0	0	0
Other cash & non-cash items	(154)	258	0	0
Operating cash flow	**1,909**	**1,280**	**768**	**1,175**
Capex	0	0	0	0
Free cash flow to the firm	**1,909**	**1,280**	**768**	**1,175**
Investing cash flow	**0**	**0**	**0**	**0**
Equity raised	0	0	0	0
Dividends paid	(192)	(1,277)	(896)	(538)
Financing cash flow	**(192)**	**(1,277)**	**(896)**	**(538)**
Total cash flow	**1,716**	**2**	**(127)**	**637**
Adjustments	0	0	0	0
Net change in cash	**1,716**	**2**	**(127)**	**637**
Per share	**12/18A**	**12/19E**	**12/20E**	**12/21E**
Shares (wtd avg.) (mn)	502	511	511	511
EPS (Credit Suisse) (NT$)	**3.80**	**2.50**	**1.50**	**2.30**
DPS (NT$)	0.38	2.50	1.75	1.05
Operating CFPS (NT$)	3.80	2.50	1.50	2.30
Earnings	**12/18A**	**12/19E**	**12/20E**	**12/21E**
Growth (%)				
Sales revenue	44.4	(17.4)	(0.0)	23.2
EBIT	254.2	(38.9)	(25.5)	48.1
EPS	463.4	(34.1)	(40.0)	52.9
Margins (%)				
EBITDA	33.9	30.4	29.6	34.7
EBIT	24.3	18.0	13.4	16.1
Valuation (x)	**12/18A**	**12/19E**	**12/20E**	**12/21E**
P/E	6.4	9.7	16.2	10.6
P/B	1.30	1.55	1.58	1.46
Dividend yield (%)	1.6	10.3	7.2	4.3
EV/sales	1.4	1.8	1.9	1.6
EV/EBITDA	4.0	6.0	6.5	4.5
EV/EBIT	5.6	10.2	14.3	9.7
ROE analysis (%)	**12/18A**	**12/19E**	**12/20E**	**12/21E**
ROE	23.7	14.7	9.7	14.4
ROIC	19.0	8.8	6.3	9.0
Credit ratios	**12/18A**	**12/19E**	**12/20E**	**12/21E**
Net debt/equity (%)	0.8	12.6	18.5	17.4
Net debt/EBITDA (x)	0.03	0.64	0.95	0.66

Source: Company data, Refinitiv, Credit Suisse estimates

Company Background

Wafer Works Corp. engages in the research and development, design, manufacture, and sale of silicon wafers for semiconductor devices. It specialises in polished silicon wafers and epitaxial wafers.

Blue/Grey Sky Scenario



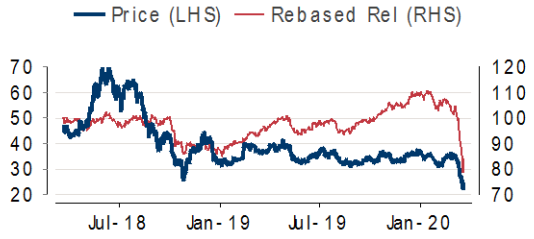
Our Blue Sky Scenario (NT$) **41.38**

Our blue sky scenario value of NT$41.38 implies 15x 2021 P/E on the back of faster-than-expected demand recovery across its foundry and IDM customers, a more balanced supply-demand for 6" and 8" and faster-than-expected 12" fab ramp.

Our Grey Sky Scenario (NT$) **20.69**

Our grey sky scenario value of NT$20.69 implies 9x 2021 P/E due to slower-than-expected tech end market demand recovery, dragging the outlook for its foundry and IDM customers. The spot price could also continue the downward trend if the industry stays in oversupply and China competition intensifies.

Share price performance

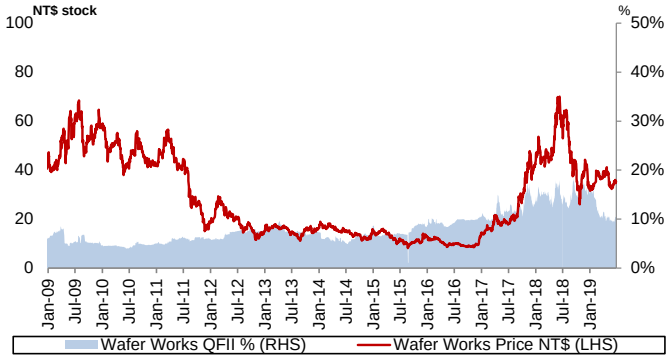


The price relative chart measures performance against the TAIWAN SE WEIGHTED INDEX which closed at 9,234.09 on 20-Mar-2020
On 20-Mar-2020 the spot exchange rate was NT$30.29/US$1

Growing investment on capacity and China competition risk the 2020-21 outlook

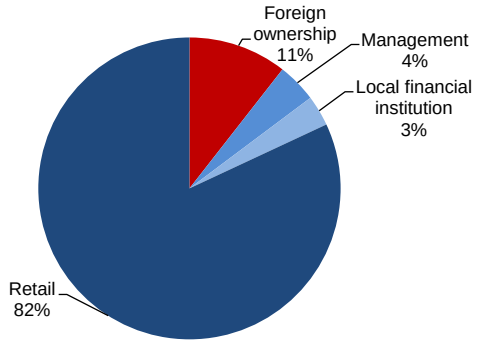
Wafer Works' President Mr. Chiao Ping Hai established Helitek in the US in 1986 and started the business of silicon wafer, laying the foundations of silicon wafer development for Wafer Works. In 1997, Wafer Works was set up and gained expertise in semiconductor wafer through acquiring Helitek, the chairman's company in US founded in 1986, which has been listed on Taiwan OTC market since 2002. The company started 4"-6" raw wafer production at its first facility in Yangmei, Taiwan, in 2000 and built an 8" facility in Longtan, Taiwan, in 2011.

Figure 76: Wafer Works' foreign ownership



Source: Company data, Credit Suisse estimates

Figure 77: Wafer Works' management ownership



Source: Company data, Credit Suisse estimates

In China, the company also set up Wafer Works Shanghai (WWXS) in 2004 and started manufacturing epi wafers in Shanghai from 2006 and shipment began from 2007, following its customers' qualification. Due to the Chinese government's push on building a local semi-conductor ecosystem, Wafer Works signed a strategic partnership with He Nan Xing Gang Investment in 2016. The industry fund acquired a 37.6% stake in Wafer Works Shanghai for Rmb700 mn, while Wafer Works will build raw wafer facilities in Zhengzhou, with 8" capacity already in production from 2Q19 while the 12" fab should start ramping from late 2020.

Figure 78: Wafer Works' milestones

Time	Event
Jul-97	Wafer Works set up
Nov-97	Wafer Works acquired Helitek
May-99	Yangmei facility started production for 6" and below wafers
May-02	Wafer Works listed on Taiwan OTC market
Mar-04	Wafer Works acquired 75% stake in Shanghai Wafer Works (WWXS)
Oct-06	WWXE started mass production on epi wafers
Aug-09	Wafer Works started heavily doped wafers
Jul-08	Wafer Works expanded Yangmei facility
Oct-11	Wafer Works' headquarter and Longtan facility started 8" wafer production
Mar-16	Wafer Works consolidated Wafer Works Opto
Dec-16	Wafer Works signed partnership agreement with Henan Xin Gang Investment
Jul-17	Wafer Works' Zhengzhou facilty under construction
Oct-18	Wafer Works' Zhengzhou facilty started trial production
Nov-18	Wafer Works' Shanghai facility stopped production due to relocation

Source: Company data, Credit Suisse estimates

Outside its core raw wafer business, Wafer Works also established Wafer Works Optoelectronic to produce substrates for LED diamond in 2007 but has phased out the business since 2015 due to continued loss. The company also provided components for solar battery back in 2012 but stopped the business due to low margins. The company has been focusing only on its raw wafer business since 2016.

12” capacity expansion in addition to current 6” and 8” portfolio

Wafer Works is the seventh largest semiconductor material provider and the top 3 leader of heavy doped wafer in the world. The company has facilities in Taiwan and China mostly for 6” and below and 8” wafer production including:

Wafer Works Taiwan: (WWX): The company has two factories in Taiwan. The Longtan fab started production from November 2011 with a focus on 8” polished wafer production, with 320k WPM 8” equivalent capacity. The Yangmei fab was built in 1999 and has been expanded to 330k WPM capacity in 2010 with a focus on 4”-6” raw wafer production.

Wafer Works Shanghai (WWXS): The facility mainly provides 4” to 6” raw wafers for China and overseas companies. With 230k WPM 6” equivalent capacity, the facility is one of the largest polished raw wafer manufacturing factories in China. The fab has been shut down since November last year for relocation but will resume production from 3Q19.

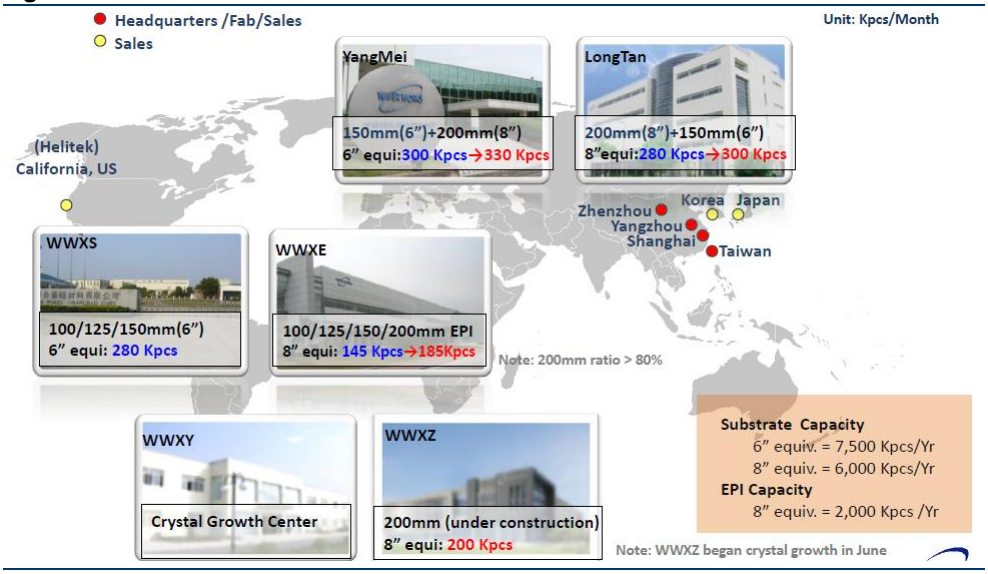
Wafer Works Epitaxial (WWXE): The facility was set up in 2005 with 170k WPM 8” equivalent capacity for 6” and 8” epitaxial raw wafers and 4”-8” heavy doped polished wafers. The company plans to expand the fab to 200k WPM capacity in 2Q19 and will have 300k WPM by the end of 2021.

Wafer Works Yangzhou (WWXY): The facility was originally to have 150k WPM 6” equivalent capacity by the end of 2018, but the project has been delayed. Currently, the facility is only for ingot growth.

Helitek: The subsidiary serves as a sales office to provide services to Wafer Works’ US and Canada customers with the raw wafers manufactured in Taiwan and China.

Wafer Works Zhengzhou (WWXZ). In addition to the existing facilities, the company will have 8” capacity ready for production in its Zhengzhou facility from 3Q19, though the capacity expansion plan has been pushed out from original 200k WPM to 100k by the year-end of 2019 due to soft 8” raw wafer demand.

Figure 79: Wafer Works’ fabs across Taiwan and China



Source: Company data

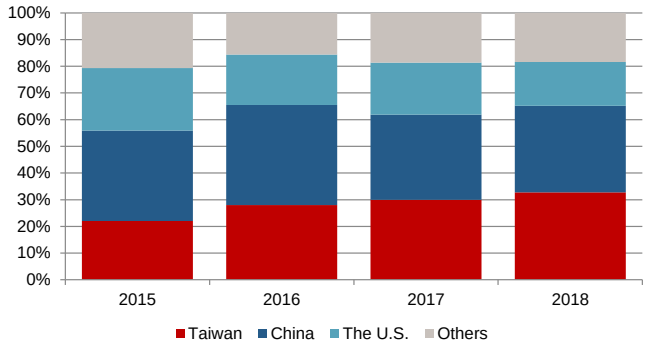
On growing 12” demand in China, the company will also have a 12” fab in Zhengzhou, with a focus on the specialty heavily doped wafer production for automotive applications and power discretes, and equipment pulling in from 2Q19. The company plans to have 10k WPM capacity in Phase 1 of the facility with production from 2Q20, and has room to expand to 200k WPM 12”

capacity at maximum, though the ramp-up plan could also be adjusted due to slow 12" raw wafer demand.

Capacity in Taiwan and China to support global IDMs

Wafer Works is leading the market for small diameter raw wafer supply, with 33% global market share in 4" wafers, 31% share in 5" and 11% in 6". With most of its capacity for 8" and below raw wafer production, Wafer Works has a diversified customer base, including IDMs and foundries across the US (ON Semi, Infineon, TI, Global Foundries, Diodes, TowerJazz and Vishay), Europe (NXP, STMicro and nexperia), Taiwan (TSMC, UMC and Macronix), China (SMIC, Hua Hong, ASMC and CSMC) and other APAC (Renesas, X-Fab, Sony, Hitachi and Rohm). Therefore, compared with the leading players providing standardised polished and epi wafers for logic and memory products, Wafer Works provides its IDM customers with heavily doped wafers for the applications including power semiconductor-related applications.

Figure 80: Wafer Works' revenue by region



Source: Company data, Credit Suisse estimates

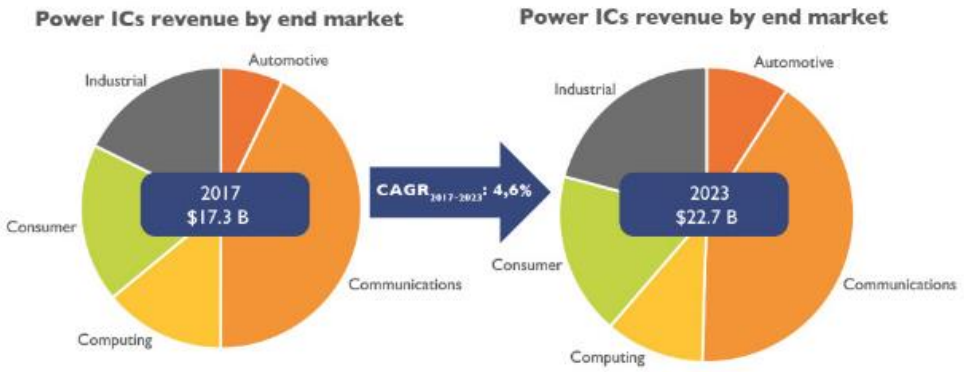
Figure 81: Wafer Works has a diversified customer base across foundries and IDMs

Source: Company data

Leading in heavily doped wafer supply to capture the secular growth in power semiconductor applications

Compared with the major players competing in standardised polished and epi wafer, Wafer Works focuses on the niche heavily doped wafers (50%+ of sales) to target power semiconductor-related applications with a 30% price premium over standardised wafers. Based on Yole's estimate, Wafer Works is the second-largest raw wafer provider for ultra-low resistance CZ raw wafer for power semiconductor applications.

Figure 82: Power IC market will grow at a 4.6% CAGR through 2023, with automotive and industrial applications outgrowing the market



Source: Yole

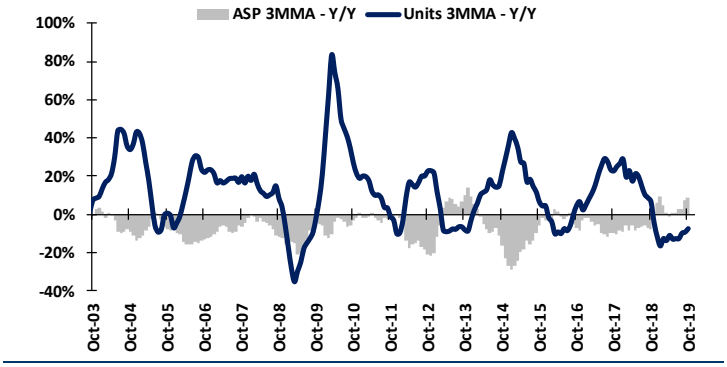
According to Yole estimates, the power IC content, including power management IC and power discrete, will grow from US$188 per vehicle in 2016 to US$209 in 2022. The market size for automotive power discrete will grow at a CAGR of 4.2% to US$15.8 bn in 2021, while the automotive power magnet IC market will also grow at a CAGR of 9% from 2017 to 2023, driving demand for heavily doped wafers and epi wafers due to the requirement of low resistance. The company, therefore, benefitted from the pricing upward trend and healthy demand for automotive and industrial applications from its IDM customers on both 6" and 8".

Broad-based demand recovery should support 6" demand though competition gets fierce in China

Auto/industrial demand stabilising, helping MCUs and analog to also start to rebound after under-shipping demand in 2019

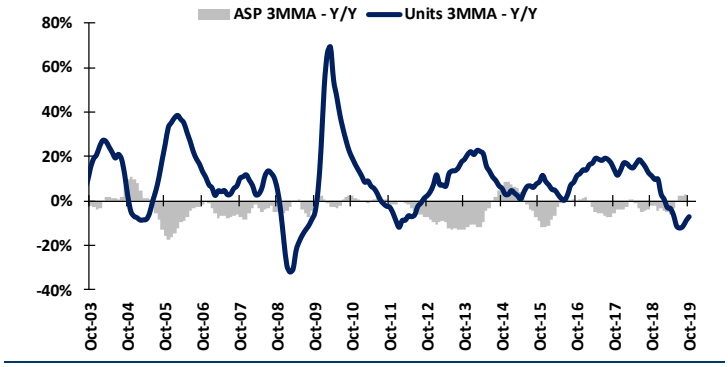
Automotive/Industrial semiconductors were in a slump throughout 2H18/2019 in a cyclical hangover from the 2016-17 upturn to adjust inventory and also respond to higher macro uncertainty from the trade war and falling EV subsidies in China. The SIA shows sales for MCUs and analog rebounding to a single digit decline in 2H19 after troughing in 2Q19, and chip suppliers at the CS annual tech conference in early December did indicate order stabilisation and leaner inventory.

Figure 83: MCU unit declines narrowing



Source: SIA, Credit Suisse estimates

Figure 84: Analog unit declines also narrowing



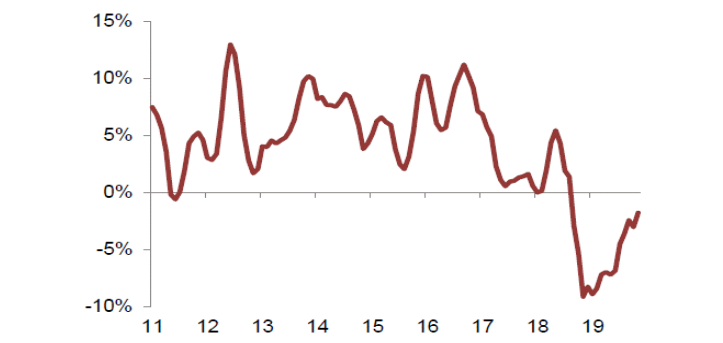
Source: SIA, Credit Suisse estimates

CS tracker or 200 global industrial companies shows demand has held up relative to industrial semis going through a four-quarter correction

The demand indicators at the start of the year before the virus outbreak were showing some signs of stabilisation. Our CS Economics Team "Fragile Tranquility" showed auto units rebounding from a trough at -9% YoY in late 2018 to -2% YoY. Auto production was weak over the past year due to multiple factors (GM US strike, regulatory changes in Europe, a typhoon in Japan, EV subsidy cuts in China, and US tariff concerns).

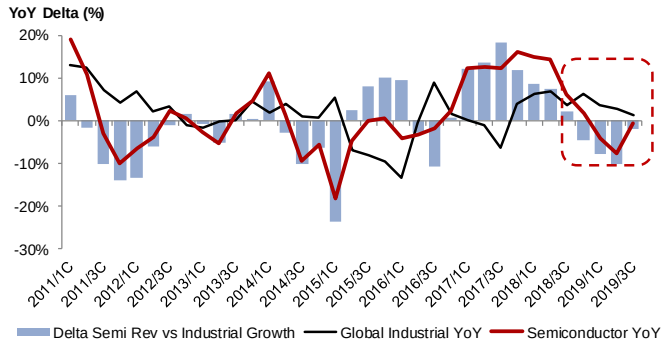
The output rebound may slow with the virus impact, although it will still have some secular growth in the medium term from higher content for electronics for ADAS, EV, infotainment and communications. CS Semi analyst John Pitzer's tracker of over 200 global industrial companies' sales at least showed industrial semiconductors under-shipped industrial demand for the past four quarters through 3Q19. Industrial semiconductor ASIC sales have also rebounded from a trough at -8% in June 2019 to up 1% YoY in 4Q19, although further pick-up will hinge on the virus spread in the developed markets.

Figure 85: Global automotive unit declines narrowing



Note: YoY % unit auto sales for US, China, Euro area and Japan.
Source: Refinitiv Datastream, Credit Suisse Economics Team

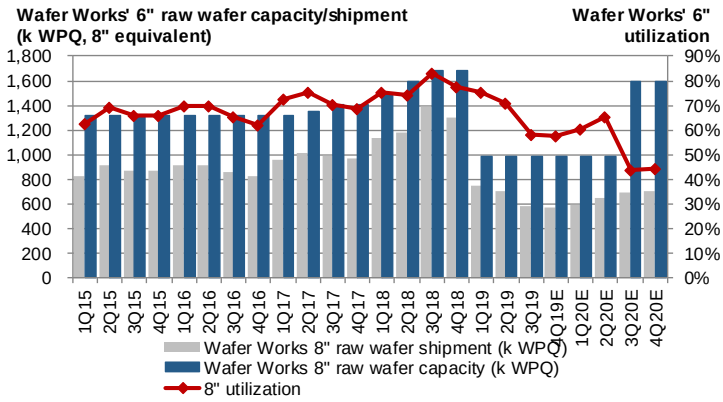
Figure 86: Industrial semis should resume growth after under-shipping industrial demand the past year



Source: SIA, company data, Factset

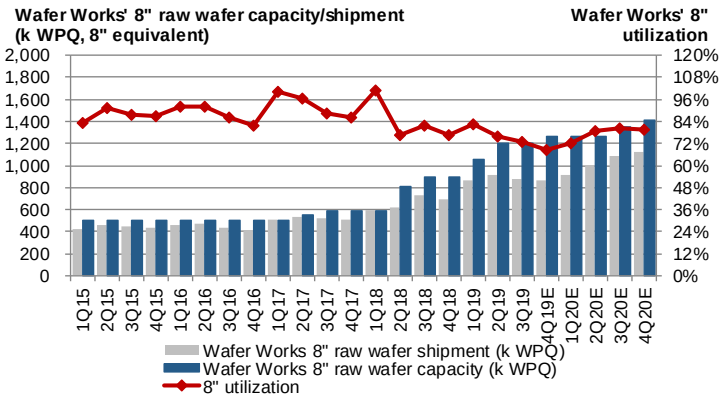
Despite the improving demand outlook, we are more cautious on the 6" competition due to its lower entry barrier. China competitors in the past few years have been ramping up the legacy 4" and 6" capacity with products already used in local IDM and foundries' production. Although Wafer Works has 50% of its 6" revenue from its global IDM customers and tries to position itself as a niche supplier for heavy doped wafers, it usually serves as a second source and needs to compete with major raw wafer suppliers who have larger scale and are also competitive on pricing. In addition, the other 50% of the company's 6" business is from its China epi wafer customers who could switch to its competitors once their technology and quality gets more mature, risking the company's sales and margins outlook in the next few years.

Figure 87: Wafer Works' 6" utilisation will stay under pressure



Source: Company data, Credit Suisse estimates

Figure 88: 8" utilisation can be stable even with new capacity



Source: Company data, Credit Suisse estimates

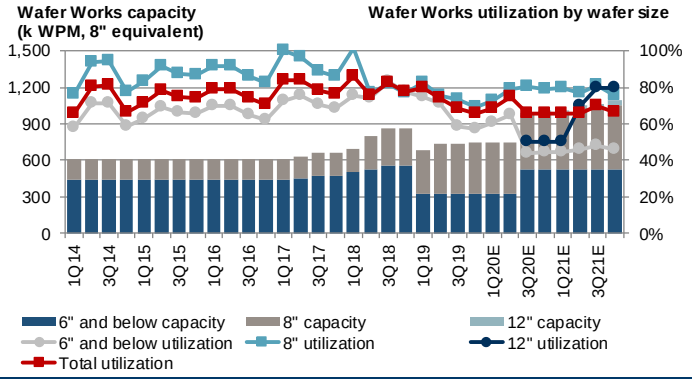
Wafer Works currently only has 330k WPM 6" capacity running in its Yangmei facility at 75-80%. The company will also resume its 6" wafer production in its Shanghai facility from 3Q20, following the equipment relocation to meet local environmental regulation started from early 2019, adding 230k WPM capacity in 2H20. We estimate the company's 6" shipment should grow 7% YoY in 2020, following a 46% decline in 2019 from both its major customers' inventory digestion and the halt of production in its Shanghai 6" facility. With pricing remaining under pressure (-8% YoY in 2020) offsetting the shipment recovery, we expect the business to decline by 1.5% YoY in 2020, representing 30% of its sales.

8" and 12" business better positioned in China

The 8" raw wafer industry outlook should be supported by foundry business reacceleration and leaner IDM inventory levels, following the decline from 2H18-1H19. On improving 8" demand, we believe Wafer Works' capacity in its Longtan facility in Taiwan is running at a high utilisation. The company is also recovering the business in its Zhengzhou facility which is running at 60-

70% utilisation following the lock-down, though it may take another half month for the business in Zhengzhou to normalise due to the quarantine requirement for the staff from other provinces. On the other hand, the company's facility for epi wafer in Shanghai has been running normally through the Chinese New Year and coronavirus, consistent with the comments from foundries with fabs in Shanghai. We believe Wafer Works' business should continue to improve sequentially through 2020, supporting a 9% shipment growth though partially offset by mid-to-high single-digits YoY decline for pricing, putting the 8" sales flat YoY in 2020.

Figure 89: Wafer Works' utilisation recovery will only be mild in 2020-21



Source: Company data, Credit Suisse estimates

Wafer Works also has plans to ramp up its 12" fab in Zhengzhou and targets to ramp up 10k WPM capacity by the end of 2020 and an additional 40k WPM in the next 1-2 years, depending on the market demand. The company's key focus will still be on the heavily doped wafers for specialty applications including power ICs (power management IC and power discretes). We estimate the revenue contribution from the 12" fab will grow from 1% in 2020 to 8-9% in 2021 based on its capacity schedule.

We would also highlight the company's plan to list its China business in A-share by the end of this year. The funds raised from the IPO could support the company's capex required to grow its 8" and 12" capacity. In addition, the listing in China would strengthen its relationship with the local government and supply chain, with long-term opportunity to setup a JV or partnership.

Sales should stabilise in 2020 before acceleration in 2021

Figure 90: Wafer Works' operating metrics

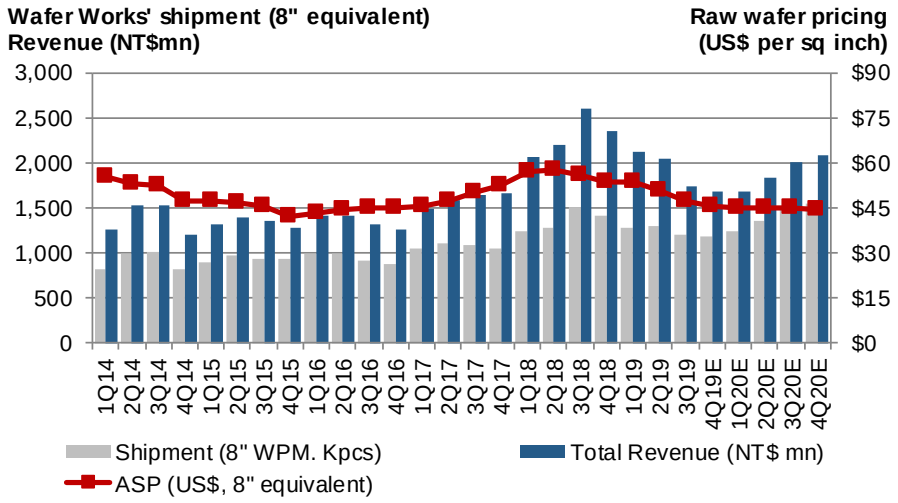
NT$ mn, 8" equivalent	1Q19	2Q19	3Q19	4Q19E	1Q20E	2Q20E	3Q20E	4Q20E	2016	2017	2018	2019E	2020E	2021E
6" raw wafer capacity	*557*	*557*	*557*	*557*	*557*	*557*	*894*	*894*	*2,970*	*3,088*	*3,628*	*2,228*	*2,903*	*3,578*
8" raw wafer capacity	*1,052*	*1,204*	*1,204*	*1,264*	*1,264*	*1,264*	*1,350*	*1,410*	*2,025*	*2,244*	*3,189*	*4,723*	*5,288*	*5,970*
12" raw wafer capacity	*0*	*0*	*0*	*0*	*0*	*0*	*34*	*68*	*0*	*0*	*0*	*101*	*810*	
Capacity (8" WPQ / WPY)	**1,609**	**1,761**	**1,761**	**1,821**	**1,821**	**1,821**	**2,278**	**2,372**	**4,995**	**5,333**	**6,818**	**6,951**	**8,291**	**10,358**
Sequential change (%)	*-13%*	*9%*	*0%*	*3%*	*0%*	*0%*	*25%*	*4%*	*0%*	*7%*	*28%*	*2%*	*19%*	*25%*
6" raw wafer shipment	*418*	*396*	*325*	*320*	*336*	*363*	*392*	*398*	*1,980*	*2,213*	*2,818*	*1,459*	*1,489*	*1,655*
8" raw wafer shipment	*866*	*910*	*882*	*870*	*914*	*996*	*1,085*	*1,118*	*1,782*	*2,073*	*2,640*	*3,529*	*4,113*	*4,675*
12" raw wafer shipment	*0*	*0*	*0*	*0*	*0*	*0*	*17*	*34*	*0*	*0*	*0*	*0*	*51*	*601*
Shipment (8" WPM. Kpcs)	**1,284**	**1,306**	**1,207**	**1,190**	**1,250**	**1,359**	**1,494**	**1,550**	**3,763**	**4,286**	**5,458**	**4,988**	**5,652**	**6,930**
Sequential change (%)	*-10%*	*2%*	*-8%*	*-1%*	*5%*	*9%*	*10%*	*4%*	*1%*	*14%*	*27%*	*-9%*	*13%*	*23%*
Utilization rate (%)	**80%**	**74%**	**69%**	**65%**	**69%**	**75%**	**66%**	**65%**	**75%**	**80%**	**80%**	**72%**	**68%**	**67%**
ASP (US$, 8" equivalent)	**$53.8**	**$51.0**	**$47.0**	**$45.6**	**$45.1**	**$44.9**	**$44.7**	**$44.6**	**$44.5**	**$48.9**	**$55.9**	**$49.5**	**$44.8**	**$45.0**
Sequential change (%)	*0%*	*-5%*	*-8%*	*-3%*	*-1%*	*0%*	*0%*	*0%*	*-2%*	*10%*	*14%*	*-12%*	*-9%*	*0%*
Revenue (US$ mn)	**69**	**67**	**57**	**54**	**56**	**61**	**67**	**69**	**167**	**209**	**305**	**247**	**253**	**312**
FX rate (NT$)	30.8	30.8	30.8	30.8	30.0	30.0	30.0	30.0	32.1	32.5	32.5	30.8	30.0	30.0
Other Revenue (NT$ mn)	2,130	2,052	1,748	1,672	1,690	1,829	2,006	2,075	5,401	6,377	9,205	7,603	7,600	9,363
Total Revenue (NT$ mn)	**2,130**	**2,052**	**1,748**	**1,672**	**1,690**	**1,829**	**2,006**	**2,075**	**5,391**	**6,377**	**9,205**	**7,603**	**7,600**	**9,363**
Capex (NT$ mn)	**981**	**705**	**676**	**938**	**800**	**800**	**800**	**900**	**213**	**1,224**	**3,731**	**3,300**	**3,300**	**3,300**
Capex/revenue (%)	*46%*	*34%*	*39%*	*56%*	*47%*	*44%*	*40%*	*43%*	*4%*	*19%*	*41%*	*43%*	*43%*	*35%*
Gross margin (%)	**42.4%**	**37.4%**	**35.0%**	**33.0%**	**31.0%**	**32.5%**	**33.2%**	**34.3%**	**7.1%**	**24.0%**	**37.1%**	**37.3%**	**32.8%**	**33.5%**
Operating margin (%)	28.2%	19.5%	12.0%	9.3%	9.8%	12.4%	14.3%	16.3%	-8.8%	9.9%	24.3%	18%	13%	16%

Source: Company data, Credit Suisse estimates

We model Wafer Works' sales to improve sequentially through 2020 following a low base in 2019. However, due to a tougher compare, the 1%/9% QoQ improvement in 1Q20/2Q20 will still lead to a 15.9% YoY drop in 1H20 before a 19% YoY recovery in 2H20, putting full-year sales only stable YoY in 2020.

For 2021, we expect Wafer Works' 6" and 8" business to grow 15% YoY, factoring in continued demand growth across its foundry and IDM customers, with leaner 8" raw wafer inventory levels on its customers' balance sheet. The tighter industry raw wafer supply may also drive mild pricing recovery from 2H21. In addition to the existing 6" and 8" business, the newly built 12" facility in China will also add 8-9% of the company's sales with full-year contribution, supporting Wafer Works' sales up 23% YoY in 2021.

Figure 91: Wafer Works' shipment to recover in 2020 but pricing under pressure

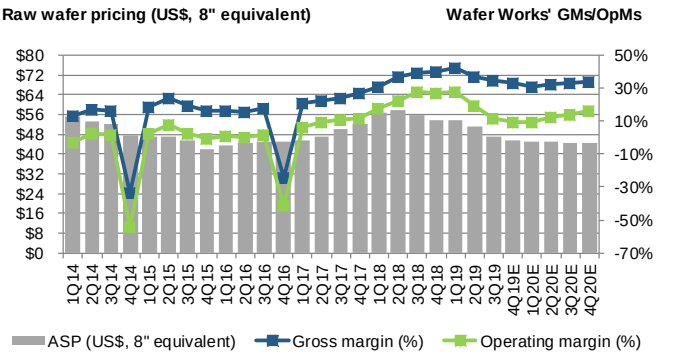


Source: Company data, Credit Suisse estimates

Margins may be dampened by lower pricing and rising depreciation

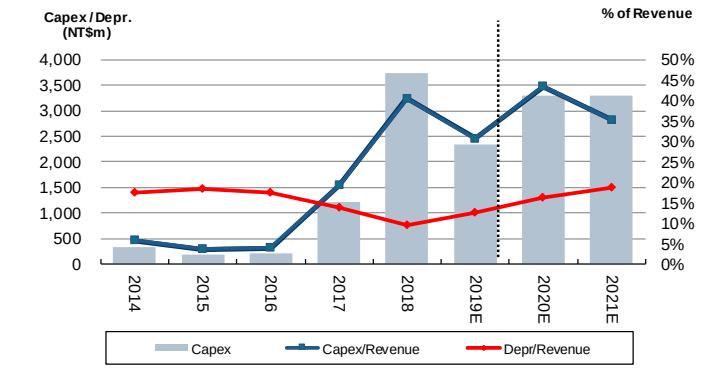
Wafer Works' GMs hit a record high at 42.4% in 1Q19 on higher 8" mix which still has better pricing compared with 6", following the temporary closure of its Shanghai 6" fab from the end of 2018. However, GMs declined by 740 bp QoQ to 35.0% in 3Q19 due to both lower utilisation and pricing across 6" and 8". We expect the company's GMs to further decline QoQ to 33% in 4Q19 due to lower utilisation and continued pricing pressure, dampening full-year margins from 37.1% in 2018 to 37.3% in 2019.

Figure 92: Profitability stays more stable due to still better pricing offsetting higher depreciation



Source: Company data, Credit Suisse estimates

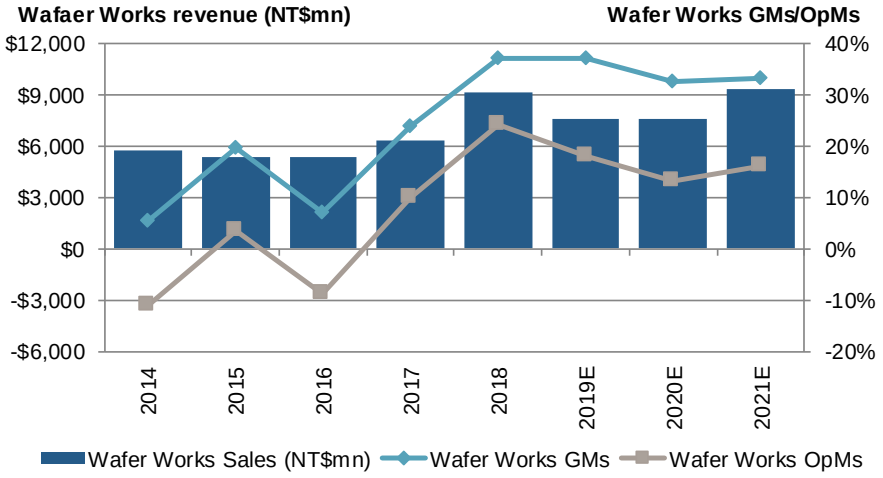
Figure 93: Growing depreciation could limit margins improvement even if demand recovers from 2020



Source: Company data, Credit Suisse estimates

Although the company's utilisation and pricing outlook should improve along with the raw wafer demand recovery from 2020, we believe the company's profitability may be capped at low 30% levels in 2020-21 due to the rising depreciation (CS +31%/41% YoY in 2020/21) due to its capacity expansion for 6" and 8" capacity in Taiwan and China since 2017, while the company also has plans to further grow its exposure in China on 8" and 12", requiring more capex in the next few years and keeping its capital intensity elevated at 35-45% levels (vs. its peers at 20%).

Figure 94: Wafer Works should be able to keep its 30-35%/15-20% GMs/OpMs profitability profile in 2020-21 as demand recovers



Source: Company data, Credit Suisse estimates

Balance sheet more leveraged for capacity expansion, while inventory days lowering from the peak levels

Wafer Works' balance sheet is more leveraged compared with Globalwafers and Formosa SUMCO, with the NT$3.4 bn debt position offsetting the more healthy cash position from improving business since 2017, putting the company's net cash close to breakeven at NT$0.05 per share as end of 3Q19. On a worsening business outlook and a still-aggressive plan to expand 8" and 12" capacity, we believe the company may need to raise funds to support its operation and fund its capex. Wafer Works' inventory level at least showed signs of improvement from 108 days in 2Q19 to 96 days in 3Q19, post the digestion since late 2018.

Figure 95: Wafer Works' balance sheet is more leveraged

Balance Sheet (NT$ mn)	3Q19(A)	2Q19	Diff
Cash and investments	3,386	4,263	-21%
Total debt	3,361	3,347	0%
Net cash	25	917	-97%
Net cash/share (NT$)	**0.05**	**1.83**	**-1.78**
Accounts receivable	2,434	2,185	11%
Days sales outstanding	**86**	**91**	**-5**
Inventory	1,658	1,634	1%
Inventory days	**96**	**108**	**-12**
Accounts payable days	53	54	-1
Cash conversion days	**128**	**145**	**-16**
Shareholders' equity	8,857	8,307	7%
Book value / share (NT$)	**17.64**	**16.54**	**1.09**

Source: Company data, Credit Suisse estimates

Additional fund raising may be required due to its ambition to expand into 12”

Wafer Works’ operating cash flow has been improving steadily in the past few years from NT$934 mn in 2015 to NT$2.7 bn in 2018 from sales and margins improvement. We expect the company’s operating cash flow to peak in 2019 at NT$3.4 bn and to decline to NT$1.4 bn /NT$2.2 bn levels in 2020/21 due to worsening raw wafer demand and pricing outlook.

Wafer Works paid NT$2.50 cash dividend per share for 2018 earnings, implying a 66% payout. With the company’s aggressive plan to build a new facility in China, Wafer Works may need to consider lowering its dividend payout during the investment phase.

Figure 96: Wafer Works’ FCF, capex and depreciation

Annual (NT$mn)	CY14	CY15	CY16	CY17	CY18	CY19E	CY20E	CY21E
Revenue	5,758	5,368	5,401	6,377	9,205	7,603	7,600	9,363
Capital spending	327	193	213	1,224	3,731	3,300	3,300	3,300
Capex/revenue (%)	**6**	**4**	**4**	**19**	**41**	**43**	**43**	**35**
Dep and amort	967	960	902	875	870	941	1,227	1,735
Depr/revenue (%)	**17**	**18**	**17**	**14**	**9**	**12**	**16**	**19**
Operating cash flow	771	934	1,809	1,820	2,679	3,389	1,382	2,194
Free cash flow	**444**	**742**	**1,596**	**596**	**-1,052**	**89**	**-1,918**	**-1,106**

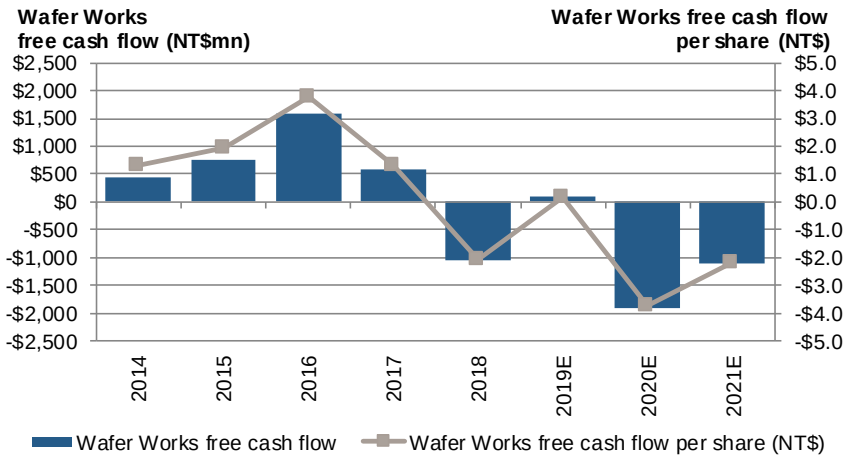
FCF and Dividends	CY14	CY15	CY16	CY17	CY18	CY19E	CY20E	CY21E
FCF / share (NT$)	1.31	1.95	3.79	1.34	-2.09	0.17	-3.75	-2.16
FCF Yield (%)	**0.3%**	**0.4%**	**0.8%**	**0.3%**	**-0.4%**	**0.0%**	**-0.8%**	**-0.4%**
Dividend/share (NT$)	0.00	0.00	0.00	0.00	0.38	2.50	1.75	1.05
Payout rate (%)		**0%**	**0%**	**0%**	**57%**	**66%**	**70%**	**70%**
Dividend amount (NT$)	$0	$0	$0	$0	$192	$1,277	$896	$538
Pre-Dividend close (NT$)	15.22	12.69	14.28	42.23	33.50	36.35	35.25	36.25
Dividend Yield (%)	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**1.1%**	**6.9%**	**5.0%**	**2.9%**

Source: Company data, Credit Suisse estimates

Although the cash flow generation capability should still be more resilient compared with previous downcycles, the company’s plan to spend NT$3.0-3.5 bn annual capex over the next few years for its 8” and 12” fab expansion in China will still turn the free cash flow into negative in 2020-21. We believe the company may need to raise funds through debt or equity and may need to lower its dividend policy in the next two years to support its business operation and capex plan.

Wafer Works’ plan to list its China operation may support its capacity expansion

Figure 97: Wafer Works may need to raise funds to support its capex plan



Source: Company data, Credit Suisse estimates

The company already announced its plan to list its China operation on A-share by the end of this year. At 60-70x average P/E A-share semiconductor companies' trade on that market and with Wafer Works' China business contributing 15-20% of its earnings, the listing could value the company's China fabs at US$400-500 mn. With Wafer Works' plan announced in December last year for 10-25% stake sales for its China business, the company could raise funds of US$40-120 mn through the listing, supporting its NT$3 bn annual capex in 2020-21.

Earnings further decelerates in 2020 on continued pricing pressure before a modest 2021 recovery

Given the lower revenue scale and dampened margins profile, we expect the company's earnings power could drop by 36% YoY from NT$1.9 bn net profit in 2018 to NT$1.3 bn in 2019. Despite a stabilising raw wafer industry outlook, we believe the company's EPS in 2020 will drop further to NT$1.50 on higher depreciation and YoY lower pricing, though the earnings power could recover to NT$2.30 in 2021 on higher 8" utilisation, full-year contribution from its new 12" fab and flat YoY raw wafer pricing.

Figure 98: Wafer Works' 4Q19-2Q20 and 2019-21 estimates—CS vs. Street

	4Q19		1Q20		2Q20		2019		2020		2021	
(NT$ mn)	CS	Street	CS	Street	CS	Street	CS	Street	CS	Street	CS	Street
Sales	**1,672**	**1,713**	**1,690**	**1,820**	**1,829**	**2,018**	**7,603**	**7,604**	**7,600**	**8,443**	**9,363**	**10,808**
Chg (%)	-4.4	-2.0	1.0	8.8	8.2	10.9	-17.4	-17.4	0.0	11.0	23.2	28.0
GM (%)	**33.0**	**32.7**	**31.0**	**30.6**	**32.5**	**32.0**	**37.3**	**37.2**	**32.8**	**33.9**	**33.5**	**36.7**
OpM (%)	**9.3**	**10.0**	**9.8**	**9.8**	**12.4**	**12.2**	**18.0**	**18.2**	**13.4**	**16.2**	**16.1**	**22.3**
Net Inc.	112	190	120	169	161	312	1,280	1,358	768	1,427	1,175	1,711
EPS (NT$)	**0.22**	**0.37**	**0.23**	**0.33**	**0.31**	**0.61**	**2.50**	**2.68**	**1.50**	**2.79**	**2.30**	**3.35**

Source: Company data, the BLOOMBERG PROFESSIONAL™ service consensus estimates, Credit Suisse estimates

Scenario analysis indicates Wafer Works' earnings outlook has limited upside even with new fab ramping

We sensitise the 8" raw wafer pricing trend vs Wafer Works' revenue growth, margins and earnings power. Compared with most of its peers with 12" exposure, Wafer Works' business outlook in the next two years will still be focusing on 6" and 8" improvement, with 75-80% of its revenue from 8" and the rest from 6". The company also has a niche focus on heavy doped wafers for power-related applications in addition to the standard polished and epi wafer business. As a second tier player, Wafer Works has limited LTA with customers and its utilisation is usually lower compared with major players.

Our base case assumes that 8" raw wafer price stabilises from late 2019 supported by improving demand from 8" foundries from 4Q19 and modest IDM recovery in 2020, following the inventory correction since 2H18. The following are key assumptions for 2020.

5. **Wafer Works' 8" raw wafer price down 10% YoY in 2020.** We assume the 8" raw wafer price would decline 10% YoY for Wafer Works in 2020, due to tougher comparison with a higher base in 1H19 despite the stabilisation since late 2019.
6. **Wafer Works 8" raw wafer shipment.** We assume Wafer Works' utilisation for 8" raw wafer capacity would improve mildly from 75% in 2019 to 78% in 2020, with shipments up 15% YoY supported by improving demand from its foundry and IDM customers.
7. **EPS.** Wafer Works' EPS could decline 40% YoY to NT$1.50 in our base case.
8. **Valuation and implied share price.** With demand improving in 2020, though pricing would still decline from 2019 and higher depreciation from 8"/12" expansion, we use 7.5x EV/EBITDA (vs at the upper half of its 2-11x range), implying 15x 2021 P/E. The share price is valued at NT$28.5, based on our base case assumption.

Figure 99: Wafer Works' sensitivity analysis indicates earnings outlook highly depends on 8" raw wafer supply/demand outlook

Raw wafer industry supply/demand model	2017	2018	2019	2020	2021	20 Base	20 Bull	20 Bear	21 Base	21 Bull	21 Bear
Global 8" raw wafer capacity (k WPM)	**5,150**	**5,370**	**5,555**	**5,770**	**5,799**	**5,770**	**5,770**	**5,770**	**5,799**	**5,799**	**5,799**
YoY	3.0%	4.3%	3.4%	3.9%	0.5%	3.9%	3.9%	3.9%	0.5%	0.5%	0.5%
Global 8" wafer capacity (k WPM)	**5,582**	**5,639**	**5,737**	**5,851**	**5,926**	**5,851**	**6,151**	**5,851**	**5,926**	**6,226**	**5,926**
YoY	2.5%	1.0%	1.7%	2.0%	1.3%	2.0%	7.2%	2.0%	1.3%	1.2%	1.3%
Global 8" raw wafer sufficiency	**92%**	**95%**	**97%**	**99%**	**98%**	**99%**	**94%**	**99%**	**98%**	**93%**	**98%**

Wafer Works P&L	2017	2018	2019	2020	2021	20 Base	20 Bull	20 Bear	21 Base	21 Bull	21 Bear
8" wafer capacity (k WPM)	***187***	***266***	***394***	***441***	***498***	***441***	***441***	***441***	***498***	***498***	***498***
8" wafer shipment (k WPM)	***173***	***220***	***294***	***343***	***390***	***343***	***366***	***322***	***390***	***423***	***363***
8" utilization	**92.4%**	**82.8%**	**74.7%**	**77.8%**	**78.3%**	**77.8%**	**83.0%**	**73.0%**	**78.3%**	**85.0%**	**73.0%**
8" wafer pricing (per wafer)	**$56**	**$64**	**$54**	**$48**	**$48**	**$48**	**$49**	**$45**	**$48**	**$50**	**$42**
Wafer Works 8" raw wafer sales	$3,507	$5,063	$5,762	$5,896	$6,732	$5,896	$6,480	$5,190	$6,732	$7,717	$5,567
Wafer Works 6" raw wafer sales	$2,869	$4,142	$1,841	$1,637	$1,827	$1,637	$1,637	$1,637	$1,827	$1,827	$1,827
Wafer Works 12" raw wafer sales	$0	$0	$0	$67	$804	$67	$67	$67	$804	$804	$804
Wafer Works Total Sales (NT$mn)	**$6,377**	**$9,205**	**$7,603**	**$7,600**	**$9,363**	**$7,600**	**$8,184**	**$6,894**	**$9,363**	**$10,348**	**$8,198**
COGs	$4,847	$5,790	$4,770	$5,104	$6,225	$5,104	$5,158	$4,878	$6,225	$6,364	$5,746
Gross Profits (NT$mn)	**$1,529**	**$3,415**	**$2,832**	**$2,496**	**$3,137**	**$2,496**	**$3,026**	**$2,016**	**$3,137**	**$3,984**	**$2,452**
Gross Margin	***24.0%***	***37.1%***	***37.3%***	***32.8%***	***33.5%***	***32.8%***	***37.0%***	***29.2%***	***33.5%***	***38.5%***	***29.9%***
Total Operating Exp	$897	$1,176	$1,465	$1,478	$1,630	$1,478	$1,591	$1,341	$1,630	$1,802	$1,427
Income from Operations (NT$mn)	**$632**	**$2,239**	**$1,367**	**$1,018**	**$1,507**	**$1,018**	**$1,435**	**$675**	**$1,507**	**$2,183**	**$1,025**
% of Sales	***9.9%***	***24.3%***	***18.0%***	***13.4%***	***16.1%***	***13.4%***	***17.5%***	***9.8%***	***16.1%***	***21.1%***	***12.5%***
EBITDA (NT$mn)	***$1,507***	***$3,109***	***$2,309***	***$2,245***	***$3,242***	***$2,245***	***$2,661***	***$1,902***	***$2,734***	***$3,410***	***$2,251***
Non-op	-$158	$137	$230	-$102	-$105	-$102	-$102	-$102	-$105	-$105	-$105
Pretax Income (NT$mn)	**$474**	**$2,376**	**$1,597**	**$916**	**$1,402**	**$916**	**$1,333**	**$574**	**$1,402**	**$2,077**	**$919**
Income Taxes Exp. /(Gains)	$18	$102	$247	$148	$227	$148	$215	$93	$226	$335	$148
Tax Rate	*3.8%*	*4.3%*	*15.4%*	*16.1%*	*16.2%*	*16.1%*	*16.1%*	*16.1%*	*16.1%*	*16.1%*	*16.1%*
Minority int.	-$156	-$365	-$71	$0	$0	$0	$0	$0	$0	$0	$0
Net Income (NT$mn)	**$301**	**$1,909**	**$1,280**	**$768**	**$1,175**	**$768**	**$1,118**	**$481**	**$1,176**	**$1,742**	**$771**
GAAP EPS (NT$)	**$0.67**	**$3.80**	**$2.50**	**$1.50**	**$2.30**	**$1.50**	**$2.19**	**$0.94**	**$2.30**	**$3.41**	**$1.51**
EPS accretive						*0.0%*	*45.5%*	*-37.4%*	*0.1%*	*48.3%*	*-34.4%*

Source: Company data, Credit Suisse estimates

Our bull case assumes that semiconductor growth rebounds better than expected, supporting a stronger 8" demand rebound across foundries and IDMs for the applications including content growth in smartphones and automotive/industrial applications with the following key assumptions.

1. **Wafer Works' 8" raw wafer price down high single digits YoY in 2020.** We assume Wafer Works' 8" raw wafer pricing should be down 9% YoY, similar to our base case, mainly due to still relatively low utilisation (83%) despite the improvement from 2019, limiting the company's bargaining power.
2. **Wafer Works' 8" raw wafer shipment.** We assume Wafer Works' utilisation for 8" raw wafer capacity would improve more meaningfully from 75% in 2019 to 83% in 2020 on stronger 8" demand from foundries and IDMs.
3. **EPS.** Wafer Works' EPS could reach NT$2.19 (-13% YoY) in our bull case.
4. **Valuation and implied share price.** With better industry demand recovery and a potential stabilsation in pricing in 2020 in our bull case, we use 9x EV/EBITDA (vs. its 2-11x range) and implying 12x 2021 P/E. The share price is valued at NT$41, based on our bull case assumption.

Our bear case assumes that raw wafer price declines worse than expected in 2020 due to macro uncertainty (e.g. softer-than-expected tech end market demand recovery due to the extended coronavirus impact) with key assumptions below.

1. **Wafer Works' 8" raw wafer price down mid-teens YoY in 2020.** We assume the raw wafer price would decline 15-20% YoY for Wafer Works as other suppliers are more aggressively on spot pricing to keep their utilisation at a reasonable level.
2. **Wafer Works' 8" raw wafer shipment.** We assume Wafer Works' utilisation for 8" raw wafer capacity would drop to 73% in 2020 from 75% in 2019 due to slower demand, leading to a 6% decline in wafer shipment.
3. **EPS.** Wafer Works' EPS could decline to NT$0.94 (-62% YoY) in our bear case.

4. **Valuation and implied share price.** With industry demand and pricing trending softer than expected, we use 5x EV/EBITDA (vs. its 2-11x range), implying 13x 2021 P/E. The share price is valued at NT$21, based on our bear case assumption.

Initiating coverage with NEUTRAL at NT$28.5 target

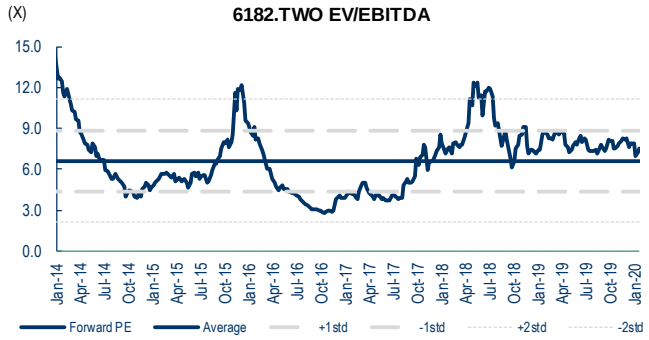
We are initiating coverage on Wafer Works with a NEUTRAL rating and target price of NT$28.5 based on 6x EV/EBITDA (vs. its 2-11x range) and 12x 2021 P/E. Wafer Works is currently trading at 11x 2021 CS earnings estimates, close to our target and reflecting our view for a relatively muted earnings outlook dragged by higher depreciation and more competition on 6" raw wafer from its China peers, offsetting the demand recovery and its shipment growth for 8" and 12" wafers.

Mid-cycle valuation but more competition from China could lead to a derate

Wafer Works' stock has been range-bound between NT$32 and NT$38 over the past year, following the 60% correction from mid-2018 through early 2019. However, we believe the street will need to adjust down the forecasts through the upcoming earnings season to reflect near-term uncertainty from the coronavirus outbreak and the company's worse-than-expected margins outlook in 2020-21.

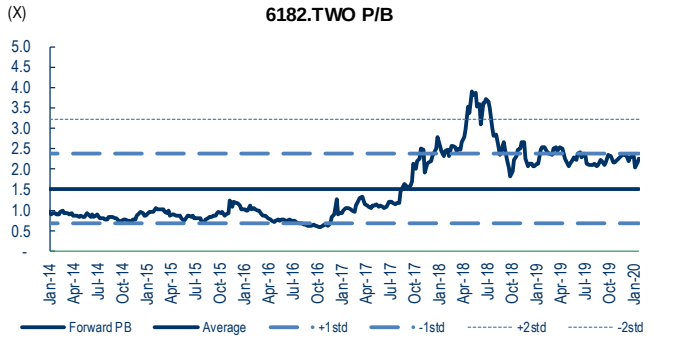
Compared with Globalwafers' high LTA exposure and 7% dividend yield at its current share price, most of Wafer Works' businesses are tied with the spot market which could be more volatile in the near term. In addition, due to the investment required for its capacity expansion for its 8" and 12" business in China, Wafer Works might not have sufficient cash to fund as high a dividend payout from 2020. The company's valuation in the long term could face more downside risk if China competitors ramp up their 6" capacity more aggressively and make progress on 8" raw wafer supply.

Figure 100: Wafer Works' stock is in line with average



Source: Company data, Credit Suisse estimates

Figure 101: Wafer Works is trading at 2.5x P/B



Source: Company data, Credit Suisse estimates

Stock trading in line with its peers

Wafer Works is trading at 17.6x/11.6x 2020/2021 P/E, in line with its peers' 2021 valuation. On EV/EBITDA, the company is trading in line with its peers at 6.9x/4.8x 2020/21 estimates. We believe the company could trade at a discount due to worse margins outlook from higher depreciation and more 6" competition in China and lack of dividend support.

Figure 102: Wafer Works' valuation is in line with its peers though competition risk is higher

Company	Ticker	Local Price 3/20/2020	Target Local Curcy	Inv'ment Rating	Target upside	Mkt Cap (US$mn)	EPS YoY 2020	EPS YoY 2021	P/E 2020	P/E 2021	P/B 2021	ROE 2021	Dividend yield 2020	Dividend yield 2021
Wafer Makers														
Globalwafers	6488.TWO	$342.50	$450.0	OPFM	31%	$4,943	-5.9%	9.2%	11.7	10.7	2.7	27.4	6.4%	6.0%
Shinetsu	4063.T	$9,075.00	$11,830	NTRL	30%	$34,297	5.5%	2.4%	11.6	11.3	1.2	14.2	2.6%	3.0%
SUMCO	3436.T	$1,076.00	$1,510	NTRL	40%	$2,862	-62.4%	18.3%	26.9	22.8	1.1	6.0	4.6%	4.6%
Siltronic	WAFGn.DE	$54.84	$83.0	NTRL	51%	$1,645	-22.2%	17.9%	9.4	8.0	1.1	14.0	5.5%	6.0%
Wafer Works	6182.TWO	$24.30	$28.5	NTRL	17%	$410	-40.0%	52.9%	16.2	10.6	1.5	11.8	7.2%	4.3%
Formosa SUMCO	3532.TW	$138.00	$105.0	UPFM	-24%	$1,767	-23.6%	65.0%	30.3	18.4	2.8	12.2	3.0%	2.3%
Wafer Maker Median:							**-22.2%**	**17.9%**	**11.7**	**10.7**	**1.2**	**14.0**	**5.5%**	**4.6%**
Wafer Maker Mean:							**-25.0%**	**20.1%**	**15.1**	**12.7**	**1.5**	**14.7**	**5.3%**	**4.8%**

Source: Company data, the BLOOMBERG PROFESSIONAL™ service consensus estimates, Credit Suisse estimates

We also used CS HOLT®, a CS valuation tool that derives a stock price based on a company's cash flow return on investment (CFROI®) and asset growth. We note the valuation tool warrants an NT$25.39 share price based on our modelled sales growth, margin assumptions and investment plans through 2021. The figure below shows our key assumptions.

Figure 103: Wafer Works' CS HOLT valuation

WAFER WORKS CORP. (6182)

Semiconductor Equipment
Market Cap: 18.0 TWD

Price: 35.20 (5 Mar, 2020)
Warranted Price: 25.39 TWD (-28%)

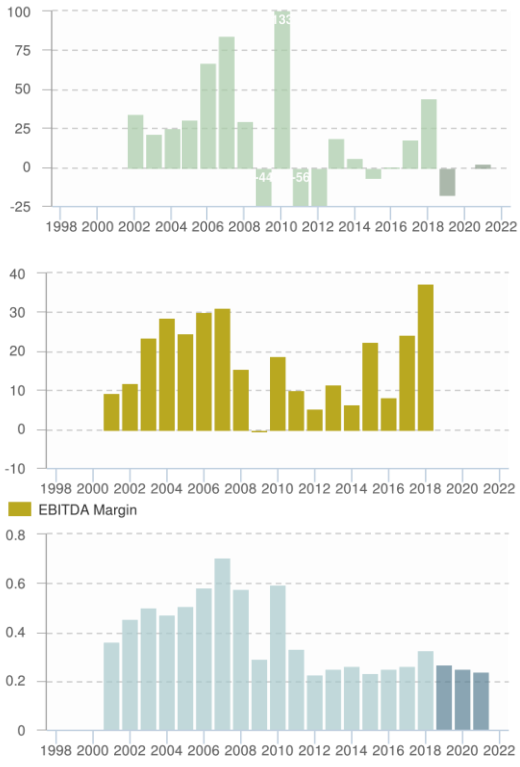
Sales, Margins & Turns Inputs

	2018	2019	2020	2021
Sales Growth %	44.4	-17.4	0.0	2.2
EBITDA %	37.5	30.4	29.6	34.7
Effective Tax Rate %	5.1	1.4	16.1	16.2
Asset Turns	0.33	0.27	0.25	0.24
CFROI %	10.5	5.2	3.2	3.8
Real Asset Growth %	15.7	-0.6	7.9	6.9
Discount Rate	6.21	5.08		

Warranted Valuation

Warranted Valuation	Amount (MM)	Per Share
+ PV Cash Flow Existing Assets	19,736	38.63
+ NPV Cash Flow Future Investments	1,820	3.56
+ Market Value Investments	NA	0
Total Economic Value	21,556	42.19
- Market Value of Debt & Equivalents	4,819	9.43
- Market Value of Minority Interest	4,486	8.78
Partial Year Adjustment	719	1.41
Warranted Equity Value	**12,971**	**25.39**
Winddown Value/Share		**20.42**
Winddown Ratio		1.72
Shares Outstanding	511	**downside -28%**

Sales, Margins & Turns



Note: North American companies only. Metrics shown are gross investment base weighted. Warranted valuation figures in millions of TWD

21

Source: Credit Suisse HOLT

Key risks: Swing in semi demand, customers' wafer pricing erosion, potential competition

We note several core risks that could impact the investment thesis and our view on the stock:

- **Swing in semiconductor demand**. Semiconductor demand has been improving since late 2019 supported by the expectation for 5G upgrade cycle lifting both unit and content growth; data centre investment recovery, AI and IoT are still growing. We expect the semiconductor industry to continue to grow at least in line with global GDP in the next few years, supporting the increase in raw wafer demand. However, we would highlight a potential risk for raw wafer pricing and demand if the industry growth slows down from macro uncertainty (e.g. prolonged coronavirus impact and trade war).
- **Customers' wafer price erosion.** Raw wafer suppliers so far could still raise raw wafer pricing as it is still down meaningfully from the peak levels and is only a small portion of its customers' cost. However, a potential risk is more fierce competition between its customers leading to a sharp decline in their pricing. This could cap the raw wafer price upside limiting the company's revenue growth.
- **More aggressive capacity expansion from competitors.** The competitive landscape so far is still benign with top suppliers only adding incremental capacity. However, if its competitors are trying to gain market share and start expanding capacity aggressively, this could lead to another downturn of the raw wafer pricing. Although the risk is low in the near term due to technology difficulty, we would be cautious on China's raw wafer makers' development as the Chinese government is pushing aggressively to build up the semi-conductor ecosystem. Similar to TFT-panel, steel and other commodity industries, Chinese competition could add significant capacity with subsidy from the local government, disrupting the industry landscape. For Wafer Works, the risk would be higher on 6" due to the lower entry barrier and Chinese raw wafer makers already expanding their capacity.

Profile of Wafer Works' senior management

Pat Chiao, CEO. Mr Pat Chiao is the CEO and founder of Wafer Works. Prior to establishing Wafer Works, Mr Pat was a senior manager of Lite-On Semiconductor and a manager of Siltec. Mr Chiao holds a master's degree in chemical engineering from San Jose State University.

Roger Chen, President. Mr Roger Chen is the President of Wafer Works. Prior to this role, Mr Chen was the President of Taisil Electronics Materials. He holds a bachelor's degree in industrial engineering from Tung Hai University.

Kuang-Chung Liao, VP of Production. Mr Kuang-Chung Liao is the Vice President of Wafer Works and is responsible for supervising production. He holds a master's degree from National Central University.

Hsien-Yuan Chang, VP of Sales and Marketing. Dr Hsien-Yuan Chang is the Vice President of Wafer Works, responsible for the sales and marketing division. He holds a doctor's degree in chemical engineering from the University of Leeds.

Ming-Yi Chi, VP of Investment Planning. Mr Ming-Yi Chi is the Vice President of Wafer Works, responsible for the investment planning division. He holds a master's degree in finance from Ming Chuan University.

Rui-Yuan Mao, VP of Finance and Accounting. Mr Rui-Yuan Mao is the Vice President of Wafer Works, responsible for the finance and accounting division. He holds a bachelor's degree in accounting from Fu Jen University.

Wen-Chung Li, CTO. Dr Wen-Chung Li is the CTO of Wafer Works. He holds a doctor's degree from the University of Kentucky.

Financial summary

Figure 104: Wafer Works' income statement

NT$ mn	1Q19	2Q19	3Q19	4Q19	1Q20	2Q20	3Q20	4Q20	2014	2015	2016	2017	2018	2019E	2020E	2021E
Net sales	**2,130**	**2,052**	**1,748**	**1,672**	**1,690**	**1,829**	**2,006**	**2,075**	**5,758**	**5,368**	**5,401**	**6,377**	**9,205**	**7,603**	**7,600**	**9,363**
Sequential change (%)	*-9.2%*	*-3.7%*	*-14.8%*	*-4.4%*	*1.0%*	*8.2%*	*9.7%*	*3.5%*								
YoY change (%)	*3.1%*	*-6.7%*	*-32.6%*	*-28.8%*	*-20.7%*	*-10.9%*	*14.7%*	*24.1%*	*5.7%*	*-6.8%*	*0.6%*	*18.1%*	*44.4%*	*-17.4%*	*0.0%*	*23.2%*
Cost of goods sold	1,227	1,286	1,137	1,121	1,165	1,235	1,340	1,364	5,448	4,313	5,015	4,847	5,790	4,770	5,104	6,225
Gross profits	**903**	**767**	**611**	**551**	**524**	**594**	**666**	**712**	**310**	**1,055**	**385**	**1,529**	**3,415**	**2,832**	**2,496**	**3,137**
Gross margin (%)	*42.4%*	*37.4%*	*35.0%*	*33.0%*	*31.0%*	*32.5%*	*33.2%*	*34.3%*	*5.4%*	*19.7%*	*7.1%*	*24.0%*	*37.1%*	*37.3%*	*32.8%*	*33.5%*
Sales and marketing	52	53	54	54	52	53	55	54	177	181	168	189	206	214	213	235
% of sales	*2.5%*	*2.6%*	*3.1%*	*3.2%*	*3.1%*	*2.9%*	*2.7%*	*2.6%*	*3.1%*	*3.4%*	*3.1%*	*3.0%*	*2.2%*	*2.8%*	*2.8%*	*2.5%*
General and administrative	167	229	259	253	228	234	241	238	445	421	411	425	625	908	941	1,038
% of sales	*7.8%*	*11.2%*	*14.8%*	*15.2%*	*13.5%*	*12.8%*	*12.0%*	*11.4%*	*7.7%*	*7.8%*	*7.6%*	*6.7%*	*6.8%*	*11.9%*	*12.4%*	*11.1%*
Research and development	84	83	89	87	78	81	83	82	320	269	280	283	345	343	324	357
% of sales	*4.0%*	*4.0%*	*5.1%*	*5.2%*	*4.6%*	*4.4%*	*4.1%*	*3.9%*	*5.6%*	*5.0%*	*5.2%*	*4.4%*	*3.8%*	*4.5%*	*4.3%*	*3.8%*
Other operating expenses	*0.0%*	*0.0%*	*0.0%*						0	0	0	0	0	0	0	0
Total operating expense	303	365	401	395	358	368	379	373	944	872	859	897	1,176	1,465	1,478	1,630
Income from operations	**600**	**401**	**210**	**156**	**166**	**226**	**287**	**338**	**-634**	**183**	**-474**	**632**	**2,239**	**1,367**	**1,018**	**1,507**
% of sales	*28.2%*	*19.5%*	*12.0%*	*9.3%*	*9.8%*	*12.4%*	*14.3%*	*16.3%*	*-11.0%*	*3.4%*	*-8.8%*	*9.9%*	*24.3%*	*18.0%*	*13.4%*	*16.1%*
Depreciation	216	221	246	258	276	295	318	338	967	960	902	875	870	941	1,227	1,735
Amortization	1	1	2	1	1	1	1	1	30	30	36	8	11	6	6	6
EBITDA	**817**	**623**	**458**	**416**	**444**	**522**	**606**	**678**	**355**	**1,167**	**455**	**1,515**	**3,120**	**2,314**	**2,250**	**3,248**
% of sales	*38.4%*	*30.4%*	*26.2%*	*24.9%*	*26.3%*	*28.6%*	*30.2%*	*32.7%*	*6.2%*	*21.7%*	*8.4%*	*23.8%*	*33.9%*	*30.4%*	*29.6%*	*34.7%*
Non operating income	(58)	(28)	340	(25)	(25)	(25)	(25)	(27)	-173	-194	-999	-158	137	230	-102	-105
Investment gains (loss)	-	-	-	-	-	-	-	-	0	1	0	0	0	0	0	0
Pretax income	**542**	**373**	**550**	**131**	**142**	**201**	**262**	**311**	**-807**	**-10**	**-1,473**	**474**	**2,376**	**1,597**	**916**	**1,402**
% of sales	*25.4%*	*18.2%*	*31.5%*	*7.9%*	*8.4%*	*11.0%*	*13.1%*	*15.0%*	*-14.0%*	*-0.2%*	*-27.3%*	*7.4%*	*25.8%*	*21.0%*	*12.1%*	*15.0%*
Income taxes exp. /(gains)	83	65	79	20	22	40	39	47	14	22	-3	18	102	247	148	227
Tax rate (%)	*15.3%*	*17.4%*	*14.4%*	*15.0%*	*15.3%*	*20.0%*	*15.0%*	*15.0%*	*-1.7%*	*-229.6%*	*0.2%*	*3.8%*	*4.3%*	*15.4%*	*16.1%*	*16.2%*
Parent Net Income	**480**	**380**	**308**	**112**	**120**	**161**	**223**	**265**	**-744**	**26**	**-1,488**	**456**	**2,274**	**1,350**	**768**	**1,175**
Minority int.	20	72	(163)	-	-	-	-	-	77	57	-18	-156	-365	-71	0	0
Net income	**500**	**452**	**146**	**112**	**120**	**161**	**223**	**265**	**-666**	**83**	**-1,506**	**301**	**1,909**	**1,280**	**768**	**1,175**
% of sales	*23.5%*	*22.0%*	*8.3%*	*6.7%*	*7.1%*	*8.8%*	*11.1%*	*12.7%*	*-11.6%*	*1.5%*	*-27.9%*	*4.7%*	*20.7%*	*16.8%*	*10.1%*	*12.5%*
Net income before extraordinaries	**500**	**452**	**146**	**112**	**120**	**161**	**223**	**265**	**-666**	**83**	**-1,506**	**301**	**1,909**	**1,280**	**768**	**1,175**
Dividend to common share holders	-	-	1,277	-	-	-	896	-	0	0	0	0	192	1,277	896	538
Extraordinaries (ASML sale)									0	0	0	0	0	0	0	0
Net income after extraordinaries	**500**	**452**	**146**	**112**	**120**	**161**	**223**	**265**	**-666**	**83**	**-1,506**	**301**	**1,909**	**1,280**	**768**	**1,175**
Pro Forma EPS (NT$)	**0.98**	**0.88**	**0.28**	**0.22**	**0.23**	**0.31**	**0.44**	**0.52**	**-1.97**	**0.22**	**-3.57**	**0.67**	**3.80**	**2.50**	**1.50**	**2.30**
GAAP EPS (NT$)	**0.98**	**0.88**	**0.28**	**0.22**	**0.23**	**0.31**	**0.44**	**0.52**	**-1.97**	**0.22**	**-3.57**	**0.67**	**3.80**	**2.50**	**1.50**	**2.30**
Adjusted share count	511	511	511	511	511	511	511	511	338	380	421	446	502	511	511	511

Source: Company data, Credit Suisse estimates

Figure 105: Wafer Works' cash flow statement

NT$ mn	1Q19	2Q19	3Q19	4Q19E	1Q20E	2Q20E	3Q20E	4Q20E	2013	2014	2015	2016	2017	2018	2019E	2020E	2021E
Net income	**459**	**308**	**471**	**112**	**120**	**161**	**223**	**265**	-717	-821	-30	-1,470	456	2,274	1,350	768	1,175
Depreciation & amortization	217	222	248	260	278	296	319	339	1,038	997	990	937	883	881	947	1,232	1,741
Dec (inc)-A/R	-240	-49	440	250	-49	-199	-178	-31	-237	-216	361	-42	-227	-407	401	-457	-510
Dec (inc)-inventory	-62	-1	-74	569	-163	-116	-111	0	-75	119	-391	475	691	-394	433	-390	-465
Inc (Dec)-A/P	-82	21	-108	-14	37	45	61	13	66	232	-18	-60	64	204	-183	157	196
LT investment loss (gain)	31	31	70	0	0	0	0	0	102	0	-1	726	27	160	132	0	0
Investment disposal loss (gain)	-1	0	0	0	0	0	0	0	-24	-1	-10	-1	22	2	-1	0	0
Others	28	41	-399	641	-43	32	42	41	109	460	33	1,245	-97	-41	310	72	58
Operating cash flow	**350**	**574**	**648**	**1,817**	**180**	**219**	**357**	**627**	**261**	**771**	**934**	**1,809**	**1,820**	**2,679**	**3,389**	**1,382**	**2,194**
Sale(Pur) of ST inv.	0	0	0						129	39	0	0	0	32	0	0	0
Sale(Pur) of LT inv.	21	35	20	0	0	0	0	0	-273	-23	-4	-43	0	-146	76	0	0
Sale of FA	4	0	686						0	12	11	59	32	84	690	0	0
Capital spending	**-981**	**-705**	**-676**	**-938**	**-800**	**-800**	**-800**	**-900**	**-1,149**	**-327**	**-193**	**-213**	**-1,224**	**-3,731**	**-2,330**	**-3,300**	**-3,306**
Others	368	334	-649	152	-1	-1	-1	-1	3	-137	-373	278	461	-119	205	-6	-6
Investing cash flow	**-589**	**-337**	**-619**	**-786**	**-801**	**-801**	**-801**	**-901**	**-1,290**	**-436**	**-558**	**80**	**-731**	**-3,880**	**-1,360**	**-3,306**	**-3,311**
Inc (Dec) of debt	1,393	343	-309	696	0	0	0	0	-127	-1,140	-952	-1,182	-1,348	-14	2,123	0	0
Bonds issued (redeemed)	0	0	0	-387	0	0	0	0	0	0	600	0	430	0	-387	0	0
Treasury stock dec(inc)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Proceed from new issue	0	0	0	0	0	0	0	0	555	493	0	338	0	1,164	0	0	0
Dividend paid	0	0	-1,277	0	0	0	-896	0	0	0	0	0	0	-192	-1,277	-896	-538
Others	-34	-271	712	-1,414	27	30	23	-3	-84	-6	17	50	3,113	77	-1,007	77	90
Financing cash flow	**1,359**	**72**	**-874**	**-1,105**	**27**	**30**	**-873**	**-3**	**343**	**-652**	**-336**	**-794**	**2,195**	**1,035**	**-548**	**-818**	**-448**
Exchange influence	90	-61	-105						80	8	-30	-101	67	-101	-77	0	0
Change in cash flow	**1,211**	**248**	**-951**	**-75**	**-594**	**-552**	**-1,317**	**-278**	**-606**	**-310**	**11**	**994**	**3,351**	**-267**	**1,404**	**-2,742**	**-1,565**
Cash - beginning	3,615	4,826	5,043	4,090	4,126	4,055	4,008	3,173	1,341	719	410	420	688	606	2,672	688	4,040
Cash - end	4,826	5,043	4,022	3,948	3,353	2,801	1,483	1,206	719	410	420	688	4,040	2,672	3,981	4,040	3,615
Operating cash per share (NT$)	0.69	1.12	1.27	3.56	0.35	0.43	0.70	1.23	0.89	2.28	2.46	4.29	4.08	5.34	6.63	2.71	4.29
Free cash flow per share (NT$)	-1.23	-0.26	-0.06	1.72	-1.21	-1.14	-0.87	-0.53	-3.04	1.31	1.95	3.79	1.34	-2.09	3.97	-3.75	-2.19

Source: Company data, Credit Suisse estimates

Figure 106: Wafer Works' balance sheet

NT$ mn	1Q19	2Q19	3Q19	4Q19	1Q20	2Q20	3Q20	4Q20	2013	2014	2015	2016	2017	2018	2019E	2020E	2021E
Cash and marketable securities	5,019	5,219	4,090	4,126	4,055	4,008	3,173	3,457	966	680	420	689	4,040	3,757	4,126	3,457	3,463
Inventories	2,029	2,029	2,103	1,534	1,697	1,813	1,924	1,924	2,468	2,348	2,739	2,264	1,573	1,967	1,534	1,924	2,389
Account receivables	2,364	2,413	1,973	1,724	1,773	1,972	2,150	2,181	1,593	1,809	1,448	1,491	1,717	2,124	1,724	2,181	2,691
Other current assets	1,151	1,196	1,331	806	861	922	998	1,003	763	420	810	799	542	1,266	806	1,003	1,253
Total current asset	**10,563**	**10,857**	**9,498**	**8,190**	**8,386**	**8,715**	**8,244**	**8,565**	**5,790**	**5,258**	**5,417**	**5,242**	**7,872**	**9,115**	**8,190**	**8,565**	**9,795**
LT investment	117	103	92	92	92	92	92	92	415	318	181	206	253	94	92	92	92
Fixed assets	9,558	9,513	9,355	10,621	10,621	10,621	10,621	10,621	8,155	7,672	6,949	5,999	6,267	8,345	10,621	10,621	10,621
Intangible assets	13	26	26	26	26	26	26	26	109	85	94	56	22	7	26	26	26
Other LT assets	2,017	2,123	2,278	2,124	2,124	2,124	2,124	2,124	2,851	2,832	2,933	1,475	1,595	1,923	2,124	2,124	2,124
Total non-current assets	**11,704**	**11,765**	**11,751**	**12,862**	**12,862**	**12,862**	**12,862**	**12,862**	**11,531**	**10,907**	**10,158**	**7,737**	**8,137**	**10,369**	**12,862**	**12,862**	**12,862**
Total assets	**22,267**	**22,623**	**21,248**	**21,052**	**21,248**	**21,577**	**21,107**	**21,427**	**17,321**	**16,165**	**15,575**	**12,979**	**16,009**	**19,484**	**21,052**	**21,427**	**22,658**
Accounts payable	801	822	714	700	737	783	844	856	461	694	675	615	679	883	700	856	1,052
ST interest bearing liabilities	1,960	2,473	1,778	2,473	2,473	2,473	2,473	2,473	4,642	5,094	3,766	4,101	3,738	1,328	2,473	2,473	2,473
Other current liabilities	1,780	2,864	999	1,115	1,126	1,219	1,337	1,384	596	565	455	515	719	997	1,115	1,384	1,691
Total current liabilities	**4,542**	**6,159**	**3,491**	**4,288**	**4,337**	**4,475**	**4,655**	**4,713**	**5,699**	**6,352**	**4,896**	**5,232**	**5,135**	**3,208**	**4,288**	**4,713**	**5,217**
LT liabilities	3,298	3,128	3,515	3,128	3,128	3,128	3,128	3,128	3,560	2,268	3,225	1,716	100	2,537	3,128	3,128	3,128
Other LT liabilities	919	1,224	1,168	1,889	1,916	1,946	1,969	1,966	931	935	876	831	884	902	1,889	1,966	2,056
Total LT liabilities	**4,216**	**4,352**	**4,682**	**5,017**	**5,044**	**5,074**	**5,097**	**5,094**	**4,491**	**3,203**	**4,101**	**2,547**	**984**	**3,439**	**5,017**	**5,094**	**5,184**
Total liabilities	**8,758**	**10,511**	**8,173**	**9,305**	**9,381**	**9,549**	**9,752**	**9,807**	**10,190**	**9,555**	**8,997**	**7,779**	**6,120**	**6,646**	**9,305**	**9,807**	**10,401**
									-	-	-	-	-	-	-	-	-
Share capital	5,109	5,109	5,109	5,109	5,109	5,109	5,109	5,109	3,368	3,834	3,832	4,131	4,716	5,109	5,109	5,109	5,109
Share premium & other reserves	2,570	2,676	2,860	2,860	2,860	2,860	2,860	2,860	3,057	3,107	2,077	2,116	1,739	2,570	2,860	2,860	2,860
Retained earnings	2,626	1,538	1,846	518	638	799	126	391	-129	(872)	169	(1,343)	453	2,147	518	391	1,027
Preferred stocks	0	0	0						0	-	-	-	-	-	-	-	-
Treasury stock	0	0	0	0	0	0	0	0	-39	-	-	-	-	-	-	-	-
Other equity	-332	-385	-502	-502	-502	-502	-502	-502	-8	7	(91)	(284)	(225)	(428)	(502)	(502)	(502)
Total equity	**9,972**	**8,937**	**9,313**	**7,985**	**8,105**	**8,266**	**7,593**	**7,858**	**6,249**	**6,076**	**5,986**	**4,619**	**6,683**	**9,397**	**7,985**	**7,858**	**8,495**
Minority interest	**3,537**	**3,174**	**3,762**	**3,762**	**3,762**	**3,762**	**3,762**	**3,762**	**3,965**	**534**	**591**	**581**	**3,156**	**3,441**	**3,762**	**3,762**	**3,762**
Total liabilities & equity	**22,267**	**22,623**	**21,248**	**21,052**	**21,248**	**21,577**	**21,107**	**21,427**	**20,404**	**16,165**	**15,575**	**12,979**	**15,959**	**19,484**	**21,052**	**21,427**	**22,658**

Source: Company data, Credit Suisse estimates

CREDIT SUISSE

Globalwafers

Better mix, LTA coverage and payouts provide resilience

6488.TWO

Target price (12M, NT$)
450.00

Outperform[V]

Telecommunications Equipment

- **1Q20 sales and margins may decline mildly QoQ.** Globalwafers' February sales were +3% MoM, putting the full quarter on track at 63% of street expectation for -1% QoQ. Although sales should recover in March as its customers take LTA shipment in the quarter-end, we model 1Q20 sales will decline 3% QoQ to reflect a mild impact from shipment delay to its China customers due to the extended holiday and only partial work resumption from the coronavirus. GMs may also be negatively impacted due to product mix shifting to lower pricing spot capacity, offsetting more contribution from advanced logic.
- **Near-term staying resilient as the supply chain ensures supply and will worry about demand later.** GWC noted no push-outs/cancellations though it acknowledges risk as the virus unfolds but still views the impact contained to within 2020, allowing a strong rebound in 2021. For the full year, pricing is still guided down low single digits, in-line with our -3% YoY due to good LTA coverage, with 75-80% covered on 12" and 70% on 8", down slightly consistent with prepayments entering the year down 10% YoY to NT$20.4bn.
- **Investments to maintain its position and improve mix.** GWC guided capex to >NT$10 bn in 2020 for cash outlay to add 150k capacity in Korea (+15% 12" capacity), sampling at end-2Q20 and fully ramped at end-2020 to support local DRAM customers. Beyond that, the company will repatriate US$355mn for automation/efficiency investments in advanced logic and RF SOI with GlobalFoundries which had a relative strength in that application from its IBM acquisition. GWC should grow in-line with the industry with higher efficiency to maintain its margin structure barring an extended over-supply period.
- **High LTA supports earnings visibility and sustains FCF/dividend.** We keep our 2020/21 estimates at NT$29.30/NT$32.0. We stay OUTPERFORM and our target price at NT$450 based on 8.5x EV/EBITDA (vs. its 4-12x range) and 13.7x 2021 cash adjusted P/E. We maintain our positive view as even in a downside scenario factoring in slower demand from the virus, Globalwafers LTA protection gives it some relative support as it did through 2019. The company also maintained its 80% payout with NT$25 dividend, providing a 7% cash yield and also on the CS HOLT team's profile of Taiwan companies with sustainable yields.

Price (20 Mar 20, NT$)	342.50
Upside/downside (%)	31.4
Mkt cap (NT$/US$ mn)	149,758 / 4,943
Enterprise value (NT$ mn)	129,483
Number of shares (mn)	437.25
Free float (%)	87.3
52-wk price range (NT$)	460-268
ADTO-6M (US$ mn)	76.7

[V] = Stock Considered Volatile (see Disclosure Appendix)

Research Analysts

Haas Liu
886 2 2715 6365
haas.liu@credit-suisse.com

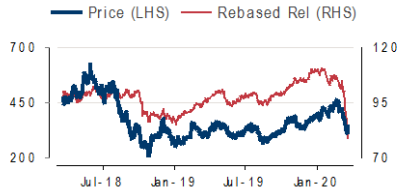
Randy Abrams, CFA
886 2 2715 6366
randy.abrams@credit-suisse.com

Financial and valuation metrics

Year	12/18A	12/19E	12/20E	12/21E
Revenue (NT$ mn)	59,063.5	58,093.7	56,958.7	63,054.8
EBITDA (NT$ mn)	22,414.6	22,872.1	22,983.5	26,682.1
EBIT (NT$ mn)	17,599.5	17,897.3	17,175.0	18,777.2
Net profit (NT$ mn)	13,653.3	13,617.1	12,813.2	13,990.0
EPS (CS adj.) (NT$)	31.23	31.14	29.3	32.0
Chg. from prev. EPS (%)	n.a.	0.0	0.0	0.0
Consensus EPS (NT$)	n.a.	31.68	30.0	34.63
EPS growth (%)	145.8	(0.3)	(5.9)	9.2
P/E (x)	11.0	11.0	11.7	10.7
Dividend yield (%)	2.9	7.3	6.4	6.0
EV/EBITDA (x)	5.3	5.5	6.0	5.0
P/B (x)	3.47	3.32	2.97	2.7
ROE (%)	35.4	30.9	26.8	26.4
Net debt/equity (%)	(69.4)	(50.9)	(21.3)	(28.3)

Source: Company data, Refinitiv, Credit Suisse estimates

Share price performance

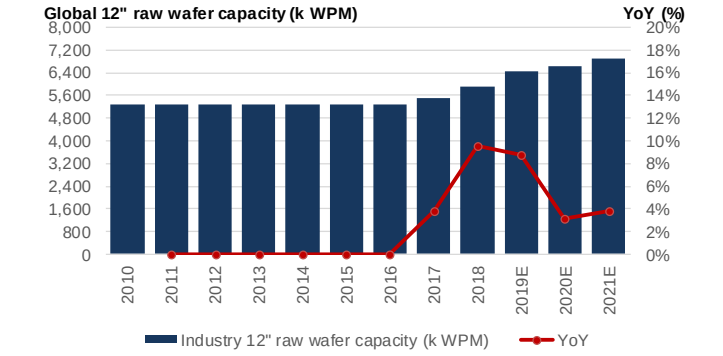


The price relative chart measures performance against the TAIWAN SE WEIGHTED INDEX which closed at 9,234.09 on 20/03/20. On 20/03/20 the spot exchange rate was NT$30.29/US$1

Performance	1M	3M	12M
Absolute (%)	(24.6)	(7.9)	11.2
Relative (%)	(3.1)	14.9	24.2

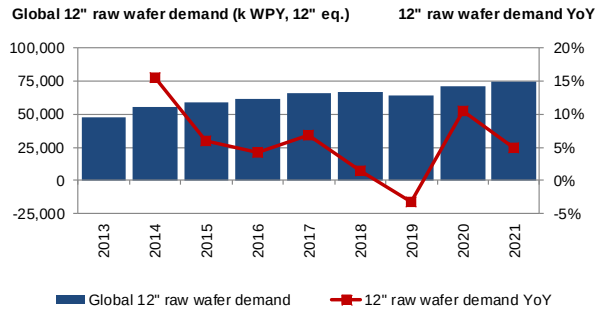
Focus charts and table

Figure 107: 12" raw wafer capacity should grow at a 3% CAGR



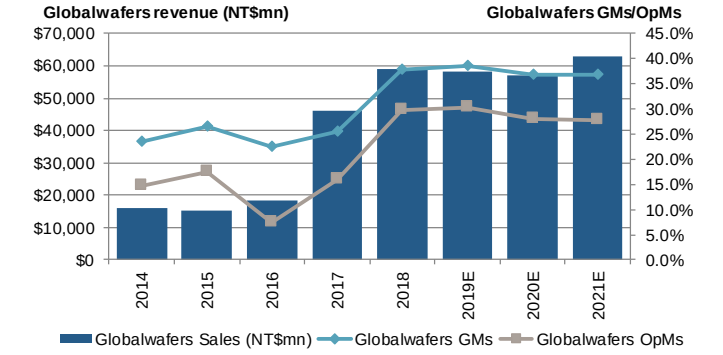
Source: Company data, Credit Suisse estimates

Figure 108: 12" raw wafer demand should recover in 2020-21



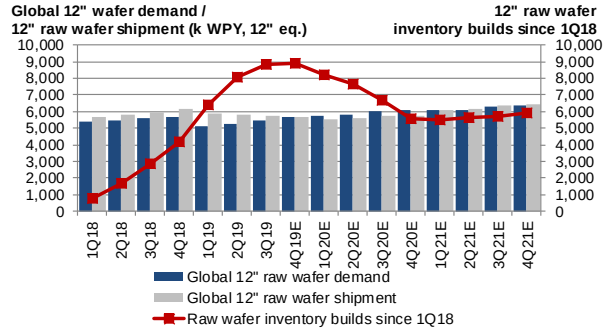
Source: Company data, Credit Suisse estimates

Figure 109: Globalwafers' sales and profitability outlook stays stable in 2019-21



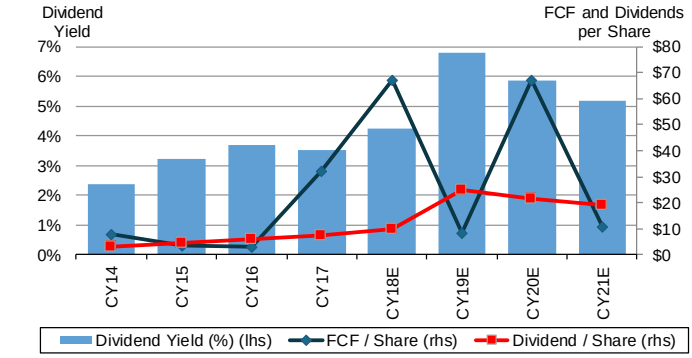
Source: Company data, Credit Suisse estimates

Figure 110: 12" raw wafer inventory should be back to normal 1 month level by 2H20



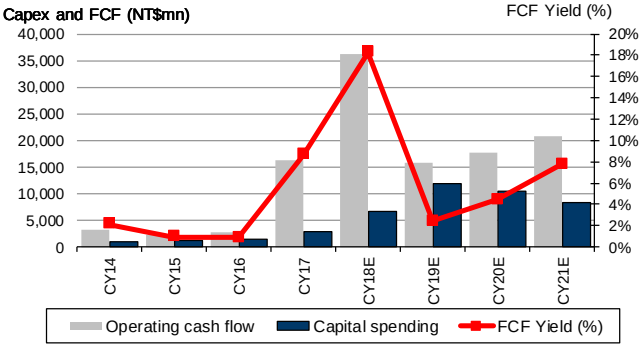
Source: Company data, Credit Suisse estimates

Figure 111: Globalwafers' share should be supported by decent dividend yield



Source: Company data, Credit Suisse estimates

Figure 112: Disciplined capex should sustain FCF in a soft pricing environment



Source: Company data, Credit Suisse estimates

Figure 113: Globalwafers 4Q19-2Q20 and 2019-21 estimates—CS vs. Street

	4Q19			1Q20			2019			2020			2021		
(NT$ mn)	CS	CS(old)	Street	CS	CS(old)	Street	CS	CS(old)	Street	CS	CS(old)	Street	CS	CS(old)	Street
Sales	**13,506**	**13,506**	**13,946**	**13,159**	**13,823**	**13,833**	**58,094**	**58,463**	**58,440**	**57,005**	**59,067**	**59,444**	**63,087**	**65,085**	**66,142**
Chg (%)	-5.6	-5.6	-8.0	-2.6	2.4	2.4	-1.6	-1.0	-1.1	-1.9	1.7	0.6	10.7	10.2	11.3
GM (%)	**35.3**	**35.3**	**37.7**	**35.4**	**36.8**	**37.4**	**38.6**	**38.9**	**39.2**	**36.8**	**38.0**	**36.3**	**36.8**	**37.6**	**34.3**
OpM (%)	**26.3**	**26.3**	**28.5**	**26.3**	**28.0**	**27.3**	**30.3**	**30.6**	**31.0**	**28.0**	**29.5**	**28.5**	**27.7**	**28.8**	**28.3**
Net Inc.	2,688	2,688	3,130	2,568	2,880	3,041	13,424	13,612	13,859	11,864	12,949	13,080	13,037	13,967	14,499
EPS (NT$)	**6.19**	**6.19**	**7.10**	**5.91**	**6.63**	**6.85**	**30.90**	**31.33**	**31.68**	**27.30**	**29.80**	**30.10**	**30.00**	**32.15**	**33.37**

Source: Company data, the BLOOMBERG PROFESSIONAL™ service consensus estimates, Credit Suisse estimates

Globalwafers (6488.TWO / 6488 TT)

Price (20 Mar 2020): **NT$342.50** Target Price: **NT$450.00**

Analyst: **Haas Liu**

Rating: **Outperform [V]**

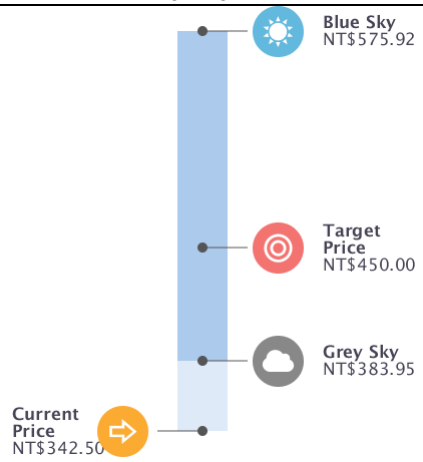
Income Statement (NT$ mn)	12/18A	12/19E	12/20E	12/21E
Sales revenue	**59,064**	**58,094**	**56,959**	**63,055**
Cost of goods sold	36,765	35,246	34,365	38,082
EBITDA	**22,415**	**22,872**	**22,983**	**26,682**
EBIT	**17,600**	**17,897**	**17,175**	**18,777**
Net interest expense/(inc.)	(356)	(414)	(140)	(128)
Recurring PBT	**18,275**	**18,554**	**17,315**	**18,905**
Profit after tax	**13,655**	**13,626**	**12,813**	**13,990**
Reported net profit	**13,653**	**13,617**	**12,813**	**13,990**
Net profit (Credit Suisse)	**13,653**	**13,617**	**12,813**	**13,990**
Balance Sheet (NT$ mn)	**12/18A**	**12/19E**	**12/20E**	**12/21E**
Cash & cash equivalents	35,451	32,822	15,085	20,039
Current receivables	9,226	8,140	7,558	8,007
Inventories	7,040	6,849	4,585	4,916
Other current assets	1,484	600	681	722
Current assets	**53,201**	**48,411**	**27,909**	**33,684**
Property, plant & equip.	30,887	34,697	37,874	37,874
Investments	230	536	536	536
Intangibles	3,649	3,392	3,392	3,392
Other non-current assets	1,855	9,549	2,918	2,918
Total assets	**89,822**	**96,586**	**72,629**	**78,404**
Current liabilities	**24,422**	**22,727**	**16,448**	**17,193**
Total liabilities	**46,666**	**51,513**	**22,125**	**22,879**
Total debt	5,500	9,886	4,321	4,321
Shareholders' equity	**43,139**	**45,067**	**50,498**	**55,519**
Minority interests	17	6	6	6
Total liabilities & equity	**89,822**	**96,586**	**72,629**	**78,404**
Cash Flow (NT$ mn)	**12/18A**	**12/19E**	**12/20E**	**12/21E**
EBIT	**17,600**	**17,897**	**17,175**	**18,777**
Net interest	356	414	140	128
Tax paid	(4,620)	(4,928)	(4,502)	(4,915)
Working capital	0	0	0	0
Other cash & non-cash items	317	234	0	0
Operating cash flow	**13,653**	**13,617**	**12,813**	**13,990**
Capex	0	0	0	0
Free cash flow to the firm	**13,653**	**13,617**	**12,813**	**13,990**
Investing cash flow	**0**	**0**	**0**	**0**
Equity raised	0	0	0	0
Dividends paid	(4,373)	(10,881)	(9,545)	(8,969)
Financing cash flow	**(4,373)**	**(10,881)**	**(9,545)**	**(8,969)**
Total cash flow	**9,281**	**2,736**	**3,268**	**5,021**
Adjustments	0	0	0	0
Net change in cash	**9,281**	**2,736**	**3,268**	**5,021**
Per share	**12/18A**	**12/19E**	**12/20E**	**12/21E**
Shares (wtd avg.) (mn)	437	437	437	437
EPS (Credit Suisse) (NT$)	**31.23**	**31.14**	**29.30**	**32.00**
DPS (NT$)	10.00	25.00	21.83	20.51
Operating CFPS (NT$)	31.23	31.14	29.30	32.00
Earnings	**12/18A**	**12/19E**	**12/20E**	**12/21E**
Growth (%)				
Sales revenue	27.8	(1.6)	(2.0)	10.7
EBIT	137.4	1.7	(4.0)	9.3
EPS	145.8	(0.3)	(5.9)	9.2
Margins (%)				
EBITDA	37.9	39.4	40.4	42.3
EBIT	29.8	30.8	30.2	29.8
Valuation (x)	**12/18A**	**12/19E**	**12/20E**	**12/21E**
P/E	11.0	11.0	11.7	10.7
P/B	3.47	3.32	2.97	2.70
Dividend yield (%)	2.9	7.3	6.4	6.0
EV/sales	2.0	2.2	2.4	2.1
EV/EBITDA	5.3	5.5	6.0	5.0
EV/EBIT	6.8	7.1	8.1	7.1
ROE analysis (%)	**12/18A**	**12/19E**	**12/20E**	**12/21E**
ROE	35.4	30.9	26.8	26.4
ROIC	61.3	74.4	41.1	34.9
Credit ratios	**12/18A**	**12/19E**	**12/20E**	**12/21E**
Net debt/equity (%)	(69.4)	(50.9)	(21.3)	(28.3)
Net debt/EBITDA (x)	(1.34)	(1.00)	(0.47)	(0.59)

Source: Company data, Refinitiv, Credit Suisse estimates

Company Background

Globalwafers is a silicon wafer manufacturer with key customers spanning from 12" foundries (TSMC, UMC), 8" foundries (Vanguard and Hua Hong) and memory makers (Samsung, Hynix, Toshiba).

Blue/Grey Sky Scenario



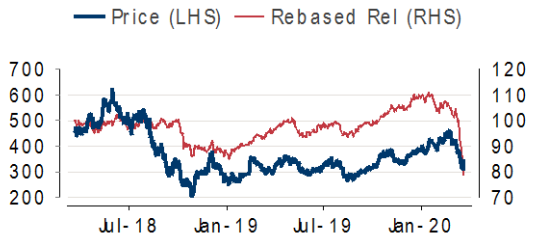
Our Blue Sky Scenario (NT$) **575.92**

Our blue sky valuation scenario of NT$575.92 implies 18x 2021 P/E on the back of better-than-expected pricing environment vs our current assumption for +14%/+6% YoY in 2019-2020 due to stronger semiconductor wafer demand.

Our Grey Sky Scenario (NT$) **383.95**

Our grey sky valuation scenario of NT$383.95 implies 12x 2021 P/E on the back of slower-than-expected pricing environment than our current assumption and slightly lower than full utilisation due to worse semiconductor wafer demand.

Share price performance



The price relative chart measures performance against the TAIWAN SE WEIGHTED INDEX which closed at 9,234.09 on 20-Mar-2020
On 20-Mar-2020 the spot exchange rate was NT$30.29/US$1

Companies Mentioned *(Price as of 20-Mar-2020)*

Advanced Micro Devices, Inc. (AMD.OQ, $39.61)
Apple Inc (AAPL.OQ, $229.24)
Broadcom Ltd (AVGO.OQ, $192.22)
Formosa SUMCO (3532.TW, NT$138.0, UNDERPERFORM[V], TP NT$105.0)
Globalwafers (6488.TWO, NT$342.5, OUTPERFORM[V], TP NT$450.0)
Hua Hong Semiconductor Limited (1347.HK, HK$13.58)
Intel Corp. (INTC.OQ, $45.83)
Maxim Integrated Products (MXIM.OQ, $44.12)
Micron Technology Inc. (MU.OQ, $36.11)
NXP Semiconductors N.V. (NXPI.OQ, $73.58)
Nanya Technology (2408.TW, NT$48.65)
ON Semiconductor Corp. (ON.OQ, $10.82)
SK Hynix Inc. (000660.KS, W74,800)
STMicroelectronics NV (STM.PA, €16.36)
SUMCO (3436.T, ¥1,076)
Samsung Electronics (005930.KS, W45,400)
Semiconductor Manufacturing International Corp. (0981.HK, HK$12.16)
Shin-Etsu Chemical (4063.T, ¥9,075)
Siltronic (WAFGn.DE, €51.26)
Sony (6758.T, ¥5,929)
Taiwan Semiconductor Manufacturing (2330.TW, NT$270.0)
Texas Instruments Inc. (TXN.OQ, $97.6)
Toshiba (6502.T, ¥2,026)
TowerJazz (TSEM.TA, agora5250.0)
TowerJazz (TSEM.OQ, $13.87)
United Microelectronics (2303.TW, NT$13.85)
Vanguard International Semiconductor (5347.TWO, NT$58.9)
Wafer Works (6182.TWO, NT$24.3, NEUTRAL[V], TP NT$28.5)
X-FAB (XFAB.PA, €2.16)

Disclosure Appendix

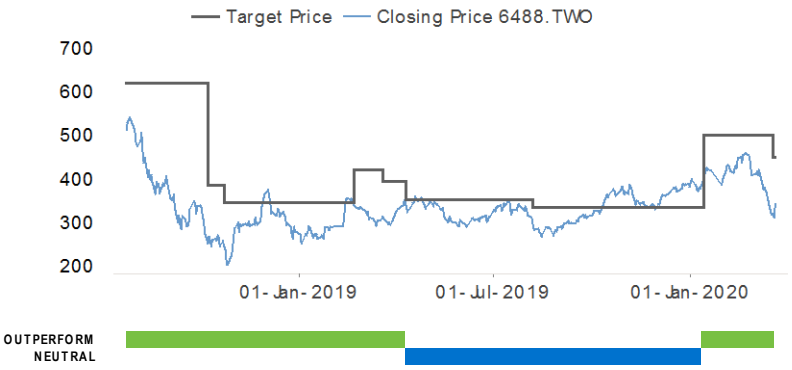
Analyst Certification

Haas Liu and Randy Abrams, CFA, each certify, with respect to the companies or securities that the individual analyzes, that (1) the views expressed in this report accurately reflect his or her personal views about all of the subject companies and securities and (2) no part of his or her compensation was, is or will be directly or indirectly related to the specific recommendations or views expressed in this report.

3-Year Price and Rating History for Globalwafers (6488.TWO)

6488.TWO	Closing Price	Target Price	
Date	(NT$)	(NT$)	Rating
24-Jul-18	513.00	620.00	O *
08-Oct-18	253.00	385.00	
23-Oct-18	245.50	345.00	
21-Feb-19	340.00	420.00	
20-Mar-19	313.50	395.00	
11-Apr-19	335.00	352.00	N
07-Aug-19	293.00	335.00	
13-Jan-20	396.00	500.00	O
18-Mar-20	319.00	450.00	

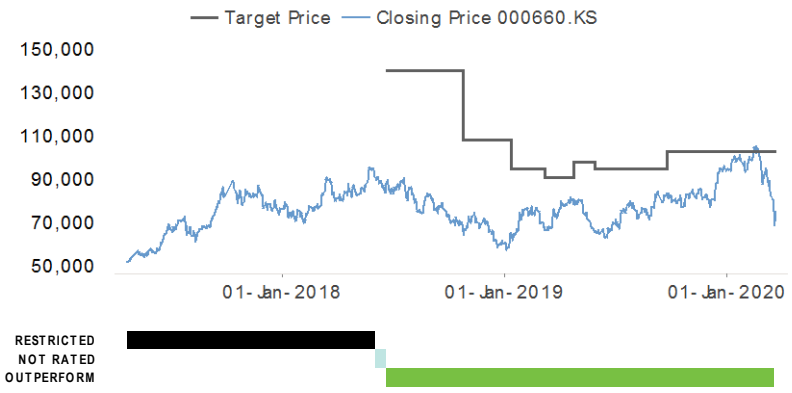
** Asterisk signifies initiation or assumption of coverage.*



3-Year Price and Rating History for SK Hynix Inc. (000660.KS)

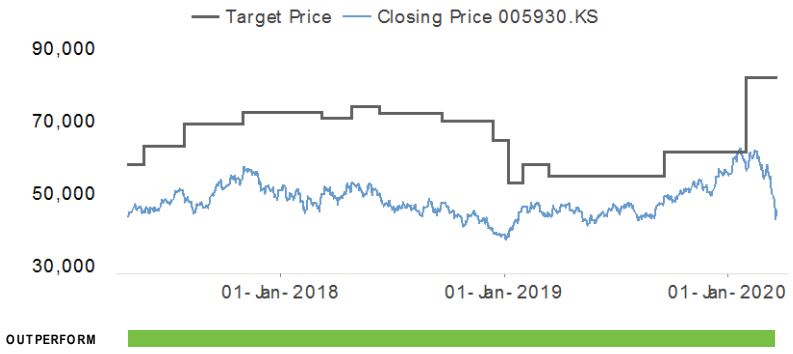
000660.KS	Closing Price	Target Price	
Date	(W)	(W)	Rating
21-Apr-17	52,000		R
04-Jun-18	89,800		NR
21-Jun-18	88,500	140,000	O
25-Oct-18	64,700	108,000	
11-Jan-19	65,100	95,000	
08-Mar-19	66,700	91,000	
25-Apr-19	80,200	98,000	
29-May-19	66,100	95,000	
25-Sep-19	81,900	103,000	

** Asterisk signifies initiation or assumption of coverage.*



3-Year Price and Rating History for Samsung Electronics (005930.KS)

005930.KS	Closing Price	Target Price	
Date	(W)	(W)	Rating
27-Apr-17	43,840	58,000	O
23-May-17	44,920	63,000	
27-Jul-17	49,800	69,200	
31-Oct-17	55,080	72,400	
09-Mar-18	49,740	70,800	
27-Apr-18	53,000	74,000	
11-Jun-18	49,900	72,000	
21-Sep-18	47,400	70,000	
13-Dec-18	40,000	64,500	
08-Jan-19	38,100	53,000	
31-Jan-19	46,150	58,000	
15-Mar-19	44,200	54,800	
19-Sep-19	49,150	61,300	
31-Jan-20	56,400	82,000	



** Asterisk signifies initiation or assumption of coverage.*

As of December 10, 2012 Analysts' stock rating are defined as follows:

Outperform (O) : The stock's total return is expected to outperform the relevant benchmark* over the next 12 months.

Neutral (N) : The stock's total return is expected to be in line with the relevant benchmark* over the next 12 months.

Underperform (U) : The stock's total return is expected to underperform the relevant benchmark* over the next 12 months.

**Relevant benchmark by region: As of 10th December 2012, Japanese ratings are based on a stock's total return relative to the analyst's coverage universe which consists of all companies covered by the analyst within the relevant sector, with Outperforms representing the most attractive, Neutrals the less attractive, and Underperforms the least attractive investment opportunities. As of 2nd October 2012, U.S. and Canadian as well as European (excluding Turkey) ratings are based on a stock's total return relative to the analyst's coverage universe which consists of all companies covered by the analyst within the relevant sector, with Outperforms representing the most attractive, Neutrals the less attractive, and Underperforms the least attractive investment opportunities. For Latin America, Turkey and Asia (excluding Japan and Australia), stock ratings are based on a stock's total return relative to the average total return of the relevant country or regional benchmark (India - S&P BSE Sensex Index); prior to 2nd October 2012 U.S. and Canadian ratings were based on (1) a stock's absolute total return potential to its current share price and (2) the relative attractiveness of a stock's total return potential within an analyst's coverage universe. For Australian and New Zealand stocks, the expected total return (ETR) calculation includes 12-month rolling dividend yield. An Outperform rating is assigned where an ETR is greater than or equal to 7.5%; Underperform where an ETR less than or equal to 5%. A Neutral may be assigned where the ETR is between -5% and 15%. The overlapping rating range allows analysts to assign a rating that puts ETR in the context of associated risks. Prior to 18 May 2015, ETR ranges for Outperform and Underperform ratings did not overlap with Neutral thresholds between 15% and 7.5%, which was in operation from 7 July 2011.*

Restricted (R) : In certain circumstances, Credit Suisse policy and/or applicable law and regulations preclude certain types of communications, including an investment recommendation, during the course of Credit Suisse's engagement in an investment banking transaction and in certain other circumstances.

Not Rated (NR) : Credit Suisse Equity Research does not have an investment rating or view on the stock or any other securities related to the company at this time.

Not Covered (NC) : Credit Suisse Equity Research does not provide ongoing coverage of the company or offer an investment rating or investment view on the equity security of the company or related products.

Volatility Indicator [V] : A stock is defined as volatile if the stock price has moved up or down by 20% or more in a month in at least 8 of the past 24 months or the analyst expects significant volatility going forward.

Analysts' sector weightings are distinct from analysts' stock ratings and are based on the analyst's expectations for the fundamentals and/or valuation of the sector* relative to the group's historic fundamentals and/or valuation:

Overweight : The analyst's expectation for the sector's fundamentals and/or valuation is favorable over the next 12 months.

Market Weight : The analyst's expectation for the sector's fundamentals and/or valuation is neutral over the next 12 months.

Underweight : The analyst's expectation for the sector's fundamentals and/or valuation is cautious over the next 12 months.

**An analyst's coverage sector consists of all companies covered by the analyst within the relevant sector. An analyst may cover multiple sectors.*

Credit Suisse's distribution of stock ratings (and banking clients) is:

Global Ratings Distribution

Rating	Versus universe (%)	Of which banking clients (%)
Outperform/Buy*	48%	(33% banking clients)
Neutral/Hold*	38%	(26% banking clients)
Underperform/Sell*	12%	(21% banking clients)
Restricted	2%	

**For purposes of the NYSE and FINRA ratings distribution disclosure requirements, our stock ratings of Outperform, Neutral, and Underperform most closely correspond to Buy, Hold, and Sell, respectively; however, the meanings are not the same, as our stock ratings are determined on a relative basis. (Please refer to definitions above.) An investor's decision to buy or sell a security should be based on investment objectives, current holdings, and other individual factors.*

Important Global Disclosures

Credit Suisse's research reports are made available to clients through our proprietary research portal on CS PLUS. Credit Suisse research products may also be made available through third-party vendors or alternate electronic means as a convenience. Certain research products are only made available through CS PLUS. The services provided by Credit Suisse's analysts to clients may depend on a specific client's preferences regarding the frequency and manner of receiving communications, the client's risk profile and investment, the size and scope of the overall client relationship with the Firm, as well as legal and regulatory constraints. To access all of Credit Suisse's research that you are entitled to receive in the most timely manner, please contact your sales representative or go to https://plus.credit-suisse.com .

Credit Suisse's policy is to update research reports as it deems appropriate, based on developments with the subject company, the sector or the market that may have a material impact on the research views or opinions stated herein.

Credit Suisse's policy is only to publish investment research that is impartial, independent, clear, fair and not misleading. For more detail please refer to Credit Suisse's Policies for Managing Conflicts of Interest in connection with Investment Research: https://www.credit-suisse.com/sites/disclaimers-ib/en/managing-conflicts.html .

Any information relating to the tax status of financial instruments discussed herein is not intended to provide tax advice or to be used by anyone to provide tax advice. Investors are urged to seek tax advice based on their particular circumstances from an independent tax professional.

Credit Suisse has decided not to enter into business relationships with companies that Credit Suisse has determined to be involved in the development, manufacture, or acquisition of anti-personnel mines and cluster munitions. For Credit Suisse's position on the issue, please see

The analyst(s) responsible for preparing this research report received compensation that is based upon various factors including Credit Suisse's total revenues, a portion of which are generated by Credit Suisse's investment banking activities

Target Price and Rating
Valuation Methodology and Risks: (12 months) for Formosa SUMCO (3532.TW)

Method: Our target price of NT$105 is based on 14x 2021 earnings supported by the continued pricing pressure for 8" and 12" raw wafer at least through 2020 due to the coronavirus outbreak. The valuation for Formosa SUMCO is also high at the mid-cycle valuation while the industry outlook will not see meaningful improvement at least until 2H21. We thus rate the stock UNDERPERFORM.

Risk: The key risk to our target price of NT$105 and UNDERPERFORM rating for Formosa SUMCO includes better-than-expected semiconductor industry demand lifting industry utilisation. The spot price could also be better if industry supply growth and utilisation are managed better by the major suppliers.

Target Price and Rating
Valuation Methodology and Risks: (12 months) for Globalwafers (6488.TWO)

Method: Our OUTPERFORM rating and target price of NT$450 for Globalwafers are based on 8.5x 2020-21 EV/EBITDA (implied 15x 2021 earnings). We are conservative on the company's business outlook due to rising pricing pressure from slower demand growth vis-à-vis on-track supply increase. Profitability will also be negatively impacted by lower pricing and utilisation and higher depreciation from 2020.

Risk: RIsks to our OUTPERFORM rating and NT$450 target include: (1) worse-than-expected industry demand leading to a worse-than-expected price decline, (2) more competition from the entry of Chinese players, and (3) more aggressive expansion by its major competitors in the next 2-3 years.

Target Price and Rating
Valuation Methodology and Risks: (12 months) for Wafer Works (6182.TWO)

Method: Our target price of NT$28.5 is based on 12x 2021 earnings supported by the continued pricing pressure for 6" and 8" raw wafer at least through 2020 due to the coronavirus outbreak. The company will also face more pressure to raise funds for its 8" and 12" raw wafer capacity expansion in China and higher depreciation from the investment. Thus, we rate the stock NEUTRAL.

Risk: Upside risk to our NEUTRAL rating and target price of NT$28.5 is better-than-expected semiconductor industry demand lifting the industry utilisation and spot price. Downside risks to our target price include: (1) more China competition on 6" and (2) worse-than-expected demand recovery leading to lower utilisation along with higher depreciation, dragging profitability.

Please refer to the firm's disclosure website at https://rave.credit-suisse.com/disclosures/view/selectArchive for the definitions of abbreviations typically used in the target price method and risk sections.

See the Companies Mentioned section for full company names

Credit Suisse currently has, or had within the past 12 months, the following as investment banking client(s): INTC.OQ, MU.OQ, NXPI.OQ, 000660.KS, AMD.OQ, AVGO.OQ, MXIM.OQ

Credit Suisse provided investment banking services to the subject company (INTC.OQ, MU.OQ, NXPI.OQ, 000660.KS, AMD.OQ, AVGO.OQ, MXIM.OQ) within the past 12 months.

Within the last 12 months, Credit Suisse has received compensation for non-investment banking services or products from the following issuer(s): INTC.OQ, MU.OQ, 6758.T, 005930.KS, AAPL.OQ, NXPI.OQ, 000660.KS, AMD.OQ, AVGO.OQ, MXIM.OQ

Credit Suisse has managed or co-managed a public offering of securities for the subject company (MU.OQ, NXPI.OQ, 000660.KS, AVGO.OQ) within the past 12 months.

Within the past 12 months, Credit Suisse has received compensation for investment banking services from the following issuer(s): INTC.OQ, MU.OQ, NXPI.OQ, 000660.KS, AMD.OQ, AVGO.OQ, MXIM.OQ
Credit Suisse expects to receive or intends to seek investment banking related compensation from the subject company (INTC.OQ, MU.OQ, 6758.T, 005930.KS, AAPL.OQ, NXPI.OQ, STM.PA, 000660.KS, AMD.OQ, AVGO.OQ, MXIM.OQ) within the next 3 months.
Credit Suisse currently has, or had within the past 12 months, the following issuer(s) as client(s), and the services provided were non-investment-banking, securities-related: INTC.OQ, MU.OQ, 6758.T, 005930.KS, AAPL.OQ, NXPI.OQ, 000660.KS, AVGO.OQ, MXIM.OQ
Credit Suisse currently has, or had within the past 12 months, the following issuer(s) as client(s), and the services provided were non-investment-banking, non securities-related: INTC.OQ, 005930.KS, 000660.KS, AMD.OQ, AVGO.OQ
Credit Suisse acts as a market maker in the shares, depositary receipts, interests or units issued by, and/or any warrants or options on these shares, depositary receipts, interests or units of the following subject issuer(s): 1347.HK, 0981.HK.
Credit Suisse or a member of the Credit Suisse Group is a market maker or liquidity provider in the securities of the following subject issuer(s): AMD.OQ, AAPL.OQ, AVGO.OQ, 3532.TW, 6488.TWO, 1347.HK, INTC.OQ, MXIM.OQ, MU.OQ, NXPI.OQ, 2408.TW, ON.OQ, 000660.KS, STM.PA, 3436.T, 005930.KS, 0981.HK, 4063.T, WAFGn.DE, 6758.T, 2330.TW, TXN.OQ, 6502.T, TSEM.TA, TSEM.OQ, 2303.TW, 5347.TWO, 6182.TWO, XFAB.PA
A member of the Credit Suisse Group is party to an agreement with, or may have provided services set out in sections A and B of Annex I of Directive 2014/65/EU of the European Parliament and Council ("MiFID Services") to, the subject issuer (INTC.OQ, MU.OQ, NXPI.OQ, 000660.KS, AMD.OQ, AVGO.OQ, MXIM.OQ) within the past 12 months.
As of the date of this report, Credit Suisse beneficially own 1% or more of a class of common equity securities of (6488.TWO, 3436.T, 2303.TW, 0981.HK, NXPI.OQ, STM.PA).
Credit Suisse beneficially holds >0.5% short position of the total issued share capital of the subject company (0981.HK).

For date and time of production, dissemination and history of recommendation for the subject company(ies) featured in this report, disseminated within the past 12 months, please refer to the link: https://rave.credit-suisse.com/disclosures/view/report?i=501878&v=344ul1w5bvjra0yvrab8h0w7e .

Important Regional Disclosures

Singapore recipients should contact Credit Suisse AG, Singapore Branch for any matters arising from this research report.
The analyst(s) involved in the preparation of this report may participate in events hosted by the subject company, including site visits. Credit Suisse does not accept or permit analysts to accept payment or reimbursement for travel expenses associated with these events.
For Credit Suisse Securities (Canada), Inc.'s policies and procedures regarding the dissemination of equity research, please visit https://www.credit-suisse.com/sites/disclaimers-ib/en/canada-research-policy.html.
Investors should note that income from such securities and other financial instruments, if any, may fluctuate and that price or value of such securities and instruments may rise or fall and, in some cases, investors may lose their entire principal investment.
Taiwanese Disclosures: This research report is for reference only. Investors should carefully consider their own investment risk and note they may be subject to the applicable rules and regulations in Taiwan. Investment results are the responsibility of the investor. Reports written by Taiwan based analysts on non-Taiwan listed companies are not considered as recommendations to buy or sell securities. Reports may not be reproduced without the permission of Credit Suisse. Pursuant to the 'Taiwan Stock Exchange Regulations Governing Securities Firms Recommending Trades in Securities to Customers' and the 'Taipei Exchange Rules Governing Securities Firms Recommending Trades in Securities to Customers', in order for a non-client of Credit Suisse AG, Taipei Securities Branch to receive this research report, no provision by such non-client of the content of the report to a third party, nor any conflict of interest, is permitted. By receiving this research report, any such non-client is deemed to acknowledge and accept our terms and disclaimers included herein.
As at the date of this report, Credit Suisse has financial interests that aggregate to an amount equal to or more than 1% of the market capitalization of (1347.HK, 0981.HK).
This research report is authored by:
Credit Suisse AG, Taipei Securities Branch.....Haas Liu ; Randy Abrams, CFA
To the extent this is a report authored in whole or in part by a non-U.S. analyst and is made available in the U.S., the following are important disclosures regarding any non-U.S. analyst contributors: The non-U.S. research analysts listed below (if any) are not registered/qualified as research analysts with FINRA. The non-U.S. research analysts listed below may not be associated persons of CSSU and therefore may not be subject to the FINRA 2241 and NYSE Rule 472 restrictions on communications with a subject company, public appearances and trading securities held by a research analyst account.
Credit Suisse AG, Taipei Securities Branch.....Haas Liu ; Randy Abrams, CFA

Important disclosures regarding companies that are the subject of this report are available by calling +1 (877) 291-2683. The same important disclosures, with the exception of valuation methodology and risk discussions, are also available on Credit Suisse's disclosure website at https://rave.credit-suisse.com/disclosures . For valuation methodology and risks associated with any recommendation, price target, or rating referenced in this report, please refer to the disclosures section of the most recent report regarding the subject company.

尖峰报告社群

分享8万+行业报告/案例、7000+工具/模版；
精选各行业前沿数据、经典案例、职场干货等。

截屏本页，微信扫一扫或搜索公众号“**尖峰报告**”
回复<**进群**> 即刻加入