

Global Semiconductors

China EDA Deep Dive Part 2 – Structurally Challenged, Primed For A "Big Bang" Moment

Deep dive into China EDA market, competition and China govt initiatives

Export regs are leading CDNS/SNPS to evaluate their China strategy on a per customer basis ([Part 1](#)). In this report we double-click into China EDA oppy of ~\$800MM-\$1B, structural challenges holding back local China EDA competitors & China govt. initiatives. We use conversations w/ local China customers incl. engineers using China EDA offerings & public competitor mgmt. comments in Mandarin to connect the dots. In [Part 3](#) we quantify CDNS/SNPS exposure to Tsinghua UNIGROUP, a large China semi.

China EDA landscape primed for a "Big-Bang" Moment

CDNS/SNPS/Mentor offerings still dominate China EDA market (\$800MM-\$1B) w/ indigenous China EDA offerings ~10% of revs. Our field work suggests that leading China EDA vendors – Huada Empyrean, Avatar, Pro-Plus are small (<\$50MM in revs), Analog focused, w/ point tools for Digital that cover only ~30% of the full flow. We think that the Entity List restricts HiSilicon from obtaining updates to US EDA platforms & w/ EDA platforms getting updated at the cadence of mfg. technology shifts & a 3-5 yr lag between EDA dev & tape-out, design activity on advanced nodes can potentially be impacted. Although our conversations suggest China EDA vendors are seeing more engagement from larger China Chipmakers, there is a recognition that they remain far behind the US vendors & we don't think they represent a solution to large China chipmakers. Although the Chinese Govt has prioritized mfg over EDA for investment (EDA <1% of Big Fund investments), recent activity suggests that things may be changing. Nevertheless, we think EDA remains a source of weakness for China semis ecosystem & do not see a short term fix to structural challenges. In our view status quo for China EDA is likely unsustainable as export restrictions tighten. We see ingredients in place for China EDA's very own "Big Bang" moment to structurally change the direction of EDA – large scale govt commitment, hiring of experienced talent, ecosystem dev, w/ larger Chipmakers potentially funding custom EDA.

How this impacts our view on CDNS/SNPS

We don't see a major competitive threat from local China EDA providers, who while making incremental progress, are hampered by predominantly structural factors – dearth of a critical mass of talent, access to leading edge mfg technology & inherent stickiness of CDNS/SNPS/Mentor EDA offerings. A trade regs driven bifurcation into distinct US/China spheres could present a far more significant LT risk to CDNS/SNPS.

Equities

Americas
Semiconductors

Pradeep Ramani

Analyst

pradeep.ramani@ubs.com
+1-415-352 5517

Timothy Arcuri

Analyst

timothy.arcuri@ubs.com
+1-415-352 5676

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

限时领取【行业资料大礼包】，回复“2020”获取

手机用户建议先截屏本页，微信扫一扫

或搜索公众号**“有点报告”**

回复<进群>，加入每日报告分享微信群



(此页只为需要行业资料的朋友提供便利，如果影响您的阅读体验，请多多理解)

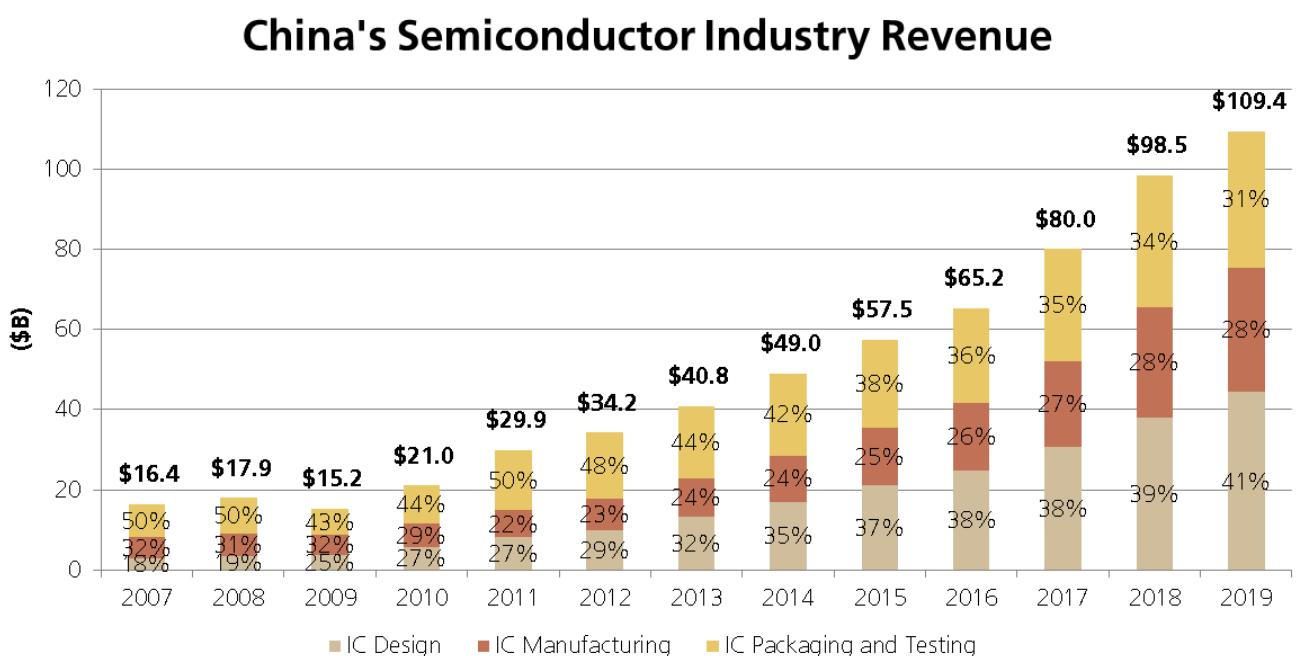
Pivotal Questions for China EDA

How big is the China EDA opportunity?

China EDA market of \$800MM-\$1B, is largely dominated by CDNS/SNPS/Mentor. Two developments are tilting the scale further towards CDNS/SNPS: 1) The China Fabless ecosystem getting increasingly concentrated, meaning larger players can afford CDNS/SNPS tools; 2) Design activity and revs shifts to 5G & Digital and away from core Analog (where indigenous China vendors have some presence)

Data from China Semiconductor Industry Association indicate that China Semis revs was ~\$110B of which IC design accounted for ~\$45B in revenue

Figure 1: China's Semiconductor Industry by Sector (excluding Optoelectronics, Sensors, and Discrete Devices)



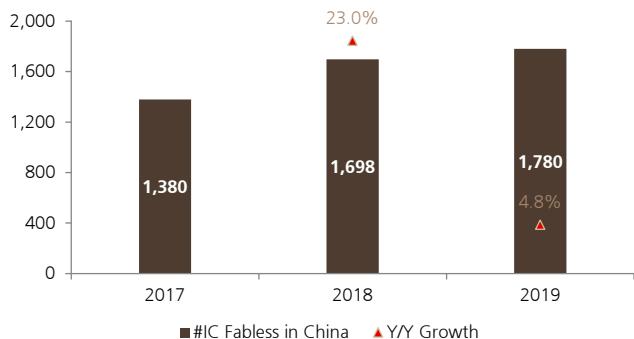
Source: CSIA

Notes: historical USD/CNY rates are used

While growth in the China Fabless ecosystem has slowed in 2019, it is also getting increasingly concentrated. Beyond the multinational design houses, a handful of large China chipmakers such as Huawei/HiSilicon, Tsinghua Unigroup & Foundries such as SMIC represent the bulk of the EDA opportunity. Our conversations suggest that there is a steep roll off in size/sophistication of R&D/EDA usage beyond these larger chipmakers & foundries.

Figure 2: China IC Fabless Industry (number of players)

Number of IC Fabless Companies in China



Source: CSIA

Figure 3: China Fabless Industry Scale & Concentration

By Scale (#Employee)	2018	2019	Change
>1000	18	18	➡
500-1000	21	33	⬆
100-500	126	153	⬆
<100	1533	1576	⬆

Concentration of IC Fabless	2017	2018	2019
Revs of Top 10 IC Fabless (CNY B)	95.174	103.615	~153.175
Revs of Top 10 IC Fabless (\$B)	14.079	15.628	22.167
IC Design (CNY B)	207.350	251.930	306.350
IC Design (\$B)	30.673	37.998	44.334
Top10% as of Total Revs	45.9%	40.2%	>50.0%

Source: CSIA

Notes: historical USD/CNY rates are used

While the China Fabless ecosystem has been focused on Analog/Power, fewer core analog projects could raise funds in 2019, and 5G related and digital projects become more attractive to investors. And therefore, we are seeing an increasing number of start-ups focusing on 5G related communication and the Digital space (SmartCard/Computer Chips).

Figure 4: China Fabless Industry by End Market (# of Players)

By End Market	2018	2019	Change
Communications Chips	307	403	⬆
SmartCard	71	102	⬆
Computer	109	140	⬆
GPS	28	41	⬆
Consumer Electronics	783	847	⬆
Multimedia	75	55	⬇
Analog	210	102	⬇
Power	115	89	⬇

Source: CSIA

Figure 5: China Fabless Industry by End Market (Revenue)

Revs by End Market (\$B)	2018	2019	Y/Y
Communications Chips	15.785	16.327	7.8%
Total Revs of Top3 Comm Co.		>14.472	
SmartCard	2.083	2.491	24.6%
Computer	5.423	6.082	16.9%
GPS	0.086	0.213	157.4%
Consumer Electronics	9.309	13.897	55.6%
Multimedia	2.851	2.262	-17.3%
Revs of Top1 as of Total Multimedia		1.283	
Analog	2.137	1.899	-7.4%
Power	1.194	1.415	23.5%

Source: CSIA

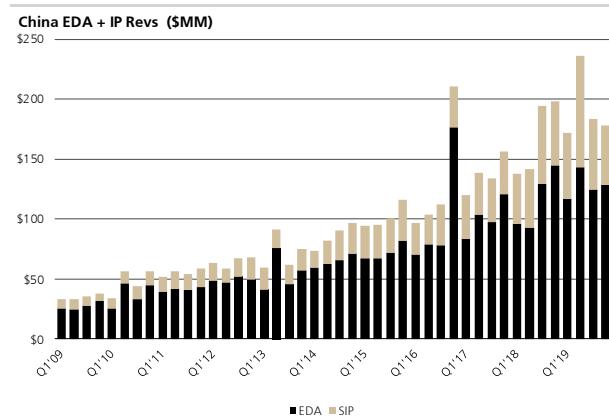
Notes:
Historical USD/CNY are used
Forex translation is not considered in Y/Y changes

Implications for EDA: We think increasing size/scale of the China Fabless ecosystem ultimately is a positive for CDNS/SNPS. Larger customers are more likely to be able to afford CDNS/SNPS solutions. Further, while indigenous China EDA vendors have had some analog presence, we think increasing Digital /communications design activity and revenue clearly favors CDNS/SNPS over local competitors.

EDA Revenue

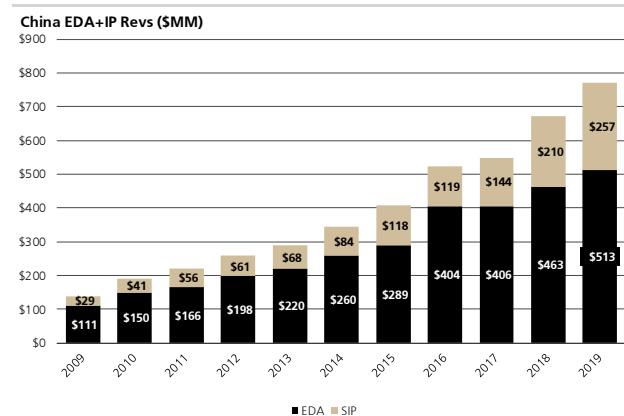
China EDA accounted for ~\$800MM. in revs (incl IP) in 2019. Assuming roughly 8% of SNPS revs from China and roughly 10% of CDNS came from China in C2019, CDNS and SNPS accounted for roughly 65% of China revs, adding in some Mentor, we think the big 3 together accounted for at least 90% of China revs. This implies that Indigenous China EDA accounted for roughly \$80MM in revs in C2019. Our field work (from anecdotal conversations, and piecing together mgmt interviews in Mandarin) suggests that with Huada potentially accounted for roughly \$40-\$50MM, and several other smaller vendors splitting the rest.

Figure 6: China EDA Revenue (\$MM) –Quarterly View



Source: ESDA, UBS estimates

Figure 7: China EDA Revenue (\$MM) – Annual View



Source: ESDA, UBS estimates

Figure 8: China remains heavily dependent on Large EDA Vendors

	2018	2019
(\$MM)		
Total EDA Revs in China	673	770
EDA	463	513
SIP	210	257
(\$MM)	93%	90%
Total EDA Revs from Overseas Co.	626	693
EDA	430	462
SIP	195	231
(\$MM)	7%	10%
Total EDA Revs from Local Co.	47	77
EDA	32	51
SIP	15	26

Source: ESDA, UBS estimates

How much Investment has EDA attracted from the Chinese Govt?

China's EDA industry has received very little support from the govt. The Big Fund has raised ~\$20B in Phase I, and another ~\$30B in Phase II. Less than 1% of The Big Fund investments thus far have been directed at indigenous EDA. However recent investment activity could indicate that things may be changing

The Big Fund is China's primary investment vehicle for the semis/Electronics verticals. The Big Fund Phase I has raised ~ \$20B from a combination of Govt/SoE/Private sectors companies. The Big Fund Phase II has raised ~\$30B of capital.

While EDA has ranked low on the priority list for the Govt

Figure 9: Big Fund Phase I - Source Of Funds

Company Name	Capital Raised (CNY B)
China Development Bank Capital	22
Beijing E-Town International Investment & Development Co., Ltd	10
Ministry of Finance of the People's Republic of China	36
China Telecom	1.4
China Electronics Corp.	0.5
San'an Optoelectronics	0.1
Da Tang Group	0.5
Wuhan Financial Holdings Group	5
China Mobile	5
Beijing Tsinghua Communication Technology Group (UNISOC)	0.1
SummitView Capital	0.1
China Unicom	1.4
Shanghai Guosheng Group Co., Ltd.	5
China National Tobacco Corp.	11
Huixin Investment Management Co., Ltd.	0.12
China Electronics Technology Capital	0.5
Common Stock In Total	98.720
Preferred Stocks	40.000
Capital In Total (CNY B)	138.720
Capital In Total (\$B) (CNY/USD=7)	\$ 20

Source: National Enterprise Credit Information Publicity System

Notes: The Big Fund is leveraging CNY500B (\$70B) (1:5 compared with Common Stock)

Our work suggests that the bulk of the investment commitments for Phase I have already been completed over the past 4-5 years. The new round of investment (Phase II) has kicked off in March 2020.

Figure 10: Big Fund Phase II – Source of Funds

Company Name	Registered capital (CNY B)	Paid-up capital (CNY B)	Current % of registered capital
Anhui Xinhua IC Investment Fund	7.5	0.375	5%
Jiequan IC Investment Fund	10	0.5	5%
Beijing E-Town International Investment & Development Co., Ltd	10	0.5	5%
Fujian IC Investment Co., Ltd	3	0.15	5%
Fuzhe IC Industry Development Co., Ltd	15	0.75	5%
China Electronics Corp.	0.5	0.025	5%
Chongqing Emerging Industries Investment Fund	15	0.75	5%
Guangzhou Industrial Investment Fund Management Co., Ltd	3	0.15	5%
China Telecom	1.5	0.075	5%
Shanghai Guosheng Group Co., Ltd.	15	0.75	5%
Beijing Tsinghua Communication Technology Group (UNISOC)	0.1	0.005	5%
Optics Valley Financial Holding Group	15	0.75	5%
Anhui Anhua Modern Industrial Investment Company	7.5	0.375	5%
Tianfu Group	15	0.75	5%
China Unicom	1	0.05	5%
GCL-Power Capital Management Co., Ltd.	0.1	0.005	5%
China National Tobacco Corp.	15	0.75	5%
Shenzhen Shenchao Tech Investment Co., Ltd.	3	0.15	5%
SummitView Capital	0.1	0	0%
Beijing Guoyi Hospital Co., Ltd.	10	0.5	5%
A Subsidiary of GDD Industry Fund Investment Group	2	0.1	5%
Ministry of Finance of the People's Republic of China	22.5	0	0%
Huaxin Investment Management Co., Ltd.	0.15	0.008	5%
Beijing Jianguang Asset Management Co., Ltd.	0.1	0.005	5%
San'an Optoelectronics	0.1	0.005	5%
China Development Bank Capital	22	1.1	5%
China Mobile	10	0.5	5%
Capital In Total (CNY B)	204.150	9.078	4%
Capital In Total (\$B) (CNY/USD=7)	\$ 29	\$ 1	4%

Source: National Enterprise Credit Information Publicity System

Notes:

Paid-up capital as of CYE2019; paid-up capital should finally be the same as registered capital
Some of the company names are translated from Chinese

The Big Fund also invests in other IC-related funds, leveraging funds from other companies, PE, or local governments.

Figure 11: Major Big Fund Investments – List of IC-related Funds

Target Company	Ecosystem	Deal Amount (CNY MM)	Deal Amount (\$MM)	Big fund's % Share In Target In Total (Directly+Indirectly)
A fund set up along with San'an Optoelectronics	RFFE, mmWave, GaAs	2,500	357	
MTM		1,600	229	30%
SPC; Set up along with BOE (owns 37.35% share)	IoT, Material, IC Design, V2X	1,500	214	37%
Shanghai Semi SPE and material investment fund		1,000	143	20%
Shanghai JYJX IC Investment Funds		998	143	45%
A fund created along with SMIC and Shenzhen gov.		800	114	50%
BJ IC Mfg&SPE Fund		700	100	
Shenzhen Hongtai Investment Funds		700	100	44%

Source: Tianyancha, National Enterprise Credit Information Publicity System, Company disclosures

Notes: Assuming CNY/USD=7:1

The first two investments made are SMIC South (\$1.5B in total planned by Big Fund, and another \$750MM from Shanghai IC Fund) and UNISOC (\$320MM in total planned). SMIC will increase the capacity of 14nm node and make further improvements in leading nodes. UNISOC will focus on the development of 5G modem chips.

Figure 12: Major Big Fund Investments – List of IC Companies (Investment Size >CNY 500MM/~\$70MM)

Target Company	Classification	Major Products	Deal Amount (CNY MM)	Big fund's % Share In Target In Total (Directly+Indirectly)
YMTC	IDM	Memory	23,550	49%
SMIC Phase I	Foundry		18,571	23%
SMIC Phase II	Foundry		11,053	
Huali Fab (Subsidiary of Huahong Group)	Foundry		12,483	42%
San'an Optoelectronics	Foundry	LED driver, RFFE, G	6,410	10%
JCST Group	OSAT		4,886	19%
SINO IC Leasing Company	SPE	Leasing	3,751	35%
Subsidiary of Huahong Group	Foundry		3,654	29%
Goodix	Under Display Fingerprint		2,829	6%
Tongfu Microelectronics (Nantong Fujitsu)	OSAT		2,561	22%
UNISOC Phase I	IC Fabless	5G Modem	1,696	27%
UNISOC Phase II			2,487	
NAVTECH	IC Design	MEMS, GPS, Aeros	1,658	
Naura	SPE	Etch, PVD, CVD	1,511	10%
Beijing BDStar Navigation	GPS		1,500	12%
Giga Device	IC Fabless	SSD Controller	1,450	8%
Jingjia Micro	IC Fabless	GPU; Defense	979	9%
Taiji	OSAT		949	6%
Silan	IDM	8inch IC Chip; Pow	800	48%
China Wafer Level CSP	OSAT	WLCSP	680	9%
Wanye Enterprise	SPE		677	7%
JCET Semi.	OSAT		650	26%
National Silicon Industry Group	Material	300mm silicon wa	567	23%
YDME	IDM	Analog; Discrete d	506	20%
Ninestar (Lexmark, Pantum, Apexmic)	IC Fabless	Printers related	500	3%
GCL-Power	Material	300mm silicon wa	500	49%

Source: Tianyancha, National Enterprise Credit Information Publicity System, Company disclosures

Notes: Assuming CNY/USD=7:1

Our analysis suggests that China's EDA industry has received very little support from The Big Fund in Phase I. The Big Fund has only committed to invest ~\$75MM to local EDA Industry; in comparison, ~\$20B in total has been invested to ~100 IC companies or IC-related funds (either directly invest or indirectly invest through another fund)

Figure 13: EDA investments still account for <1% of total investment

Target Company	Classification	Major Products	Deal Amount (CNY MM)	Deal Amount (\$MM)	Big fund's % Share In Target In Total (Directly+Indirectly)
Huada Empyrean	EDA	Full-flow platform for Analog; Point Tools for Digital	24	3	14%
Giga-da *through Shenzhen Hongtai Fund	EDA	Physical design from Netlist-in to GDS-out	500	71	45%
*Big Fund plans to invest CNY500MM in total into Giga-da					
Total Planned Investments in EDA			-CNY525MM	-\$75MM	
Total Capital Raised and Total Investments Made by Big Fund Phase I			~CNY140B	~\$20B	
Total Planned Investments in EDA as % of Total Investments Made by Big Fund					0.38%

Source: Tiansyancha, National Enterprise Credit Information Publicity System, Company disclosures

Notes: Assuming CNY/USD=7:1

We think there is some University ecosystem building that is on-going – Peking University will invest \$40MM to cultivate EDA talent by collaborating with foundries, Empyrean on leading IC companies.

Empyrean has been recently added to the list of companies that can receive subsidies on IP build-out and protection financed by Beijing gov.

Our work suggests that Chinese govt may be gradually increasing focus on EDA

In 2019 the Big Fund committed to invest CNY 500 (~\$70MM) in Giga-da via other funds. Giga-da focuses on physical design. The investment commitment of CNY500MM is about 20x Big Fund's last EDA investment in Huada Empyrean (~CNY25MM), and we think this could be a leading indicator of an increasing emphasis on the development of EDA. When this is taken in context with other sustained investment efforts on IC manufacturing and IC design, we think there could be a push towards creating an ecosystem for EDA. Our work indicates that with the support of the Big Fund, Giga-da is able to offer competitive compensation packages to attract talent.

Our work suggests that the two shareholders of Giga-da are Shenzhen Hongtai Fund (90.91%) and SMiT (9.09%). Shenzhen Hongtai Fund is set up in Nov. 2018 by the Big Fund 49.50%, Shenzhen Guiding Fund Investment 49.5% (which is managed by Shenzhen Capital Group), and Giga-da Venture Capital 0.99%. The Shenzhen Hongtai Fund is committed to invest CNY1000MM in total to Giga-da, and CNY600MM has been paid as of CYE2019. The commitment was made in Nov. 2018. The Big Fund typically injects investment capital into the Hongtai Fund (and therefore to Giga-da) when needed and gradually.

Huawei Hubble

Hubble is an investment company set by Huawei in early 2019, focusing on the IC industry. The paid-up capital of Hubble is CNY700MM (~\$100MM), and the

registered capital would reach CNY1700MM. Hubble has largely focused on investing in Analog/RF. Although our work indicates that HiSilicon is beginning to work more closely with Huada as are China hyperscalers we are yet to see a major investment from HiSilicon in EDA.

Figure 14: Huawei Hubble Investments

Target Company	Classification	Major Products	Hubble's % Share In Target In Total (Directly+Indirectly)
Vertilite	IDM	VCSEL	6%
NewCo Semi	IC Fabless	Optical communication	9%
STARCONN	IDM	Connector	32%
SHOULDER ELEC.	IDM	Duplexer, Filters	6%
North Ocean Photonics	IDM	Structual light, TOF, AR Module	6%
Motor Comm	IC Fabless	Auto Ethernet chips	8%
iDeepWise	AI		4%
Joulwatt	IC Fabless	Power	5%
SICC	Material	SiC, Sapphire Substrate	8%
3PEAK Incorporation	IC Fabless	Signal; Battery Management	8%

Source: Tianshan, National Enterprise Credit Information Publicity System, Company disclosures

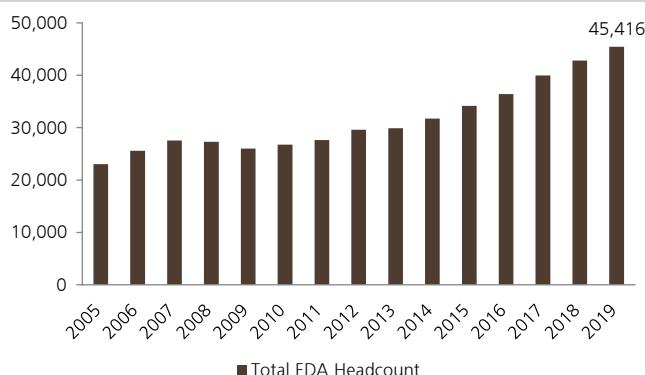
Notes: Most of the deal amount is not disclosed.

Structural Factors are limiting Indigenous China EDA

We think China EDA competition lags far behind the Big three due to structural factors: 1) a lack of experienced engineering/ managerial talent; 2) EDA remains sticky and few customers want to voluntarily switch away from CDNS/SNPS/Mentor offerings; 3) Lack of a leading edge foundry ecosystem is hampering China EDA competitiveness in Digital. We don't see a near term fix for these structural issues.

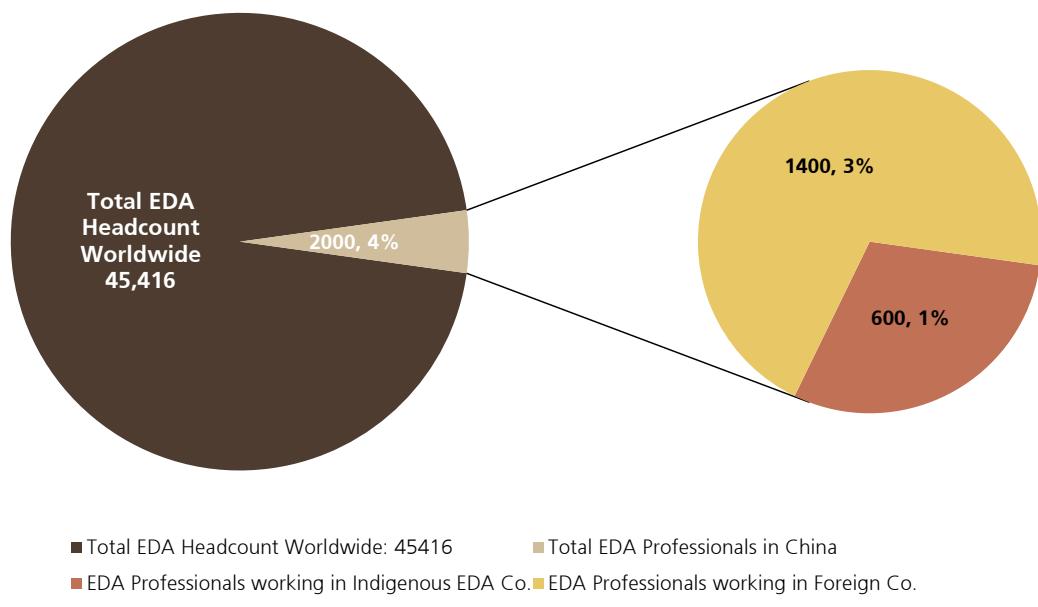
Talent remains the biggest constraint. Our work suggests that EDA talent remains scarce in China. Our conversations suggest that out of ~45,000 EDA employees world-wide, only roughly 2000 work in China. Further, out of the ~2000, only about 600 are employed by indigenous China EDA companies of which Huada employs ~300-400. This talent pool is being replenished at a rate of only ~50 EDA engineers graduating from school each year.

Figure 15: Total EDA headcount Worldwide



Source: ESDA

Figure 16: China EDA headcount as % of Total



Source: ESDA, UBS Analysis

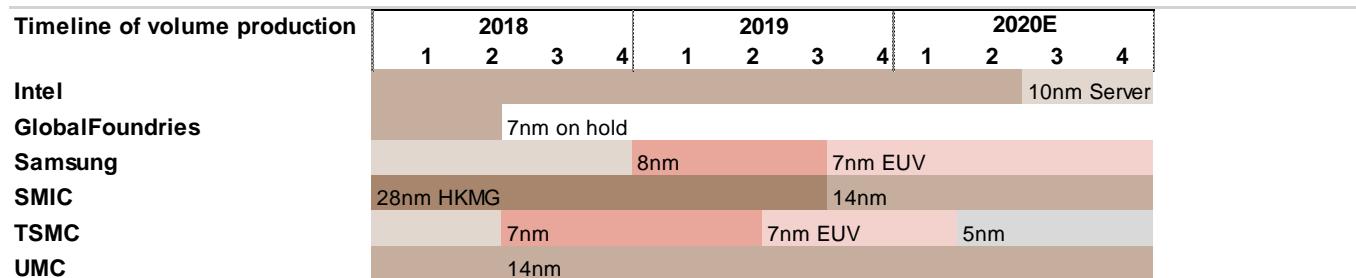
EDA remains sticky and dominated by CDNS/SNPS/Mentor. Although the trade regulations are prompting a re-think – migration costs remain high, meaning barrier to entry is very high for local EDA vendors

Access to leading edge foundry technology is the key to driving competitive digital EDA offerings. Although China EDA vendors are making progress on this front, CDNS/SNPS have decades of experience working with foundries on the leading edge and as such remain entrenched.

We think these factors are structural and we don't see a near term fix for China's heavy dependence of CDNS/SNPS//Mentor tools. Indigenous China providers in the

present form do not have the critical mass to compete at a large scale. Ultimately we think there is a large leap to be made from making progress in point tools to developing a full flow EDA platform for leading edge technology, and as such the indigenous China industry in the present form seems subscale. We therefore view this as a structural challenge for the indigenous China ecosystem.

Figure 17: Mfg Process node roadmaps



Source: Company data, UBS

Source: Company data , UBS

With the entity list potentially limiting the US of EDA tools in advanced nodes, going forward should trade regulations become increasingly more restrictive, we think this could ultimately catalyze a "Big-Bang" moment for China EDA – that funnels Govt backing with large scale hiring from US based competition, more vertical integration/EDA ecosystem funding by Chipmakers such as UNISOC, HiSilicon and a more wholehearted drive to develop a talent pool.

What our field work revealed about indigenous China competition in EDA

Our field work suggests that some of the China EDA point tool vendors include

- Huada Empyrean
- Avatar
- Xpeedic
- Pro-Plus

Huada Empyrean – Largest Indigenous China EDA Vendor by Revenue

Management commentary/interviews in Mandarin suggest that Empyrean revs of ~\$50MM in 2019. Empyrean employs roughly 300-400 employees, having almost doubled its head count in the last year, w/ >70% in R&D.

Analog:

- Analog platform is well regarded in China w/ Empyrean having >300 customers world-wide including customers such as Renesas, DIODES; ALPS (a parallel simulator) remains well regarded by industry.

- Empyrean Flat Panel Display solutions are also well regarded in the industry

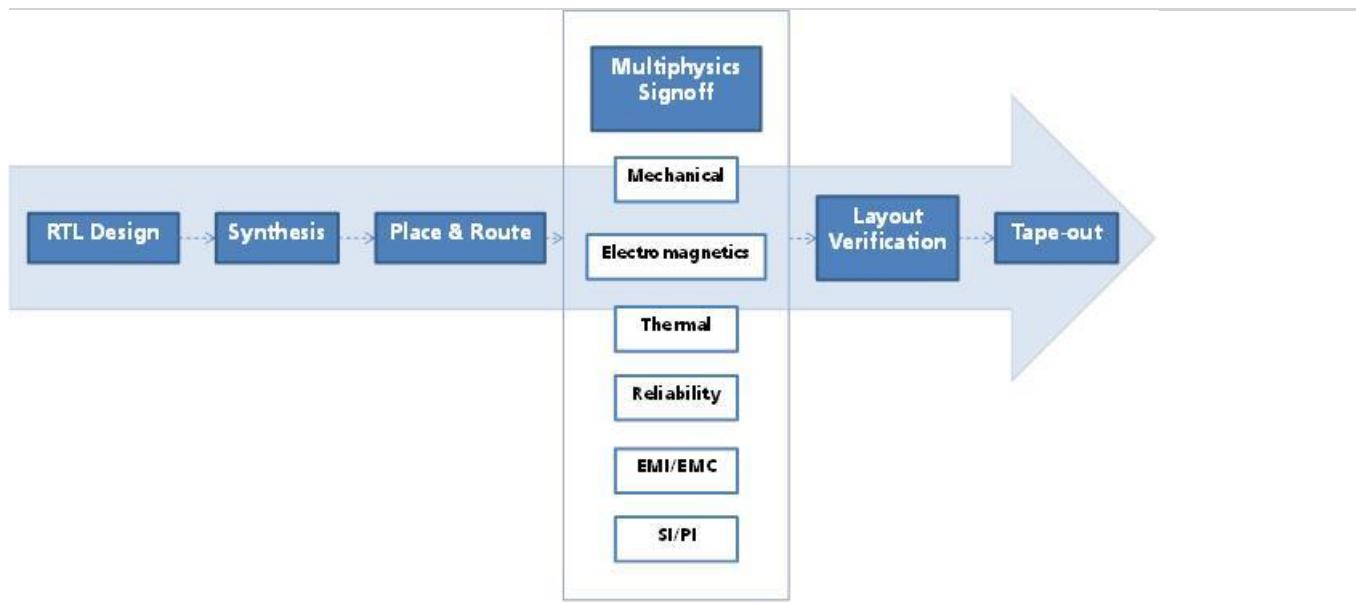
Layout:

- Empyrean is beginning to make strides in Layout. Our field work suggests that Skipper is well regarded by China Foundries with some engineers preferring Skipper for its User Interface that permits faster viewing of large size layout files, relative to US peers.
- Huada is seeing traction in Digital – XTOP and XTime supporting 10nm/7nm nodes and they have already delivered tens of successful tape-outs and is deployed at leading China IC vendors including HiSilicon.

Digital

- While Empyrean SoC point tools have been adopted by UNISOC, Marvell, TSMC, SMIC, YMTC, NVIDIA, XILINX, our work suggests that it still remains largely point tool focused, meaning it lacks CDNS/SNPS like full flow design platform. Our conversations suggest that its tools account for ~30% (or less) of the design flow.

Figure 18: Typical Digital Chip Design Flow (Front End)



Source: UBS Analysis

- Empyrean is partnering with C-SKY a company acquired by Alibaba on IoT and AI designs using ICExplorer and we think this may be its path to break into China hyperscalers

- **C-SKY (Now under T-head/Pingtouge)**

- T-head launched the self-made NPU (Hanguang-800 [NPU](#), something should be similar to AWS Inferentia) for

Ali Cloud last September. The NPU is fabricated with TSMC 12nm process. However, till now, it has not been deployed in any of the Ali Cloud's instance. ([Instance list](#) in Chinese)

- T-head plans to launch the new version of the NPU (with TSMC 7nm process) this September ([link](#)).
 - We think some of the CPU products of C-SKY/T-head ([Link](#)) could be used for Edge Inference/IoT
-
- Our work suggests that a major GPU vendor is using Qualib to verify the quality of its IP library. Huada is working closely with the indigenous China foundry ecosystem as it strives to improve the collaboration across the supply chain.

Process Node Traction

- Our work suggests that Empyrean has long had a presence at SMIC. Although this relates to focus on lagging edge nodes 14nm and older, we note that given its focus on Analog thus far it seems to make sense. We think SMIC maybe one of Empyrean's largest customers
- Empyrean is also working with TSMC 7nm and is one of the members of TSMC OIP, meaning it may have a pathway to tune its offerings to 7nm and beyond

Business model/Focus

- Our field work suggests that although it has presence at the larger China Chipmakers such as HiSilicon and UNICSO, Empyrean is also working closely with a large portion of the indigenous China Fabless ecosystem and has a reputation for being more flexible (than US vendors) in customizing offerings to their needs.
- Empyrean's tool sets while viewed as somewhat incomplete especially on the Digital/mfg side, appear to be of high quality overall.
- Field work suggest that while Empyrean offers similar 2-3 yr licensing contract duration as US vendors, and like other China EDA vendors compete by targeting smaller players in the China Fabless ecosystem with a combination of attractive pricing, services & customization of offerings.

Avatar Integrated Systems – Working on Advanced Nodes

Our field work suggests that Avatar (is US headquartered) executive team is made up of former CDNS/SNPS/ANSS. Avatar's Physical Implementation tools Aprisa and Apogee are well regarded in the industry and Avatar is working with foundries including TSMC at 7nm.

Xpeedic

Focuses on Signal Integrity, packaging and RF solutions. Xpeedic has 100+ engineers and counts SMIC and HiSilicon as customers.

Pro-Plus

Mgmt team comes from ex. CDNS, UC Berkeley. Pro-plus has roughly ~100 engineers and focuses on simulation, yield enhancement.

How this impacts our view on CDNS/SNPS

We think the China chip design ecosystem remains heavily dependent on CDNS/SNPS/Mentor. While indigenous vendors make incremental progress, they are hampered by a lack of critical mass in terms of engineering & managerial experience, access to leading edge technology and inherent stickiness of EDA offerings, all of which appear to be structural factors. Even as we think Chinese govt is gradually increasing focus on EDA driven by restrictive export regulations, we don't see any specific indigenous China EDA vendor as a major threat to CDNS/SNPS over a 1/3 yr period.

However we think that ingredients are in place for China EDA's very own "Big-Bang" moment and tightening restrictions on US EDA vendors could ultimately provide a spark that catalyzes a large revamp of the indigenous China EDA industry driven by – increased government commitment, large scale hiring of experienced engineering and managerial talent from the Big three (CDNS/SNPS/Mentor), a focused effort by SoE and other larger China chipmakers towards creation of a local EDA platform. Ultimately a trade regs driven bifurcation of the chip ecosystem into distinct US/China spheres represents a far more significant LT risk to CDNS/SNPS rather than the local EDA industry in the current form.

Valuation Method and Risk Statement

We use various valuation techniques such as SOTP, EV/Sales for valuing the companies in this report. Risk factors include but are not limited to macroeconomic factors such as a downturn in the economy, a disruption of international trade, technological disruption due to new inventions, or business model innovation whereby structural changes in the industry alter the future course of unit sales, ASPs, and revenues.

Required Disclosures

This report has been prepared by UBS Securities LLC, an affiliate of UBS AG. UBS AG, its subsidiaries, branches and affiliates are referred to herein as UBS.

For information on the ways in which UBS manages conflicts and maintains independence of its research product; historical performance information; certain additional disclosures concerning UBS research recommendations; and terms and conditions for certain third party data used in research report, please visit www.ubs.com/disclosures. The figures contained in performance charts refer to the past; past performance is not a reliable indicator of future results. Additional information will be made available upon request. UBS Securities Co. Limited is licensed to conduct securities investment consultancy businesses by the China Securities Regulatory Commission. UBS acts or may act as principal in the debt securities (or in related derivatives) that may be the subject of this report. This recommendation was finalized on: 15 July 2020 03:53 AM GMT. UBS has designated certain Research department members as Derivatives Research Analysts where those department members publish research principally on the analysis of the price or market for a derivative, and provide information reasonably sufficient upon which to base a decision to enter into a derivatives transaction. Where Derivatives Research Analysts co-author research reports with Equity Research Analysts or Economists, the Derivatives Research Analyst is responsible for the derivatives investment views, forecasts, and/or recommendations.

Analyst Certification: Each research analyst primarily responsible for the content of this research report, in whole or in part, certifies that with respect to each security or issuer that the analyst covered in this report: (1) all of the views expressed accurately reflect his or her personal views about those securities or issuers and were prepared in an independent manner, including with respect to UBS, 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 by that research analyst in the research report.

UBS Investment Research: Global Equity Rating Definitions

12-Month Rating	Definition	Coverage ¹	IB Services ²
Buy	FSR is > 6% above the MRA.	49%	32%
Neutral	FSR is between -6% and 6% of the MRA.	39%	30%
Sell	FSR is > 6% below the MRA.	13%	20%
Short-Term Rating	Definition	Coverage ³	IB Services ⁴
Buy	Stock price expected to rise within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%
Sell	Stock price expected to fall within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%

Source: UBS. Rating allocations are as of 30 June 2020.

1:Percentage of companies under coverage globally within the 12-month rating category.

2:Percentage of companies within the 12-month rating category for which investment banking (IB) services were provided within the past 12 months.

3:Percentage of companies under coverage globally within the Short-Term rating category.

4:Percentage of companies within the Short-Term rating category for which investment banking (IB) services were provided within the past 12 months.

KEY DEFINITIONS: **Forecast Stock Return (FSR)** is defined as expected percentage price appreciation plus gross dividend yield over the next 12 months. In some cases, this yield may be based on accrued dividends. **Market Return Assumption (MRA)** is defined as the one-year local market interest rate plus 5% (a proxy for, and not a forecast of, the equity risk premium). **Under Review (UR)** Stocks may be flagged as UR by the analyst, indicating that the stock's price target and/or rating are subject to possible change in the near term, usually in response to an event that may affect the investment case or valuation. **Short-Term Ratings** reflect the expected near-term (up to three months) performance of the stock and do not reflect any change in the fundamental view or investment case. **Equity Price Targets** have an investment horizon of 12 months.

EXCEPTIONS AND SPECIAL CASES: UK and European Investment Fund ratings and definitions are: **Buy:** Positive on factors such as structure, management, performance record, discount; **Neutral:** Neutral on factors such as structure, management, performance record, discount; **Sell:** Negative on factors such as structure, management, performance record, discount. **Core Banding Exceptions (CBE):** Exceptions to the standard +/-6% bands may be granted by the Investment Review Committee (IRC). Factors considered by the IRC include the stock's volatility and the credit spread of the respective company's debt. As a result, stocks deemed to be very high or low risk may be subject to higher or lower bands as they relate to the rating. When such exceptions apply, they will be identified in the Company Disclosures table in the relevant research piece.

Research analysts contributing to this report who are employed by any non-US affiliate of UBS Securities LLC are not registered/qualified as research analysts with FINRA. Such analysts may not be associated persons of UBS Securities LLC and therefore are not subject to the FINRA restrictions on communications with a subject company, public appearances, and trading securities held by a research analyst account. The name of each affiliate and analyst employed by that affiliate contributing to this report, if any, follows.

UBS Securities LLC: Pradeep Ramani; Timothy Arcuri.

Unless otherwise indicated, please refer to the Valuation and Risk sections within the body of this report. For a complete set of disclosure statements associated with the companies discussed in this report, including information on valuation and risk, please contact UBS Securities LLC, 1285 Avenue of Americas, New York, NY 10019, USA, Attention: Investment Research.

The Disclaimer relevant to Global Wealth Management clients follows the Global Disclaimer.

Global Disclaimer

This document has been prepared by UBS Securities LLC, an affiliate of UBS AG. UBS AG, its subsidiaries, branches and affiliates are referred to herein as UBS.

This Document is provided solely to recipients who are expressly authorized by UBS to receive it. If you are not so authorized you must immediately destroy the Document.

Global Research is provided to our clients through UBS Neo, and in certain instances, UBS.com and any other system or distribution method specifically identified in one or more communications distributed through UBS Neo or UBS.com (each a system) as an approved means for distributing Global Research. It may also be made available through third party vendors and distributed by UBS and/or third parties via e-mail or alternative electronic means. The level and types of services provided by Global Research to a client may vary depending upon various factors such as a client's individual preferences as to the frequency and manner of receiving communications, a client's risk profile and investment focus and perspective (e.g., market wide, sector specific, long-term, short-term, etc.), the size and scope of the overall client relationship with UBS and legal and regulatory constraints.

All Global Research is available on UBS Neo. Please contact your UBS sales representative if you wish to discuss your access to UBS Neo.

When you receive Global Research through a system, your access and/or use of such Global Research is subject to this Global Research Disclaimer and to the UBS Neo Platform Use Agreement (the "Neo Terms") together with any other relevant terms of use governing the applicable System.

When you receive Global Research via a third party vendor, e-mail or other electronic means, you agree that use shall be subject to this Global Research Disclaimer, the Neo Terms and where applicable the UBS Investment Bank terms of business (<https://www.ubs.com/global/en/investment-bank/regulatory.html>) and to UBS's Terms of Use/Disclaimer (<http://www.ubs.com/global/en/legalinfo2/disclaimer.html>). In addition, you consent to UBS processing your personal data and using cookies in accordance with our Privacy Statement (<http://www.ubs.com/global/en/legalinfo2/privacy.html>) and cookie notice (<http://www.ubs.com/global/en/homepage/cookies/cookie-management.html>).

If you receive Global Research, whether through a System or by any other means, you agree that you shall not copy, revise, amend, create a derivative work, provide to any third party, or in any way commercially exploit any UBS research provided via Global Research or otherwise, and that you shall not extract data from any research or estimates provided to you via Global Research or otherwise, without the prior written consent of UBS.

This document is for distribution only as may be permitted by law. It is not directed to, or intended for distribution to or use by, any person or entity who is a citizen or resident of or located in any locality, state, country or other jurisdiction where such distribution, publication, availability or use would be contrary to law or regulation or would subject UBS to any registration or licensing requirement within such jurisdiction.

This document is a general communication and is educational in nature; it is not an advertisement nor is it a solicitation or an offer to buy or sell any financial instruments or to participate in any particular trading strategy. Nothing in this document constitutes a representation that any investment strategy or recommendation is suitable or appropriate to an investor's individual circumstances or otherwise constitutes a personal recommendation. By providing this document, none of UBS or its representatives has any responsibility or authority to provide or have provided investment advice in a fiduciary capacity or otherwise. Investments involve risks, and investors should exercise prudence and their own judgment in making their investment decisions. None of UBS or its representatives is suggesting that the recipient or any other person take a specific course of action or any action at all. By receiving this document, the recipient acknowledges and agrees with the intended purpose described above and further disclaims any expectation or belief that the information constitutes investment advice to the recipient or otherwise purports to meet the investment objectives of the recipient. The financial instruments described in the document may not be eligible for sale in all jurisdictions or to certain categories of investors.

Options, structured derivative products and futures (including OTC derivatives) are not suitable for all investors. Trading in these instruments is considered risky and may be appropriate only for sophisticated investors. Prior to buying or selling an option, and for the complete risks relating to options, you must receive a copy of "The Characteristics and Risks of Standardized Options." You may read the document at <http://www.theocc.com/publications/risks/riskchap1.jsp> or ask your salesperson for a copy. Various theoretical explanations of the risks associated with these instruments have been published. Supporting documentation for any claims, comparisons, recommendations, statistics or other technical data will be supplied upon request. Past performance is not necessarily indicative of future results. Transaction costs may be significant in option strategies calling for multiple purchases and sales of options, such as spreads and straddles. Because of the importance of tax considerations to many options transactions, the investor considering options should consult with his/her tax advisor as to how taxes affect the outcome of contemplated options transactions.

Mortgage and asset-backed securities may involve a high degree of risk and may be highly volatile in response to fluctuations in interest rates or other market conditions. Foreign currency rates of exchange may adversely affect the value, price or income of any security or related instrument referred to in the document. For investment advice, trade execution or other enquiries, clients should contact their local sales representative.

The value of any investment or income may go down as well as up, and investors may not get back the full (or any) amount invested. Past performance is not necessarily a guide to future performance. Neither UBS nor any of its directors, employees or agents accepts any liability for any loss (including investment loss) or damage arising out of the use of all or any of the Information.

Prior to making any investment or financial decisions, any recipient of this document or the information should take steps to understand the risk and return of the investment and seek individualized advice from his or her personal financial, legal, tax and other professional advisors that takes into account all the particular facts and circumstances of his or her investment objectives.

Any prices stated in this document are for information purposes only and do not represent valuations for individual securities or other financial instruments. There is no representation that any transaction can or could have been effected at those prices, and any prices do not necessarily reflect UBS's internal books and records or theoretical model-based valuations and may be based on certain assumptions. Different assumptions by UBS or any other source may yield substantially different results.

No representation or warranty, either expressed or implied, is provided in relation to the accuracy, completeness or reliability of the information contained in any materials to which this document relates (the "Information"), except with respect to Information concerning UBS. The Information is not intended to be a complete statement or summary of the securities, markets or developments referred to in the document. UBS does not undertake to update or keep current the Information. Any opinions expressed in this document may change without notice and may differ or be contrary to opinions expressed by other business areas or groups, personnel or other representative of UBS. Any statements contained in this report attributed to a third party represent UBS's interpretation of the data, information and/or opinions provided by that third party either publicly or through a subscription service, and such use and interpretation have not been reviewed by the third party. In no circumstances may this document or any of the Information (including any forecast, value, index or other calculated amount ("Values")) be used for any of the following purposes:

- (i) valuation or accounting purposes;
- (ii) to determine the amounts due or payable, the price or the value of any financial instrument or financial contract; or
- (iii) to measure the performance of any financial instrument including, without limitation, for the purpose of tracking the return or performance of any Value or of defining the asset allocation of portfolio or of computing performance fees.

By receiving this document and the Information you will be deemed to represent and warrant to UBS that you will not use this document or any of the Information for any of the above purposes or otherwise rely upon this document or any of the Information.

UBS has policies and procedures, which include, without limitation, independence policies and permanent information barriers, that are intended, and upon which UBS relies, to manage potential conflicts of interest and control the flow of information within divisions of UBS and among its subsidiaries, branches and affiliates. For further information on the ways in which UBS manages conflicts and maintains independence of its research products, historical performance information and certain additional disclosures concerning UBS research recommendations, please visit www.ubs.com/disclosures.

Research will initiate, update and cease coverage solely at the discretion of UBS Research Management, which will also have sole discretion on the timing and frequency of any published research product. The analysis contained in this document is based on numerous assumptions. All material information in relation to published research reports, such as valuation methodology, risk statements, underlying assumptions (including sensitivity analysis of those assumptions), ratings history etc. as required by the Market Abuse Regulation, can be found on UBS Neo. Different assumptions could result in materially different results.

The analyst(s) responsible for the preparation of this document may interact with trading desk personnel, sales personnel and other parties for the purpose of gathering, applying and interpreting market information. UBS relies on information barriers to control the flow of information contained in one or more areas within UBS into other areas, units, groups or affiliates of UBS. The compensation of the analyst who prepared this document is determined exclusively by research management and senior management (not including investment banking). Analyst compensation is not based on investment banking revenues; however, compensation may relate to the revenues of UBS and/or its divisions as a whole, of which investment banking, sales and trading are a part, and UBS's subsidiaries, branches and affiliates as a whole.

For financial instruments admitted to trading on an EU regulated market: UBS AG, its affiliates or subsidiaries (excluding UBS Securities LLC) acts as a market maker or liquidity provider (in accordance with the interpretation of these terms under English law or, if not carried out by UBS in the UK, the law of the relevant jurisdiction in which UBS determines it carries out the activity) in the financial instruments of the issuer save that where the activity of liquidity provider is carried out in accordance with the definition given to it by the laws and regulations of any other EU jurisdictions, such information is separately disclosed in this document. For financial instruments admitted to trading on a non-EU regulated market: UBS may act as a market maker save that where this activity is carried out in the US in accordance with the definition given to it by the relevant laws and regulations, such activity will be specifically disclosed in this document. UBS may have issued a warrant the value of which is based on one or more of the financial instruments referred to in the document. UBS and its affiliates and employees may have long or short positions, trade as principal and buy and sell in instruments or derivatives identified herein; such transactions or positions may be inconsistent with the opinions expressed in this document.

Within the past 12 months UBS AG, its affiliates or subsidiaries may have received or provided investment services and activities or ancillary services as per MiFID II which may have given rise to a payment or promise of a payment in relation to these services from or to this company.

Where Global Research refers to "UBS Evidence Lab Inside" or has made use of data provided by UBS Evidence Lab you understand that UBS Evidence Lab is a separate department to Global Research and that UBS Evidence Lab does not provide research, investment recommendations or advice.

United Kingdom: This material is distributed by UBS AG, London Branch to persons who are eligible counterparties or professional clients. UBS AG, London Branch is authorised by the Prudential Regulation Authority and subject to regulation by the Financial Conduct Authority and limited regulation by the Prudential Regulation Authority. **Europe:** Except as otherwise specified herein, these materials are distributed by UBS Europe SE, a subsidiary of UBS AG, to persons who are eligible counterparties or professional clients (as detailed in the Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin) Rules and according to MiFID) and are only available to such persons. The information does not apply to, and should not be relied upon by, retail clients. UBS Europe SE is authorised by the [European Central Bank (ECB)] and regulated by the BaFin and the ECB. **France:** Prepared by UBS Europe SE and distributed by UBS Europe SE and UBS Securities France S.A. UBS Securities France S.A. is regulated by the ACPR (Autorité de Contrôle Prudentiel et de Résolution) and the Autorité des Marchés Financiers (AMF). Where an analyst of UBS Securities France S.A. has contributed to this document, the document is also deemed to have been prepared by UBS Securities France S.A. **Germany:** Where an analyst of UBS Europe SE has contributed to this document, the document is also deemed to have been prepared by UBS Europe SE. In all cases it is distributed by UBS Europe SE and UBS AG, London Branch. **Luxembourg, the Netherlands, Belgium and Ireland:** Where an analyst of UBS Europe SE has contributed to this document, the document is also deemed to have been prepared by UBS Europe SE. In all cases it is distributed by UBS Europe SE and UBS AG, London Branch. **Spain:** Prepared by UBS Europe SE and distributed by UBS Europe SE and UBS Securities España SV, SA. UBS Securities España SV, SA is regulated by the Comisión Nacional del Mercado de Valores (CNMV).

Turkey: Distributed by UBS AG, London Branch. No information in this document is provided for the purpose of offering, marketing and sale by any means of any capital market instruments and services in the Republic of Turkey. Therefore, this document may not be considered as an offer made or to be made to residents of the Republic of Turkey. UBS AG, London Branch is not licensed by the Turkish Capital Market Board under the provisions of the Capital Market Law (Law No. 6362). Accordingly, neither this document nor any other offering material related to the instruments/services may be utilized in connection with providing any capital market services to persons within the Republic of Turkey without the prior approval of the Capital Market Board. However, according to article 15 (d) (ii) of the Decree No. 32, there is no restriction on the purchase or sale of the securities abroad by residents of the Republic of Turkey. **Poland:** Distributed by UBS Europe SE (spółka z ograniczoną odpowiedzialnością) Oddział w Polsce regulated by the Polish Financial Supervision Authority. Where an analyst of UBS Europe SE (spółka z ograniczoną odpowiedzialnością) Oddział w Polsce has contributed to this document, the document is also deemed to have been prepared by UBS Europe SE (spółka z ograniczoną odpowiedzialnością) Oddział w Polsce. **Russia:** Prepared and distributed by UBS Bank (OOO). Should not be construed as an individual Investment Recommendation for the purpose of the Russian Law – Federal Law #39-FZ ON THE SECURITIES MARKET Articles 6.1-6.2. **Switzerland:** Distributed by UBS AG to persons who are institutional investors only. UBS AG is regulated by the Swiss Financial Market Supervisory Authority (FINMA). **Italy:** Prepared by UBS Europe SE and distributed by UBS Europe SE and UBS Europe SE, Italy Branch. Where an analyst of UBS Europe SE, Italy Branch has contributed to this document, the document is also deemed to have been prepared by UBS Europe SE, Italy Branch. **South Africa:** Distributed by UBS South Africa (Pty) Limited (Registration No. 1995/011140/07), an authorised user of the JSE and an authorised Financial Services Provider (FSP 7328). **Saudi Arabia:** This document has been issued by UBS AG (and/or any of its subsidiaries, branches or affiliates), a public company limited by shares, incorporated in Switzerland with its registered offices at Aeschenvorstadt 1, CH-4051 Basel and Bahnhofstrasse 45, CH-8001 Zurich. This publication has been approved by UBS Saudi Arabia (a subsidiary of UBS AG), a Saudi closed joint stock company incorporated in the Kingdom of Saudi Arabia under commercial register number 1010257812 having its registered office at Tatweer Towers, P.O. Box 75724, Riyadh 11588, Kingdom of Saudi Arabia. UBS Saudi Arabia is authorized and regulated by the Capital Market Authority to conduct securities business under license number 08113-37. **UAE / Dubai:** The information distributed by UBS AG Dubai Branch is only intended for Professional Clients and/or Market Counterparties, as classified under the DFSA rulebook. No other person should act upon this material/communication. The information is not for further distribution within the United Arab Emirates. UBS AG Dubai Branch is regulated by the DFSA in the DIFC. UBS is not licensed to provide banking services in the UAE by the Central Bank of the UAE, nor is it licensed by the UAE Securities and Commodities Authority. **United States:** Distributed to US persons by either UBS Securities LLC or by UBS Financial Services Inc., subsidiaries of UBS AG; or by a group, subsidiary or affiliate of UBS AG that is not registered as a US broker-dealer (a '**non-US affiliate**') to major US institutional investors only. UBS Securities LLC or UBS Financial Services Inc. accepts responsibility for the content of a report prepared by another non-US affiliate when distributed to US persons by UBS Securities LLC or UBS Financial Services Inc. All transactions by a US person in the securities mentioned in this report must be effected through UBS Securities LLC or UBS Financial Services Inc., and not through a non-US affiliate. UBS Securities LLC is not acting as a municipal advisor to any municipal entity or obligated person within the meaning of Section 15B of the Securities Exchange Act (the "Municipal Advisor Rule"), and the opinions or views contained herein are not intended to be, and do not constitute, advice within the meaning of the Municipal Advisor Rule. **Canada:** Distributed by UBS Securities Canada Inc., a registered investment dealer in Canada and a Member-Canadian Investor Protection Fund, or by another affiliate of UBS AG that is registered to conduct business in Canada or is otherwise exempt from registration. **Brazil:** Except as otherwise specified herein, this material is prepared by UBS Brasil CCTVM S.A. to persons who are eligible investors residing in Brazil, which are considered to be Investidores Profissionais, as designated by the applicable regulation, mainly the CVM Instruction No. 539 from the 13th of November 2013 (determines the duty to verify the suitability of products, services and transactions with regards to the client's profile). **Hong Kong:** Distributed by UBS Securities Asia Limited and/or UBS AG, Hong Kong Branch, which is incorporated in Switzerland with limited liability. Please contact local licensed/registered representatives of UBS Securities Asia Limited and/or UBS AG, Hong Kong Branch in respect of any matters arising from, or in connection with, the analysis or document. **Singapore:** Distributed by UBS Securities Pte. Ltd. [MCI (P) 079/08/2019 and Co. Reg. No.: 198500648C] or UBS AG, Singapore Branch. Please contact UBS Securities Pte. Ltd., an exempt financial adviser under the Singapore Financial Advisers Act (Cap. 110); or UBS AG, Singapore Branch, an exempt financial adviser under the Singapore Financial Advisers Act (Cap. 110) and a wholesale bank licensed under the Singapore Banking Act (Cap. 19) regulated by the Monetary Authority of Singapore, in respect of any matters arising from, or in connection with, the analysis or document. The recipients of this document represent and warrant that they are accredited and institutional investors as defined in the Securities and Futures Act (Cap. 289). **Japan:** Distributed by UBS Securities Japan Co., Ltd. to professional investors (except as otherwise permitted). Where this report has been prepared by UBS Securities Japan Co., Ltd., UBS Securities Japan Co., Ltd. is the author, publisher and distributor of the report. Distributed by UBS AG, Tokyo Branch to Professional Investors (except as otherwise permitted) in relation to foreign exchange and other banking businesses when relevant. **Australia:** Clients of UBS AG: Distributed by UBS AG (ABN 47 088 129 613 and holder of Australian Financial Services License No. 231087). Clients of UBS Securities Australia Ltd: Distributed by UBS Securities Australia Ltd (ABN 62 008 586 481 and holder of Australian Financial Services License No. 231098). This Document contains general information and/or general advice only and does not constitute personal financial product advice. As such, the information in this document has been prepared without taking into account any investor's objectives, financial situation or needs, and investors should, before acting on the Information, consider the appropriateness of the Information, having regard to their objectives, financial situation and needs. If the information contained in this document relates to the acquisition, or potential acquisition of a particular financial product by a 'Retail' client as defined by section 761G of the Corporations Act 2001 where a Product Disclosure Statement would be required, the retail client should obtain and consider the Product Disclosure Statement relating to the product before making any decision about whether to acquire the product. The UBS Securities Australia Limited Financial Services Guide is available at: www.ubs.com/ecs-research-fsg. **New Zealand:** Distributed by UBS New Zealand Ltd. UBS New Zealand Ltd is not a registered bank in New Zealand. You are being provided with this UBS publication or material because you have indicated to UBS that you are a "wholesale client" within the meaning of section 5C of the Financial Advisers Act 2008 of New Zealand (Permitted Client). This publication or material is not intended for clients who are not Permitted Clients (non-permitted Clients). If you are a non-permitted Client you must not rely on this publication or material. If despite this

warning you nevertheless rely on this publication or material, you hereby (i) acknowledge that you may not rely on the content of this publication or material and that any recommendations or opinions in such this publication or material are not made or provided to you, and (ii) to the maximum extent permitted by law (a) indemnify UBS and its associates or related entities (and their respective Directors, officers, agents and Advisors) (each a 'Relevant Person') for any loss, damage, liability or claim any of them may incur or suffer as a result of, or in connection with, your unauthorised reliance on this publication or material and (b) waive any rights or remedies you may have against any Relevant Person for (or in respect of) any loss, damage, liability or claim you may incur or suffer as a result of, or in connection with, your unauthorised reliance on this publication or material. **Korea:** Distributed in Korea by UBS Securities Pte. Ltd., Seoul Branch. This report may have been edited or contributed to from time to time by affiliates of UBS Securities Pte. Ltd., Seoul Branch. This material is intended for professional/institutional clients only and not for distribution to any retail clients. **Malaysia:** This material is authorized to be distributed in Malaysia by UBS Securities Malaysia Sdn. Bhd (Capital Markets Services License No.: CMSL/A0063/2007). This material is intended for professional/institutional clients only and not for distribution to any retail clients. **India:** Distributed by UBS Securities India Private Ltd. (Corporate Identity Number U67120MH1996PTC097299) 2/F, 2 North Avenue, Maker Maxity, Bandra Kurla Complex, Bandra (East), Mumbai (India) 400051. Phone: +912261556000. It provides brokerage services bearing SEBI Registration Number: INZ000259830; merchant banking services bearing SEBI Registration Number: INM000010809 and Research Analyst services bearing SEBI Registration Number: INH000001204. UBS AG, its affiliates or subsidiaries may have debt holdings or positions in the subject Indian company/companies. Within the past 12 months, UBS AG, its affiliates or subsidiaries may have received compensation for non-investment banking securities-related services and/or non-securities services from the subject Indian company/companies. The subject company/companies may have been a client/clients of UBS AG, its affiliates or subsidiaries during the 12 months preceding the date of distribution of the research report with respect to investment banking and/or non-investment banking securities-related services and/or non-securities services. With regard to information on associates, please refer to the Annual Report at: http://www.ubs.com/global/en/about_ubs/investor_relations/annualreporting.html **Taiwan:** Except as otherwise specified herein, this material may not be distributed in Taiwan. Information and material on securities/instruments that are traded in a Taiwan organized exchange is deemed to be issued and distributed by UBS Securities Pte. LTD., Taipei Branch, which is licensed and regulated by Taiwan Financial Supervisory Commission. Save for securities/instruments that are traded in a Taiwan organized exchange, this material should not constitute "recommendation" to clients or recipients in Taiwan for the covered companies or any companies mentioned in this document. No portion of the document may be reproduced or quoted by the press or any other person without authorisation from UBS. **Indonesia:** This report is being distributed by PT UBS Sekuritas Indonesia and is delivered by its licensed employee(s), including marketing/sales person, to its client. PT UBS Sekuritas Indonesia, having its registered office at Wisma GKBL, 22nd floor, JL. Jend. Sudirman, kav.28, Jakarta 10210, Indonesia, is a subsidiary company of UBS AG and licensed under Capital Market Law no. 8 year 1995, a holder of broker-dealer and underwriter licenses issued by the Capital Market and Financial Institution Supervisory Agency (now Otoritas Jasa Keuangan/OJK). PT UBS Sekuritas Indonesia is also a member of Indonesia Stock Exchange and supervised by Otoritas Jasa Keuangan (OJK). Neither this report nor any copy hereof may be distributed in Indonesia or to any Indonesian citizens except in compliance with applicable Indonesian capital market laws and regulations. This report is not an offer of securities in Indonesia and may not be distributed within the territory of the Republic of Indonesia or to Indonesian citizens in circumstance which constitutes an offering within the meaning of Indonesian capital market laws and regulations.

The disclosures contained in research documents produced by UBS AG, London Branch or UBS Europe SE shall be governed by and construed in accordance with English law.

UBS specifically prohibits the redistribution of this document in whole or in part without the written permission of UBS and in any event UBS accepts no liability whatsoever for any redistribution of this document or its contents or the actions of third parties in this respect. Images may depict objects or elements that are protected by third party copyright, trademarks and other intellectual property rights. © UBS 2020. The key symbol and UBS are among the registered and unregistered trademarks of UBS. All rights reserved.

Global Wealth Management Disclaimer

You receive this document in your capacity as a client of UBS Global Wealth Management. This publication has been distributed to you by UBS Switzerland AG (regulated by FINMA in Switzerland) or its affiliates ("UBS") with whom you have a banking relationship with. The full name of the distributing affiliate and its competent authority can be found in the country-specific disclaimer at the end of this document.

The date and time of the first dissemination of this publication is the same as the date and time of its publication.

Risk information:

You agree that you shall not copy, revise, amend, create a derivative work, provide to any third party, or in any way commercially exploit any UBS research, and that you shall not extract data from any research or estimates, without the prior written consent of UBS.

This document is for distribution only as may be permitted by law. It is not directed to, or intended for distribution to or use by, any person or entity who is a citizen or resident of or located in any locality, state, country or other jurisdiction where such distribution, publication, availability or use would be contrary to law or regulation or would subject UBS to any registration or licensing requirement within such jurisdiction.

This document is a general communication and is educational in nature; it is not an advertisement nor is it a solicitation or an offer to buy or sell any financial instruments or to participate in any particular trading strategy. Nothing in this document constitutes a representation that any investment strategy or recommendation is suitable or appropriate to an investor's individual circumstances or otherwise constitutes a personal recommendation. By providing this document, none of UBS or its representatives has any responsibility or authority to provide or have provided investment advice in a fiduciary capacity or otherwise. Investments involve risks, and investors should exercise prudence and their own judgment in making their investment decisions. None of UBS or its representatives is suggesting that the recipient or any other person take a specific course of action or any action at all. By receiving this document, the recipient acknowledges and agrees with the intended purpose described above and further disclaims any expectation or belief that the information constitutes investment advice to the recipient or otherwise purports to meet the investment objectives of the recipient. The financial instruments described in the document may not be eligible for sale in all jurisdictions or to certain categories of investors.

Options, derivative products and futures are not suitable for all investors, and trading in these instruments is considered risky. Mortgage and asset-backed securities may involve a high degree of risk and may be highly volatile in response to fluctuations in interest rates or other market conditions. Foreign currency rates of exchange may adversely affect the value, price or income of any security or related instrument referred to in the document. For investment advice, trade execution or other enquiries, clients should contact their local sales representative.

The value of any investment or income may go down as well as up, and investors may not get back the full (or any) amount invested. Past performance is not necessarily a guide to future performance. Neither UBS nor any of its directors, employees or agents accepts any liability for any loss (including investment loss) or damage arising out of the use of all or any of the information (as defined below).

Prior to making any investment or financial decisions, any recipient of this document or the information should take steps to understand the risk and return of the investment and seek individualized advice from his or her personal financial, legal, tax and other professional advisors that takes into account all the particular facts and circumstances of his or her investment objectives.

Any prices stated in this document are for information purposes only and do not represent valuations for individual securities or other financial instruments. There is no representation that any transaction can or could have been effected at those prices, and any prices do not necessarily reflect UBS's internal books and records or theoretical model-based valuations and may be based on certain assumptions. Different assumptions by UBS or any other source may yield substantially different results.

No representation or warranty, either expressed or implied, is provided in relation to the accuracy, completeness or reliability of the information contained in any materials to which this document relates (the "Information"), except with respect to Information concerning UBS. The Information is not intended to be a complete statement or summary of the securities, markets or developments referred to in the document. UBS does not undertake to update or keep current the Information. Any opinions expressed in this document may change without notice and may differ or be contrary to opinions expressed by other business areas or groups, personnel or other representative of UBS. Any statements contained in this report attributed to a third party represent UBS's interpretation of the data, information and/or opinions provided by that third party either publicly or through a subscription service, and such use and interpretation have not been reviewed by the third party. In no circumstances may this document or any of the Information (including any forecast, value, index or other calculated amount ("Values")) be used for any of the following purposes:

- (i) valuation or accounting purposes;
- (ii) to determine the amounts due or payable, the price or the value of any financial instrument or financial contract; or
- (iii) to measure the performance of any financial instrument including, without limitation, for the purpose of tracking the return or performance of any Value or of defining the asset allocation of portfolio or of computing performance fees.

By receiving this document and the Information you will be deemed to represent and warrant to UBS that you will not use this document or any of the Information for any of the above purposes or otherwise rely upon this document or any of the Information.

UBS has policies and procedures, which include, without limitation, independence policies and permanent information barriers, that are intended, and upon which UBS relies, to manage potential conflicts of interest and control the flow of information within divisions of UBS (including between Global Wealth Management and Research) and among its subsidiaries, branches and affiliates. For further information on the ways in which UBS manages conflicts and maintains independence of its research products, historical performance information and certain additional disclosures concerning UBS research recommendations, please visit www.ubs.com/disclosures.

Research will initiate, update and cease coverage solely at the discretion of research management, which will also have sole discretion on the timing and frequency of any published research product. The analysis contained in this document is based on numerous assumptions. Different assumptions could result in materially different results.

The analyst(s) responsible for the preparation of this document may interact with trading desk personnel, sales personnel and other parties for the purpose of gathering, applying and interpreting market information. UBS relies on information barriers to control the flow of information contained in one or more areas within UBS into other areas, units, groups or affiliates of UBS. The compensation of the analyst who prepared this document is determined exclusively by research management and senior management (not including investment banking). Analyst compensation is not based on investment banking revenues; however, compensation may relate to the revenues of UBS and/or its divisions as a whole, of which investment banking, sales and trading are a part, and UBS's subsidiaries, branches and affiliates as a whole.

For financial instruments admitted to trading on an EU regulated market: UBS AG, its affiliates or subsidiaries (excluding UBS Securities LLC) acts as a market maker or liquidity provider (in accordance with the interpretation of these terms in the UK) in the financial instruments of the issuer save that where the activity of liquidity provider is carried out in accordance with the definition given to it by the laws and regulations of any other EU jurisdictions, such information is separately disclosed in this document. For financial instruments admitted to trading on a non-EU regulated market: UBS may act as a market maker save that where this activity is carried out in the US in accordance with the definition given to it by the relevant laws and regulations, such activity will be specifically disclosed in this document. UBS may have issued a warrant the value of which is based on one or more of the financial instruments referred to in the document. UBS and its affiliates and employees may have long or short positions, trade as principal and buy and sell in instruments or derivatives identified herein; such transactions or positions may be inconsistent with the opinions expressed in this document.

Options and futures are not suitable for all investors, and trading in these instruments is considered risky and may be appropriate only for sophisticated investors. Prior to buying or selling an option, and for the complete risks relating to options, you must receive a copy of "Characteristics and Risks of Standardized Options". You may read the document at <https://www.theocc.com/about/publications/character-risks.jsp> or ask your financial advisor for a copy.

Investing in structured investments involves significant risks. For a detailed discussion of the risks involved in investing in any particular structured investment, you must read the relevant offering materials for that investment. Structured investments are unsecured obligations of a particular issuer with returns linked to the performance of an underlying asset. Depending on the terms of the investment, investors could lose all or a substantial portion of their investment based on the performance of the underlying asset. Investors could also lose their entire investment if the issuer becomes insolvent. UBS Financial Services Inc. does not guarantee in any way the obligations or the financial condition of any issuer or the accuracy of any financial information provided by any issuer. Structured investments are not traditional investments and investing in a structured investment is not equivalent to investing directly in the underlying asset. Structured investments may have limited or no liquidity, and investors should be prepared to hold their investment to maturity. The return of structured investments may be limited by a maximum gain, participation rate or other feature. Structured investments may include call features and, if a structured investment is called early, investors would not earn any further return and may not be able to reinvest in similar investments with similar terms. Structured investments include costs and fees which are generally embedded in the price of the investment. The tax treatment of a structured investment may be complex and may differ from a direct investment in the underlying asset. UBS Financial Services Inc. and its employees do not provide tax advice. Investors should consult their own tax advisor about their own tax situation before investing in any securities.

Within the past 12 months UBS Switzerland AG, its affiliates or subsidiaries may have received or provided investment services and activities or ancillary services as per MiFID II which may have given rise to a payment or promise of a payment in relation to these services from or to this company.

If you require detailed information on disclosures of interest or conflict of interest as required by Market Abuse Regulation please contact the mailbox MAR_disclosures_twopager@ubs.com. Please note that e-mail communication is unsecured.

External Asset Managers / External Financial Consultants: In case this research or publication is provided to an External Asset Manager or an External Financial Consultant, UBS expressly prohibits that it is redistributed by the External Asset Manager or the External Financial Consultant and is made available to their clients and/or third parties.

Distributed to US persons by UBS Financial Services Inc. or UBS Securities LLC, subsidiaries of UBS AG. UBS Switzerland AG, UBS Europe SE, UBS Bank, S.A., UBS Brasil Administradora de Valores Mobiliários Ltda, UBS Asesores Mexico, S.A. de C.V., UBS Securities Japan Co., Ltd, UBS Wealth Management Israel Ltd and UBS Menkul Degerler AS are affiliates of UBS AG. UBS Financial Services Incorporated of Puerto Rico is a subsidiary of UBS Financial Services Inc. **UBS Financial Services Inc. accepts responsibility for the content of a report prepared by a non-US affiliate when it distributes reports to US persons. All transactions by a US person in the securities mentioned in this report should be effected through a US-registered broker dealer affiliated with UBS, and not through a non-US affiliate. The contents of this report have not been and will not be approved by any securities or investment authority in the United States or elsewhere. UBS Financial Services Inc. is not acting as a municipal advisor to any municipal entity or obligated person within the meaning of Section 15B of the Securities Exchange Act (the "Municipal Advisor Rule") and the opinions or views contained herein are not intended to be, and do not constitute, advice within the meaning of the Municipal Advisor Rule.**

Austria: This publication is not intended to constitute a public offer under Austrian law. It is distributed only for information purposes to clients of UBS Europe SE, Niederlassung Österreich, with place of business at Wächtergasse 1, A-1010 Wien. UBS Europe SE, Niederlassung Österreich is subject to the joint supervision of the European Central Bank ("ECB"), the German Central Bank (Deutsche Bundesbank), the German Federal Financial Services Supervisory Authority (Bundesanstalt für Finanzdienstleistungsaufsicht), as well as of the Austrian Financial Market Authority (Finanzmarktaufsicht, FMA), to which this publication has not been submitted for approval. UBS Europe SE is a credit institution constituted under German law in the form of a Societas Europaea, duly authorized by the ECB. **Bahrain:** UBS is a Swiss bank not licensed, supervised or regulated in Bahrain by the Central Bank of Bahrain and does not undertake banking or investment business activities in Bahrain. Therefore, clients have no protection under local banking and investment services laws and regulations. **Canada:** The information contained herein is not, and under no circumstances is to be construed as, a prospectus, an advertisement, a public offering, an offer to sell securities described herein, solicitation of an offer to buy securities described herein, in Canada or any province or territory thereof. Any offer or sale of the securities described herein in Canada will be made only under an exemption from the requirements to file a prospectus with the relevant Canadian securities regulators and only by a dealer properly registered under applicable securities laws or, alternatively, pursuant to an exemption from the dealer registration requirement in the relevant province or territory of Canada in which such offer or sale is made. Under no circumstances is the information contained herein to be construed as investment advice in any province or territory of Canada and is not tailored to the needs of the recipient. To the extent that the information contained herein references securities of an issuer incorporated, formed or created under the laws of Canada or a province or territory of Canada, any trades in such securities must be conducted through a dealer registered in Canada or, alternatively, pursuant to a dealer registration exemption. No securities commission or similar regulatory authority in Canada has reviewed or in any way passed upon these materials, the information contained herein or the merits of the securities described herein and any representation to the contrary is an offence. In Canada, this publication is distributed by UBS Investment Management Canada Inc. **China:** This research report is neither intended to be distributed to PRC investors nor to provide securities investment consultancy services within the territory of PRC. **Czech Republic:** UBS is not a licensed bank in the Czech Republic and thus is not allowed to provide regulated banking or investment services in the Czech Republic. Please notify UBS if you do not wish to receive any further correspondence. **Denmark:** This publication is not intended to constitute a public offer under Danish law. It is distributed only for information purposes to clients of UBS Europe SE, Denmark Branch, filial af UBS Europe SE, with place of business at Sankt Annæ Plads 13, 1250 Copenhagen, Denmark, registered with the Danish Commerce and Companies Agency, under No. 38 17 24 33. UBS Europe SE, Denmark Branch, filial af UBS Europe SE is subject to the joint supervision of the European Central Bank ("ECB"), the German Central Bank (Deutsche Bundesbank), the German Federal Financial Services Supervisory Authority (Bundesanstalt für Finanzdienstleistungsaufsicht), as well as of the Danish Financial Supervisory Authority (Finanstilsynet), to which this publication has not been submitted for approval. UBS Europe SE is a credit institution constituted under German law in the form of a Societas Europaea, duly authorized by the ECB. **Egypt:** Securities or other investment products are not being offered or sold by UBS to the public in Egypt and they have not been and will not be registered with the Egyptian Financial Supervisory Authority. **France:** This publication is distributed by UBS (France) S.A, French "société anonyme" with share capital of € 132.975.556, 69, boulevard Haussmann F-75008 Paris, R.C.S. Paris B 421 255 670, to its clients and prospects. UBS (France) S.A. is a provider of investment services duly authorized according to the terms of the "Code Monétaire et Financier", regulated by French banking and financial authorities as the "Autorité de Contrôle Prudentiel et de Résolution." **Germany:** This publication is not intended to constitute a public offer under German law. It is distributed only for information purposes to clients of UBS Europe SE, Germany, with place of business at Bockenheimer Landstrasse 2-4, 60306 Frankfurt am Main. UBS Europe SE is a

credit institution constituted under German law in the form of a Societas Europaea, duly authorized by the European Central Bank ("ECB"), and supervised by the ECB, the German Central Bank (Deutsche Bundesbank) and the German Federal Financial Services Supervisory Authority (Bundesanstalt für Finanzdienstleistungsaufsicht), to which this publication has not been submitted for approval. **Greece:** UBS Switzerland AG and its affiliates (UBS) are not licensed as bank or financial institution under Greek legislation and do not provide banking and financial services in Greece. Consequently, UBS provides such services from branches outside of Greece, only. This document may not be considered as a public offering made or to be made to residents of Greece. **Hong Kong:** This publication is distributed to clients of UBS AG Hong Kong Branch by UBS AG Hong Kong Branch, a licensed bank under the Hong Kong Banking Ordinance and a registered institution under the Securities and Futures Ordinance. UBS AG Hong Kong Branch is incorporated in Switzerland with limited liability. **Indonesia, Malaysia, Philippines, Thailand:** This material was provided to you as a result of a request received by UBS from you and/or persons entitled to make the request on your behalf. Should you have received the material erroneously, UBS asks that you kindly destroy/delete it and inform UBS immediately. Any and all advice provided and/or trades executed by UBS pursuant to the material will only have been provided upon your specific request or executed upon your specific instructions, as the case may be, and may be deemed as such by UBS and you. The material may not have been reviewed, approved, disapproved or endorsed by any financial or regulatory authority in your jurisdiction. The relevant investments will be subject to restrictions and obligations on transfer as set forth in the material, and by receiving the material you undertake to comply fully with such restrictions and obligations. You should carefully study and ensure that you understand and exercise due care and discretion in considering your investment objective, risk appetite and personal circumstances against the risk of the investment. You are advised to seek independent professional advice in case of doubt. **India:** UBS Securities India Private Ltd. (Corporate Identity Number U67120MH1996PTC097299) 2/F, 2 North Avenue, Maker Maxity, Bandra Kurla Complex, Bandra (East), Mumbai (India) 400051. Phone: +912261556000. It provides brokerage services bearing SEBI Registration Number INZ000259830; merchant banking services bearing SEBI Registration Number: INM000010809 and Research Analyst services bearing SEBI Registration Number: INH000001204. UBS AG, its affiliates or subsidiaries may have debt holdings or positions in the subject Indian company/companies. Within the past 12 months, UBS AG, its affiliates or subsidiaries may have received compensation for non-investment banking securities-related services and/or non-securities services from the subject Indian company/companies. The subject company/companies may have been a client/clients of UBS AG, its affiliates or subsidiaries during the 12 months preceding the date of distribution of the research report with respect to investment banking and/or non-investment banking securities-related services and/or non-securities services. With regard to information on associates, please refer to the Annual Report at: http://www.ubs.com/global/en/about_ubs/investor_relations/annualreporting.html. **Israel:** UBS is a premier global financial firm offering wealth management, asset management and investment banking services from its headquarters in Switzerland and its operations in over 50 countries worldwide to individual, corporate and institutional investors. In Israel, UBS Switzerland AG is registered as Foreign Dealer in cooperation with UBS Wealth Management Israel Ltd., a wholly owned UBS subsidiary. UBS Wealth Management Israel Ltd. is a Portfolio Manager licensee which engages also in Investment Marketing and is regulated by the Israel Securities Authority. This publication is intended for information only and is not intended as an offer to buy or solicitation of an offer. Furthermore, this publication is not intended as an investment advice and/or investment marketing and is not replacing any investment advice and/or investment marketing provided by the relevant licensee which is adjusted to each person needs. No action has been, or will be, taken in Israel that would permit an offering of the product(s) mentioned in this document or a distribution of this document to the public in Israel. In particular, this document has not been reviewed or approved by the Israeli Securities Authority. The product(s) mentioned in this document is/are being offered to a limited number of sophisticated investors who qualify as one of the investors listed in the first supplement to the Israeli Securities Law, 5728-1968. This document may not be reproduced or used for any other purpose, nor be furnished to any other person other than those to whom copies have been sent. Anyone who purchases the product(s) mentioned herein shall do so for its own benefit and for its own account and not with the aim or intention of distributing or offering the product(s) to other parties. Anyone who purchases the product(s) shall do so in accordance with its own understanding and discretion and after it has received any relevant financial, legal, business, tax or other advice or opinion required by it in connection with such purchase(s). The word "advice" and/or any of its derivatives shall be read and construed in conjunction with the definition of the term "investment marketing" as defined under the Israeli Regulation of Investment Advice, Investment Marketing and Portfolio Management Law, 1995. **Italy:** This publication is not intended to constitute a public offer under Italian law. It is distributed only for information purposes to clients of UBS Europe SE, Succursale Italia, with place of business at Via del Vecchio Politecnico, 3-20121 Milano. UBS Europe SE, Succursale Italia is subject to the joint supervision of the European Central Bank ("ECB"), the German Central Bank (Deutsche Bundesbank), the German Federal Financial Services Supervisory Authority (Bundesanstalt für Finanzdienstleistungsaufsicht), as well as of the Bank of Italy (Banca d'Italia) and the Italian Financial Markets Supervisory Authority (CONSOB - Commissione Nazionale per le Società e la Borsa), to which this publication has not been submitted for approval. UBS Europe SE is a credit institution constituted under German law in the form of a Societas Europaea, duly authorized by the ECB. **Jersey:** UBS AG, Jersey Branch, is regulated and authorized by the Jersey Financial Services Commission for the conduct of banking, funds and investment business. Where services are provided from outside Jersey, they will not be covered by the Jersey regulatory regime. UBS AG, Jersey Branch is a branch of UBS AG a public company limited by shares, incorporated in Switzerland whose registered offices are at Aeschenvorstadt 1, CH-4051 Basel and Bahnhofstrasse 45, CH 8001 Zurich. UBS AG, Jersey Branch's principal place business is 1, IFC Jersey, St Helier, Jersey, JE2 3BX. **Luxembourg:** This publication is not intended to constitute a public offer under Luxembourg law. It is distributed only for information purposes to clients of UBS Europe SE, Luxembourg Branch, with place of business at 33A, Avenue J. F. Kennedy, L-1855 Luxembourg. UBS Europe SE, Luxembourg Branch is subject to the joint supervision of the European Central Bank ("ECB"), the German Central bank (Deutsche Bundesbank), the German Federal Financial Services Supervisory Authority (Bundesanstalt für Finanzdienstleistungsaufsicht), as well as of the Luxembourg supervisory authority (Commission de Surveillance du Secteur Financier), to which this publication has not been submitted for approval. UBS Europe SE is a credit institution constituted under German law in the form of a Societas Europaea, duly authorized by the ECB. **Mexico:** This information is distributed by UBS Asesores México, S.A. de C.V. ("UBS Asesores"), an affiliate of UBS Switzerland AG, incorporated as a non-independent investment advisor under the Securities Market Law due to the relation with a Foreign Bank. UBS Asesores is a regulated entity and it is subject to the supervision of the Mexican Banking and Securities Commission ("CNBV"), which exclusively regulates UBS Asesores regarding the rendering of portfolio management, as well as on securities investment advisory services, analysis and issuance of individual investment recommendations, so that the CNBV has no surveillance faculties nor may have over any other service provided by UBS Asesores. UBS Asesores is registered before CNBV under Registry number 30060. You are being provided with this UBS publication or material because you have indicated to UBS Asesores that you are a Sophisticated Qualified Investor located in Mexico. The compensation of the analyst(s) who prepared this report is determined exclusively by research management and senior management of any entity of UBS Group to which such analyst(s) render services. **Nigeria:** UBS Switzerland AG and its affiliates (UBS) are not licensed, supervised or regulated in Nigeria by the Central Bank of Nigeria or the Nigerian Securities and Exchange Commission (SEC) and do not undertake banking or investment business activities in Nigeria. The investment products mentioned in this material are not being offered or sold by UBS to the public in Nigeria and they have not been submitted for approval nor registered with the Nigerian SEC. If you are interested in products of this nature, please let us know and we will direct you to someone who can advise you. The investment products mentioned in this material are not being directed to, and are not being made available for subscription by any persons within Nigeria other than the selected investors to whom the offer materials have been addressed as a private sale or domestic concern within the exemption and meaning of Section 69(2) of the Investments and Securities Act, 2007 (ISA). **Poland:** UBS is a premier global financial services firm offering wealth management services to individual, corporate and institutional investors. UBS is established in Switzerland and operates under Swiss law and in over 50 countries and from all major financial centres. UBS Switzerland AG is not licensed as a bank or as an investment firm under Polish legislation and is not permitted to provide banking and financial services in Poland. **Portugal:** UBS Switzerland AG is not licensed to conduct banking and financial activities in Portugal nor is UBS Switzerland AG supervised by the Portuguese regulators (Bank of Portugal "Banco de Portugal" and Portuguese Securities Exchange Commission "Comissão do Mercado de Valores Mobiliários"). **Russia:** This document or information contained therein is for information purposes only and constitute neither a public nor a private offering, is not an invitation to make offers, to sell, exchange or otherwise transfer any financial instruments in the Russian Federation to or for the benefit of any Russian person or entity and does not constitute an advertisement or offering of securities in the Russian Federation within the meaning of Russian securities laws. **Singapore:** This material was provided to you as a result of a request received by UBS from you and/or persons entitled to make the request on your behalf. Should you have received the material erroneously, UBS asks that you kindly destroy/delete it and inform UBS immediately. Clients of UBS AG Singapore branch are asked to please contact UBS AG Singapore branch, an exempt financial adviser under the Singapore Financial Advisers Act (Cap. 110) and a wholesale bank licensed under the Singapore Banking Act (Cap. 19) regulated by the Monetary Authority of Singapore, in respect of any matters arising from, or in connection with, the analysis or report. **Spain:** This publication is not intended to constitute a public offer under Spanish law. It is distributed only for information purposes to clients of UBS Europe SE, Sucursal en España, with place of business at Calle María de Molina 4, C.P. 28006, Madrid. UBS Europe SE, Sucursal en España is subject to the joint supervision of the European Central Bank ("ECB"), the German Central bank (Deutsche Bundesbank), the German Federal Financial Services Supervisory Authority (Bundesanstalt für Finanzdienstleistungsaufsicht), as well as of the Spanish supervisory authority (Banco de España), to which this publication has not been submitted for approval. Additionally it is authorized to provide investment services on securities and financial instruments, regarding which it is supervised by the Comisión Nacional del Mercado de Valores as well. UBS Europe SE, Sucursal en España is a branch of UBS Europe SE, a credit institution constituted under German law in the form of a Societas Europaea, duly authorized by the ECB. **Sweden:** This publication is not intended to constitute a public offer under Swedish law. It is distributed only for information purposes to clients of UBS Europe SE, Sweden Bankfilial, with place of business at Regeringsgatan 38, 11115 Stockholm, Sweden, registered with the Swedish Companies Registration Office under Reg. No 516406-1011. UBS Europe SE, Sweden Bankfilial is subject to the joint supervision of the European Central Bank ("ECB"), the German Central bank (Deutsche Bundesbank), the German Federal Financial Services Supervisory Authority (Bundesanstalt für Finanzdienstleistungsaufsicht), as well as of the Swedish supervisory authority (Finansinspektionen), to which this publication has not been submitted for approval. UBS Europe SE is a credit institution constituted under German law in the form of a Societas Europaea, duly authorized by the ECB. **Taiwan:** This material is provided by UBS AG, Taipei Branch in accordance with laws of Taiwan, in agreement with or at the request of clients/prospects. **Turkey:** No information in this document is provided for the purpose of offering, marketing and sale by any means of any capital market instruments and services in the Republic of Turkey. Therefore, this document may not be

considered as an offer made or to be made to residents of the Republic of Turkey in the Republic of Turkey. UBS Switzerland AG is not licensed by the Turkish Capital Market Board (the CMB) under the provisions of the Capital Market Law (Law No. 6362). Accordingly neither this document nor any other offering material related to the instruments/services may be utilized in connection with providing any capital market services to persons within the Republic of Turkey without the prior approval of the CMB. However, according to article 15 (d) (ii) of the Decree No. 32 there is no restriction on the purchase or sale of the instruments by residents of the Republic of Turkey. **UAE:** UBS is not licensed in the UAE by the Central Bank of UAE or by the Securities & Commodities Authority. The UBS AG Dubai Branch is licensed in the DIFC by the Dubai Financial Services Authority as an authorised firm. **United Kingdom:** This document is issued by UBS Wealth Management, a division of UBS AG which is authorised and regulated by the Financial Market Supervisory Authority in Switzerland. In the United Kingdom, UBS AG is authorised by the Prudential Regulation Authority and is subject to regulation by the Financial Conduct Authority and limited regulation by the Prudential Regulation Authority. Details about the extent of regulation by the Prudential Regulation Authority are available from us on request. A member of the London Stock Exchange. This publication is distributed to retail clients of UBS Wealth Management. **Ukraine:** UBS is not registered and licensed as a bank/financial institution under Ukrainian legislation and does not provide banking and other financial services in Ukraine. UBS has not made and will not make any offer of the mentioned products to the public in Ukraine. No action has been taken to authorize an offer of the mentioned products to the public in Ukraine and the distribution of this document shall not constitute financial services for the purposes of the Law of Ukraine "On Financial Services and State Regulation of Financial Services Markets" dated 12 July 2001. Accordingly, nothing in this document or any other document, information or communication related to the mentioned products shall be interpreted as containing an offer or invitation to offer, or solicitation of securities in the territory of Ukraine. Electronic communication must not be considered as an offer to enter into an electronic agreement or electronic instrument within the meaning of the Law of Ukraine "On Electronic Commerce" dated 3 September 2015.

This document is strictly for private use by its holder and may not be passed on to third parties or otherwise publicly distributed.

© UBS 2020. The key symbol and UBS are among the registered and unregistered trademarks of UBS. All rights reserved.



有点报告社群

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“有点报告”
回复<进群>即刻加入