Economics & Strategy

Understanding Taiwan: Post-pandemic tech opportunities and some complications

Group Research

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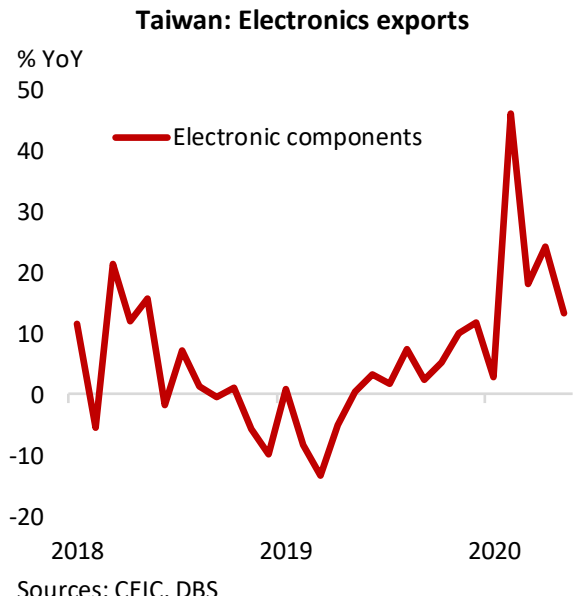
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- *Taiwan's tech economy has been performing well so far this year, thanks to the rise in global demand for ICT goods and services during the COVID-19 pandemic.*
- *The rise in purchase of computers and consumer electronics is likely to be a one-off. But demand associated with digitalization and automation would continue to grow after COVID-19, driving the segment of electronic components.*
- *Taiwan is well positioned to benefit from the post-pandemic tech opportunities, thanks to its leading role in global semiconductor fabrication, established semiconductor supply chain, and strong technology and investment capabilities.*
- *The pandemic has also increased the risks of tech protectionism and nationalism, especially with respect to China and the US. This would pose challenges for Taiwan's tech sector, in both the short and long term.*

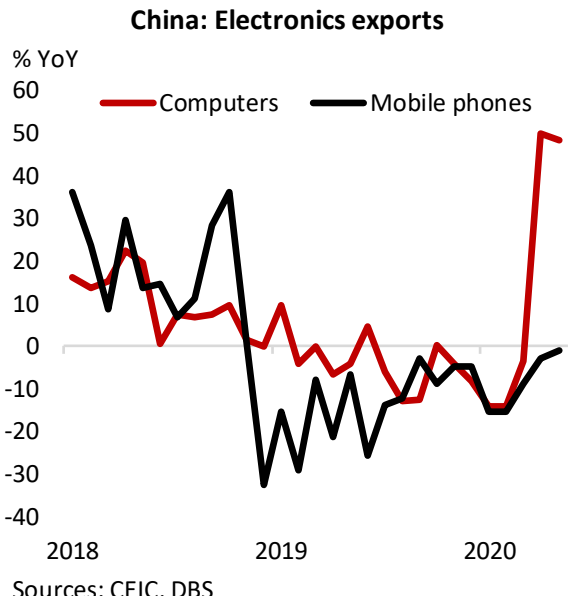
Taiwan's tech economy has been performing well so far this year, thanks to the rise in global demand for information and communication technology (ICT) goods and services during the COVID-19 pandemic. Taiwan's exports of semiconductors and other electronic components recorded a double-digit growth of 20% YoY on average in the first five months of 2020. Meanwhile, China's exports of computer products surged by almost 50% YoY in Apr-May, which also partly reflected the sales of Taiwanese PC makers located on the mainland.

The strong performance of the tech sector, coupled with the fact that COVID-19 in Taiwan is well contained, help to explain why the island's GDP has avoided a sharp contraction and why the TAIEX and the TWD have remained resilient during the first half of 2020.

Refer to important disclosures at the end of this report.



Sources: CEIC, DBS



Sources: CEIC, DBS

Post-pandemic demand outlook

The current sources of tech demand could be broken down into three main categories: 1) computers and consumer electronics, 2) mobile phones, 3) digitalization, automation and other new technology areas. The first and the third categories have been the key drivers for global tech demand during COVID-19. The pandemic-related purchase of computers and consumer electronics should be one-off, in our view. But the demand associated with digitalization and automation would continue to grow after COVID-19, creating sustained opportunities for the segment of electronic components.

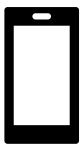
Computers and consumer electronics: Global demand for PCs, laptops and tablets has risen during COVID-19, due to the need for remote work and distance learning. Likewise, demand for consumer electronics products like gaming devices and audio equipment has increased, as people spent more time at home. These purchases should be one-off. Growth in the segment of computers and consumer electronics may see a pullback in 2021 after a strong surge this year.

Mobile phones: Unlike computers and consumer electronics, the mobile phone segment has remained sluggish during COVID-19 (mobile phone exports from China contracted persistently in Jan-May). This is probably because the penetration rate in global smartphone market is already relatively high. Consumers' upgrade to new smartphone models could be postponed due to the ongoing job losses, income declines and weakening of purchasing power. Growth in the mobile phone segment

is expected to drop significantly this year and recover moderately in 2021, roughly in line with the global GDP trajectory.

Digitalization and automation: Global demand for digital connectivity has clearly increased during COVID-19, due to the need for video streaming/conferencing, e-commerce, online entertainment, among others. The application of automation technology has also risen, such as using robots and drones for food/medical supplies delivery and disinfection. Despite the easing of lockdown and the reopening of economy after COVID-19, many large-scale conferences/events will likely remain virtual for some time and consumers' preference for contactless solutions will likely remain intact. Demand in the new technology areas is expected to remain buoyant in the coming years.

Table 1: Sources of tech demand

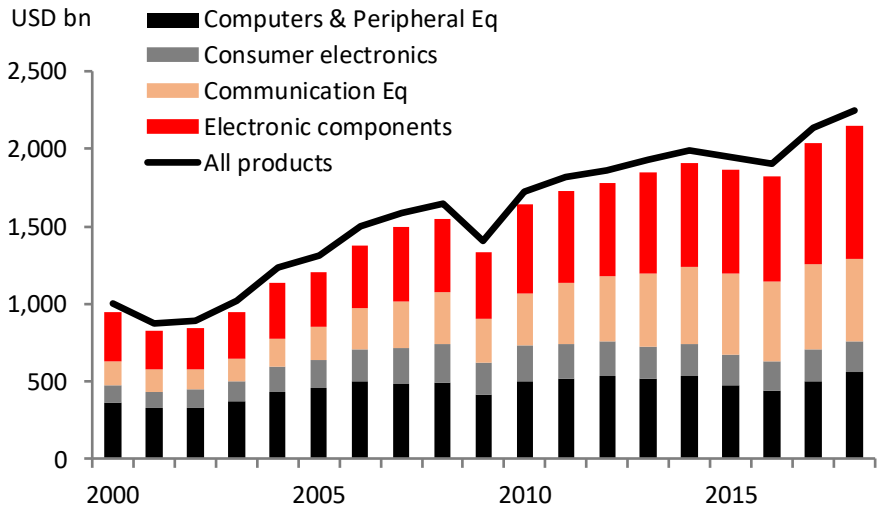
	Segments	Products	COVID-19 factors	2020	2021
	**Computers & Consumer electronics**	PCs, laptops, tablets, gaming devices, audio equipment	Remote work Distance learning Stay-at-home demand	↗	↘
	**Mobile phones**	Smartphones	Job/income conditions	↘	↗
	**Digitalization**	5G networks, Cloud, data centers	Video streaming/conferencing E-commerce Online entertainment	↗	↗
	**Automation**	Robots, drones, AI, IoT	Automated delivery/disinfection Contactless solutions	↗	↗

Source: DBS

Rising application of cloud, 5G, robots, Artificial Intelligence (AI), Internet of Things (IoT) would stimulate demand for servers, network devices, chips, sensors, and various types of other electronic components. This would imply lasting impact on the global tech sector.

Indeed, from a long-term perspective, global ICT exports have been increasingly driven by semiconductors and other electronic components in recent years, reflecting the new wave of technological innovation characterized by 5G, AI and IoT. COVID-19 may reinforce the existing trend of innovation and structural change in the global tech sector.

Global ICT goods exports, by product

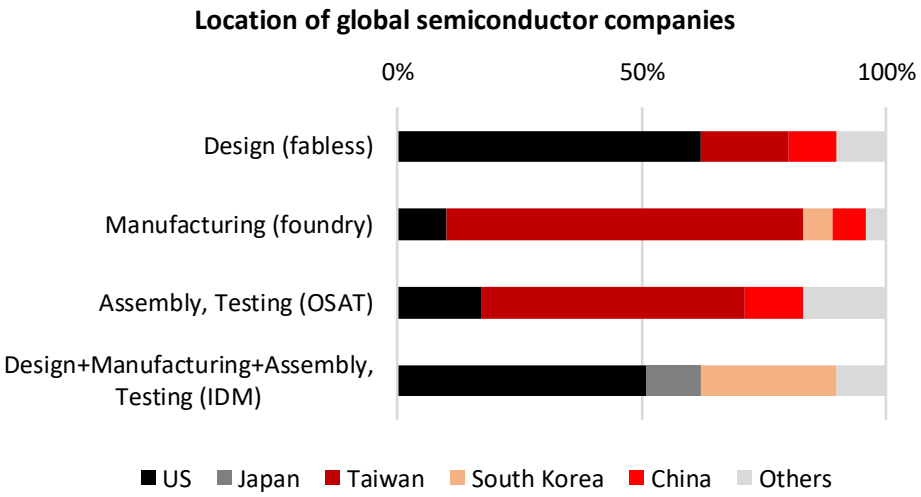


Sources: CEIC, DBS

Taiwan's supply-side competitiveness

Taiwan should be well positioned to benefit from the post-pandemic opportunities in the global tech sector. The island has a well-established semiconductor supply chain, ranging from the upstream design to downstream fabrication and packaging and testing. It is the world's largest base of wafer foundry and integrated circuit (IC) packaging and testing, accounting for a dominant share of 70% and 50%, respectively.

As far as semiconductor fabrication is concerned, Taiwan Semiconductor Manufacturing Company (TSMC) plays a leading role globally. At present, only TSMC and South Korea's Samsung are capable to produce chips at the most advanced process node of 5 nanometer (nm). Both companies have announced to begin mass production of the 5nm chips this year, which will pave the way for transition to 3nm in mid-2020s. In contrast, China's No.1 foundry, Semiconductor Manufacturing International Corporation (SMIC), has just started to produce at the 14nm node. Intel, the leading integrated device manufacturer (IDM) in the US, produces at the 10nm node currently.



Sources: Hinrich Foundation, DBS

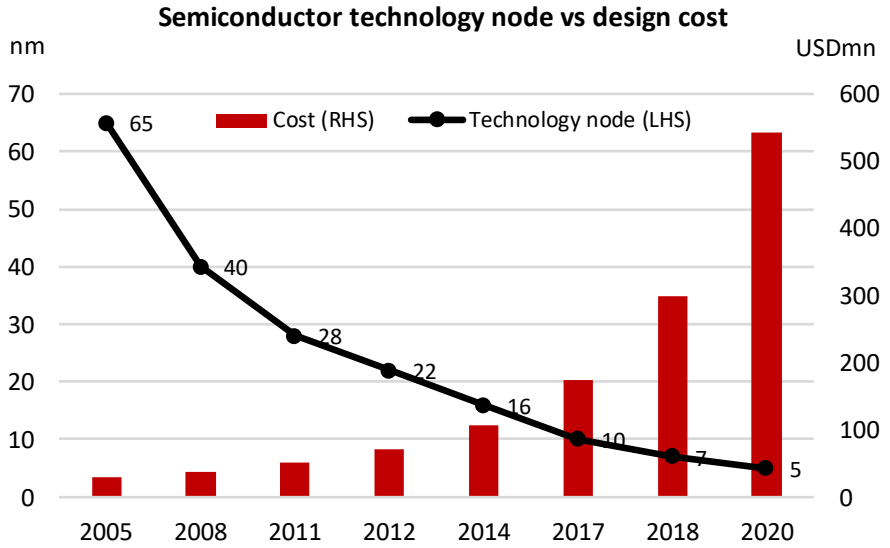
Table 2: Distribution of global semiconductor supply chain

Segments	Countries/ Regions	Companies
Design (fabless)	US Taiwan	Broadcom, Qualcomm, Nvidia, AMD, Xilinx, Marvell MediaTek, Novatek, Realtek
Manufacturing (foundry)	Taiwan US South Korea China	TSMC, UMC, PSMC, VIS GlobalFoundries Samsung, DB HiTek SMIC, Hua Hong
Assembly & Testing (OSAT)	Taiwan China US	ASE, SPIL, Powertech, KYEC, ChipMOS, Chipbond JCET, TFME, TSHT Amkor
Design + Manufacturing + Assembly, Testing (IDM)	US South Korea Japan	Intel, Micron, Texas Instruments, Analog Devices, Microchip Samsung, SK Hynix Toshiba, Sony, Fujitsu, Hitachi, Mitsubishi
Semiconductor manufacturing equipment	US Japan Netherlands	Applied Materials, Lam Research, KLA, Teradyne Tokyo Electron, Advantest, SCREEN, Hitachi High-Tech ASML, ASM International
Semiconductor materials	Japan US	Shin-Etsu, SUMCO, Kanto, JSR, JX/Nikko, Tosoh SunEdison, KMG, Dow, Cabot, Versum, Praxair, Honeywell

Sources: Trendforce, VLSI Research, DBS

Taiwan's competitiveness in the semiconductor sector is a reflective of its strong technology and investment capabilities. The chip manufacturing process is highly complicated and capital intensive. The

design cost of a 3nm chip is estimated to range from USD500mn to USD1.5bn. Moving from 10/14/16nm to 5nm means increasing the cost by 4 times, while moving to 3nm could mean 10 times. As such, only the semiconductor firms with proven technological capabilities could take the risk to invest in the frontier areas and to stay competitive.



Sources: SemiEngineering, WikiChip, DBS

Tech protectionism and nationalism

The COVID-19 pandemic also presents new risks and challenges for the global tech sector, i.e., tech protectionism and nationalism. Foremost, the China-US ties have deteriorated further, bringing the China-US tech war back to the fore. The US already imposed export controls on Chinese tech giant Huawei in 2019; and issued an entity list covering 28 Chinese companies and institutions, banning them from accessing US technology. Further actions were taken after the COVID-19 outbreak this year. Washington broadened the ban on Huawei in May, requiring foreign firms supplying to Huawei to seek a license (if they use American technology and software); and added 33 Chinese companies and institutions into the entity list (1, 2). In response, Beijing announced in 2019 that it will also roll out an unreliable entity list, which may involve retaliatory measures like investigations, and restrictions of sales/operations in the Chinese market. Whether Beijing will activate the list and add American tech companies later this year, when the 120-day grace period for Huawei expires, needs to be closely watched.

Meanwhile, tech tensions have increased between China and other countries beyond the US. Australia, for instance, has blocked Huawei's

participation in building its 5G networks since 2018, citing national security concerns. Japan has imposed a de facto ban on Chinese telecom companies during public procurement. Following the US's new ban on Huawei this year, more western countries have started to review whether to prohibit the company from their 5G networks. More recently, India announced in June to ban 59 mobile phone apps from Chinese tech companies (e.g., TikTok, WeChat), partly due to the ongoing border dispute with China, partly also due to national security concerns.

Furthermore, as COVID-19 exposes the vulnerability of global supply chains, many countries now plan to reconfigure their supply chain networks, such as localizing production and increasing self-sufficiency in the critical sectors. The US, for instance, is calling for the reshoring of semiconductor production. A bipartisan group of lawmakers proposed the Creating Helpful Incentives to Produce Semiconductors for America Act (CHIPS for America Act) in June. The bill includes more than USD22bn tax incentives, grants and R&D funding over the next 5-10 years to encourage semiconductor firms to build chip facilities in the US.

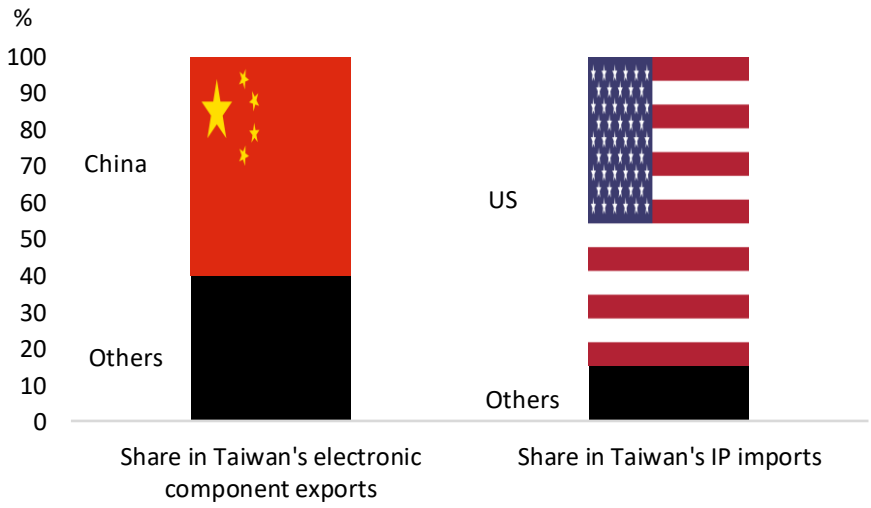
China also has the ambition to boost its semiconductor manufacturing capabilities, to achieve de-Americanization in the tech supply chain. As one of the top 10 sectors in the Made in China 2025 plan, semiconductor sector has received strong support from government funds in the past five years. At the Two Sessions in May this year, Beijing further proposed the New Infrastructure initiative. The initiative covers seven key areas including 5G, industrial internet, data centers, AI, and new energy vehicles, which is estimated to bring CNY10tn (USD1.4tn) direct investment over the next five years. This may provide a further catalyst for the growth of China's semiconductor sector in the years ahead.

Challenges for Taiwan

There are both the short- and long-term challenges for Taiwan. In the short term, the US-China tech tensions could create collateral damage for Taiwan by disrupting the existing supply chain. Taiwanese semiconductor companies still rely on the US for upstream IC design and the supply of semiconductor manufacturing equipment and chemical materials today. As much as 80% of Taiwan's intellectual property imports comes from the US. This means Taiwan will be vulnerable to the US's cutting of advanced technology supply, which originally targets the downstream Chinese tech companies.

Taiwanese semiconductor firms also heavily rely on China for market sales. China and Hong Kong account for about 60% of Taiwan's total exports of electronic components. As such, Taiwan will also be susceptible to Beijing's restriction measures on market access, although the direct target is the upstream American tech companies.

Taiwan squeezed by China-US tech tensions



Sources: CEIC, DBS

In the longer term, the imperative of both the US and China to build their own semiconductor supply chains may squeeze Taiwan. In response to the US's call for semiconductor reshoring, Taiwan's TSMC announced in May to invest USD12bn to build a new 5nm chip plant in Arizona. Beijing has also been urging Taiwanese semiconductor firms to move more advanced operations to the mainland, and meanwhile, offering competitive compensation to attract more Taiwanese engineers to go to the mainland to work. While the most advanced semiconductor manufacturing capacity remains in Taiwan today, whether the island's comparative advantage will weaken as the US and China catch up will be a question for the coming decade.

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Sources: Data for all charts and tables are from CEIC, Bloomberg and DBS Group Research (forecasts and transformations).

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