On the development of Chinese semiconductor industry and its meaning to Japan

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The semiconductor industry in Mainland China has a fast trend. As a pillar of China's manufacturing 2025, support by the government to the semiconductor industry is active, and since the establishment and plan of the semiconductor manufacturing factory and the silicon wafer factory has rapidly increased since the establishment of the China Integrated Circuit Industry Investment fund Co., Ltd. (CICF) in 2014.

China has more than four times the gap of domestic supply to semiconductor demand, and the import value of semiconductor exceeds the amount of oil imports. By this economical reason, the government lead investment in semiconductor manufacturing.

[1] And it is causing friction with the United States. The US wants to protect the top position of the hierarchical structure of electronic devices (Fig.1). [2] CNBC reports that the US is causing trade friction to take the initiative of 5G against China's positive efforts to China semiconductor industry. [3] The number of establishment of the new manufacturing fab in China (8 inches, 12 inches) is about 30 as far as it can grasp (Table1). In addition, the number of silicon wafer fab as semiconductor materials is around nine. Advanced technology in China is 28 nm behind by 3 generations and is in mass production stage (Table2). Semiconductor development and manufacturing of not only logic but also memory (DRAM, 3D NAND) and power IC are active, and SiC and GaN device factories are planned to be newly established. With respect to the development of the Chinese semiconductor industry like this, in the semiconductor industry in Japan, equipment and materials makers are booming. They have received unexpected orders for demand from the Mainland China and global demand by the Super Silicon Cycle. For example, it takes about 8 months to about a year, which is more than twice as long as ordinary from ordering of equipment to delivery. Semiconductor manufacturing equipment exports from Japan to China are rapidly increasing, reaching 700 billion yen in 2017. Meanwhile, the export of electronic components such as semiconductors from Japan to China has remained flat at about 1 trillion yen since 2006. As for imports from China, communications equipment (such as smartphones) is on the rise of 2.2 trillion yen (2017). The export of electronic parts such as semiconductors to Japan is about 500 billion yen. In a near future, what is the meaning for Japan if the Chinese semiconductor industry developed successfully as a result of Made in China 2025? In this paper, the development of the Chinese semiconductor industry (Made in China2025), the trade friction between China and the United States, and the meaning they give to Japan. And I would like to have some suggestions for thinking about the semiconductor manufacturing industry in Japan.

Comparison was made between the dominance and inferiority of the semiconductor industry competition in 2018 and 2025. In 2025, the inferiority of Chinese memory and semiconductor manufacturing equipment/materials was eliminated, and Japan's inferior CPU / GPU / AI, DRAM, advanced manufacturing remained unchanged in 2018 (Table3).

Therefore, in exports and imports, Japan will generate a deficit of more than 3.7 trillion yen in future devices. China will be able to supply its core devices in the future. And the export of advanced semiconductors manufactured in China (and finished products equipped with them, smart phones etc.) to Japan will increase (Fig.2). With innovation 25 raised by the Japanese government, about 60% of future core devices will depend on overseas products (Table4). That is, Japan's competitiveness is weak at 5G, the core of Innovation 25 (or Industry 4.0, Society 5.0), the construction of each infrastructure is delayed, and the value of goods in the world market is low.

Further discussion will be reported at the conference.


Fig. 1. Hierarchical structure of the electronic device industry.

Table 1. New Fab plan in mainland China.

Table 2. Technology development status in mainland China.

Table 3. Competitive advantage and disadvantage of Japan and mainland China in the Semiconductor Industry.

Table 4. Core devices of Innovation25 and key ICs, Domestic IC supply possibility.