Mizuho Economic Outlook & Analysis

June 4, 2019

Dark clouds loom over the semiconductor market

Bottoming out will likely drag on with the trade war escalating between the US and China

< Summary >

◆ The fourth tariff increase by the United States on Chinese goods includes laptop computers and mobile phones, which the US imports mostly from China. A decline in demand for these goods and the resultant deterioration of corporate earnings run the risk of negatively affecting the semiconductor market.

◆ Sanctions imposed on Huawei will have an adverse impact on the semiconductor market by delaying the spread of 5G and raising the level of uncertainty. After sanctions against Huawei were strengthened, the uncertainty index skyrocketed.

◆ Increasing tensions between the US and China will likely continue for a while, suggesting the risk of a protracted bottoming out of the semiconductor market and a weaker than expected recovery afterwards. Investment in semiconductor manufacturing equipment, one of Japan's main export items, will probably decline as well.

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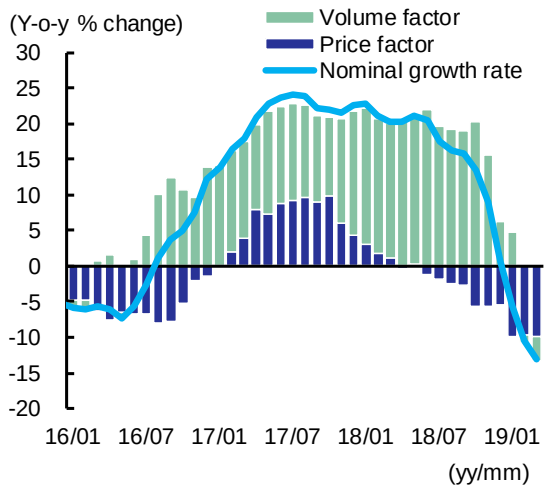
1. The semiconductor market sits in the midst of an adjustment phase as unfavorable winds of the US-China trade war blow once again

The downward trend of the semiconductor market never seems to stop. Global semiconductor sales in January 2019 plummeted into the negative territory for the first time in 30 months (**Chart 1**). In February and March, semiconductor sales on a volume basis, excluding the price fluctuation factor, or real semiconductor sales, also declined year-on-year for the first time in 33 months. Also, the silicon cycle movement (until March) created by MHRI shows that the market is in the midst of an adjustment phase (**Chart 2**).

According to a report by Yazawa and Miyajima (2018), the semiconductor market is expected to remain in an adjustment phase until the first half of 2019 based on past silicon cycle trends, and the market is now moving in line with this forecast.

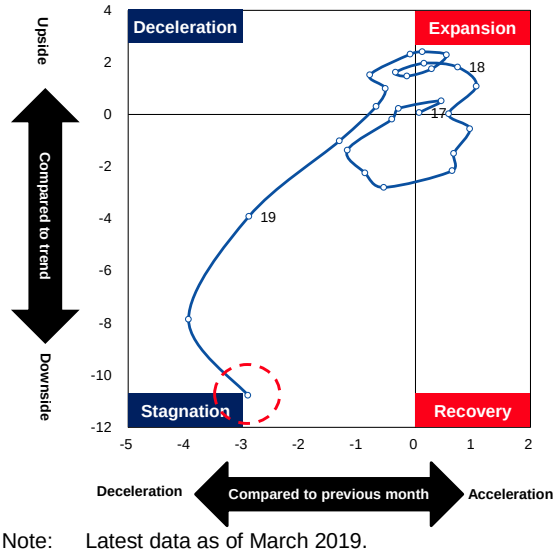
Furthermore, while the report projects the semiconductor market's adjustment phase to end in the latter half of 2019, it also points to the risk that the timing of recovery may drag on should the US-China trade war intensify further. Unfortunately, this risk may become a reality.

Chart 1: Global sales of semiconductors



Note: The breakdown of factors is based on estimates by MHRI.
Source: Made by MHRI based upon CEIC data.

Chart 2: Business cycle clock of the silicon cycle index



Note: Latest data as of March 2019.
Source: Made by MHRI.

On May 10, the US Trump administration decided to raise tariffs against Chinese products for a third time. Moreover, on May 12, just two days after this decision was made, the Trump administration announced the United States would start deliberations on a fourth tariff increase that would include almost all Chinese goods not already

subject to import tariffs. On May 15, it also announced the addition of Huawei Technologies to its "entity list," effectively banning US companies from selling their products to the Chinese telecommunications company.[1] Huawei is one of the world's top three mobile phone makers, taking the lead in the area of 5G base stations. There is concern that this measure will have a greater impact on the IT markets, including semiconductors, than past measures taken by the US against China's state-owned telecommunication company ZTE in 2018 and another state-owned semiconductor maker JHICC (Fujian Jinhua Integrated Circuit).

In this latest report, we will discuss how the US' fourth tariff hike on Chinese products and the imposition of sanctions against Huawei may adversely affect the semiconductor market.

2. Of the products subject to the fourth tariff increase, mobile phones and laptop computers will be affected most

Chart 3 shows the import value of the items possibly subject to the tariff increase when the US imposes the fourth tariff hike. The chart shows that the fourth tariff increase will be applied to a wide variety of products ranging from toys to apparel items, but from a share point of view, electrical machinery and general-purpose machinery account for more than 50%. Furthermore, if we look at the details of these products, mobile phones occupy a major share in electrical machinery and laptop computers in general-purpose machinery.

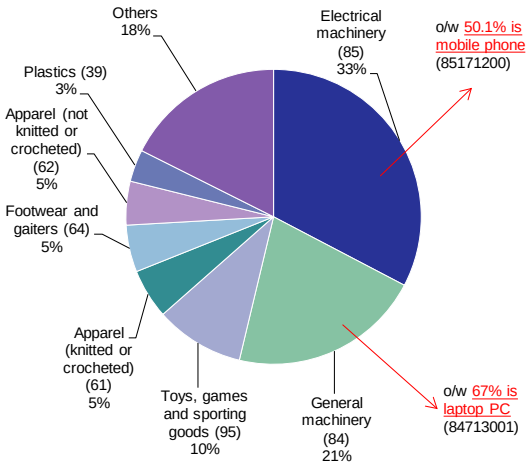
The following **Chart 4** depicts the degree of US dependence on Chinese imports for mobile phones and laptop computers. It reveals that the US depends almost entirely on China for mobile phone and laptop computer imports. Currently, Chinese mobile phones and laptop computers imported into the US are tariff free. If import tariffs are applied to these products, their selling prices in the US will rise and place downward pressure on consumer demand. As a result, the production plans for laptop computers and mobile phones will most likely be revised downward, having a negative impact on the market by prompting firms to postpone their investment plans for related equipment.

As generally known, IT products such as mobile phones and laptop computers manufactured in China are incorporated into the supply chain where electrical parts are supplied by Japan, South Korea and Taiwan, and the final products are assembled in China for export to the United States. Hence, if the tariff increase leads to a drop in mobile phone and laptop computer sales in the US market, the demand for installed

[1] On May 20, the US government announced it would establish a grace period of 90 days to implement a portion of the measures; but it only covered maintenance-related operations, including maintenance of existing networks and software updates for existing smartphones.

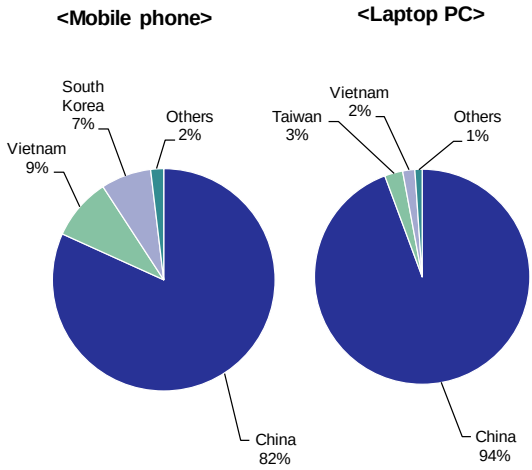
semiconductors will also fall, causing significant damage to the earnings of semiconductor makers.[2]

Chart 3: US share of Chinese products subject to the fourth tariff increase among total imports from China



Note: Figures in brackets show the HS code. Data as of 2018.
Source: Made by MHRI based upon USA Trade Online, among others.

Chart 4: Breakdown of US mobile phone and laptop computer import value by region



Note: The HS code for mobile phones is 85171200, and laptop computers is 84713001.
Source: Made by MHRI based on USA Trade Online, among others.

A decline in American consumer demand can be avoided if suppliers do not raise the prices of mobile phones and laptop computers in the domestic market. But in this case, companies will have to bear the burden of increased tariffs, which in turn will suppress their earnings due to the cost increase, and it will not only be the downstream manufacturers who bear the additional cost; the upstream makers of semiconductor parts and materials will also be asked by purchasers to lower their prices, placing downward pressure on all parties concerned. If this happens, there is a risk that semiconductor demand will contract due to the delay in machinery and equipment investment as well as a decline in market sentiment driven by the drop in stock prices of IT sector-related companies.

Another countermeasure that companies may take includes shifting their final assembly bases for mobile phones and laptop computers currently in China to elsewhere (such as Vietnam, South Korea and Taiwan) and then exporting the products to the United States. In this way, firms can avoid the cost increase stemming from the imposition of increased tariffs against Chinese imports by the United States. If we look at the media coverage, the leading IT companies have already started to consider moving

[2] There seems to be the option to sell oversupplied products resulting from the fall in US market sales to other markets by slashing prices to compensate for the losses. But certainly, lower prices will lead to suppressed corporate earnings.

their production bases in China to other regions.[3] But with a big change in the existing supply chain involving great cost and time to establish new transportation networks, secure a local labor force, and get the new system up and running, it is not always a realistic option to completely move existing production facilities to other nations.

In the end, if increased tariffs are applied to laptop computers and mobile phones imported into the United States from China, it will be difficult for firms to avoid the cost burden entirely. If we follow this logic, we can say with certainty that the tariff increase will have an adverse impact on the semiconductor market through the decline in demand for final products and suppressed company earnings.

3. Sanctions against Huawei may lead to a delay in generating of 5G-related demand

In addition to higher tariffs, the US government's imposition of sanctions against Huawei may simply make matters worse. We hold that its negative impact will surface as the following two scenarios.

The first scenario is a delay in the spread of 5G due to the downward revision of Huawei's communication base station production plans, stifling the emergence of semiconductor demand after the proliferation of 5G. Huawei is highly evaluated in the global market as a leading communication infrastructure supplier, boasting a top share[4] in the world and holding the key to future deployment of 5G base stations. We can also confirm from trade statistics that China holds the world's top share in base station exports (**Chart 5**), and that Chinese products are widely used all around the world. If Huawei finds it difficult to procure parts and materials from the US and revises its base station production plans downward, the 5G rollout may be delayed.

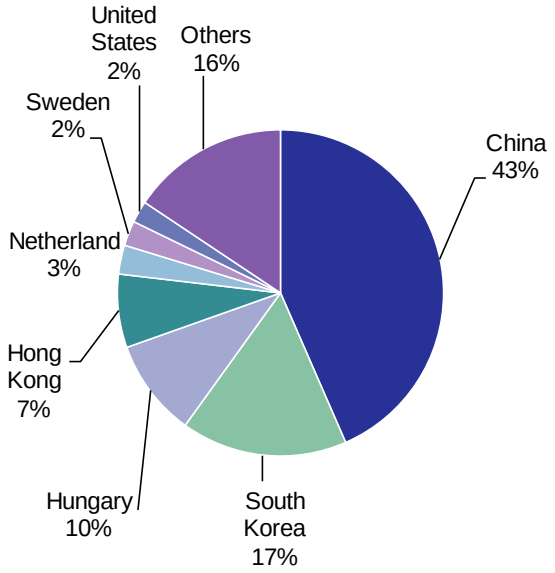
In addition, the US' harsher attitude toward Huawei has paralyzed other countries' policies on how they treat Huawei-made products. We see conflicting responses by countries like the UK and Germany who did not take steps to completely exclude Huawei's equipment, while the Australian government decided to abolish the use of Huawei products. Since Huawei's base stations enjoy a high reputation for their high quality and low cost, telecommunication companies all around the world may adopt a wait-and-see approach on applying Huawei base stations. Even if telecom companies want to switch their base stations to other firms, it will not be easy to secure the

[3] For example, Pegatron is considering transferring its production base to Vietnam and India, but it may be difficult to begin mass production within the same year (article from Y's New" dated May 15, 2019). Also, Hon Hai Precision Industry has revealed its plan to transfer its Tianjin factory and part of its Shenzhen factory to Gaoxiong (article from Y's News dated May 9, 2019). ASUS is reported to be transferring part of its production to Vietnam and Taiwan and will adjust its product lineup to offset the adverse impact (article from Y's News dated May 14, 2019).

[4] According to IHS Markit (press release dated March 13, 2018), the 2017 share of communication base station infrastructure was 28% for Huawei, 27% for Ericson, 23% for Nokia and 13% for ZTE.

necessary amounts. If they rush to secure large volumes of base stations, the move will only invite price hikes and companies may be compelled to refrain from further investment due to higher costs. If this happens, the deployment of base stations will be delayed, and the emergence of semiconductor demand driven by the full-fledged deployment of 5G will be disrupted.

Chart 5: Regional breakdown of global base station exports



Note: HS code 851761. Values are as of 2017.
Source: Made by MHRI based upon UN Comtrade.

Thanks to the main feature of 5G, which is "simultaneous connection" (significantly increasing the number of gadgets, such as smartphones, cars and machine tools, that can be connected to the internet at the same time), the IoT environment is expected to vastly improve, boosting demand for semiconductors for IoT (such as sensors and semiconductors for communication tools). Also, since the development of new smartphones that respond to the 5G communication system is expected to enhance the functions of smartphones, the demand for semiconductor is also anticipated to increase. Some countries have already launched new services that take advantage of 5G, and according to the industrial association GSMA, the share of the world's population covered by 5G circuits is expected to rise to about 30% in the five years after 2020.[5] In view of such high expectations of 5G deployment to stimulate the IT markets, including semiconductors, a delay in its deployment will likely be a big blow to the industry.

The second scenario involves a decline in smartphone sales. Huawei is the third largest smartphone company in the world in terms of shipments.[6] Moreover, although the number of global shipments of smartphones fell by 4.1% year-on-year in 2018 for the second consecutive year, Huawei increased its smartphone shipments significantly by 33.6%, steadily enhancing its presence in the market. Nonetheless, the imposition of sanctions by the US has made it impossible for Huawei to procure semiconductors and electrical parts necessary to manufacture smartphones from American firms, forcing

[5] The Ministry of Internal Affairs and Communications, *2018 White Paper on Information and Communications in Japan*.
[6] A press release of IDC dated January 30, 2019.

Huawei to find other suppliers. It is said that Huawei buys semiconductors for smartphones from major US semiconductor firms like Qualcomm and Micron. If it becomes difficult to procure such materials as semiconductors from US firms, Huawei may be compelled to revise its smartphone manufacturing plans downward, which would also damage semiconductor demand.

However, we also hear that Huawei has anticipated this type of situation and has already begun discussing to make changes to its supply system internally. For example, if Huawei can successfully procure integrated circuits from substitute suppliers in Taiwan or South Korea,[7] Huawei could possibly avoid a significant decline in its base station and smartphone production. We can even say that Taiwan and South Korea may benefit from Huawei's shift in parts suppliers. But as we pointed out earlier, since making a big change in the existing supply chain requires a significant investment in cost and time, we believe this situation will have a negative impact by reducing final demand in the short term.

4. Uncertainty caused by stronger sanctions against Huawei is having a strong impact

The increase in import tariffs against China as mentioned earlier has not taken effect at the time of writing this report. But looking at the actual imposition of sanctions against Huawei, the US' attitude toward China is becoming harsher than ever. There are rising concerns over the fourth tariff increase on Chinese products, and uncertainty is mounting as the US-China trade war escalates.

The rise in uncertainty, as analyzed by Sakai, et al. (2018), will curb capital investment by cooling down firms' investment appetite and negatively affect the semiconductor sector. More specifically, in view of intensified trade friction, companies may become more cautious about taking risks and be inclined to set more conservative targets for future production and capital investment. This in turn will dampen orders by firms that procure semiconductors and ultimately lead to a decline in semiconductor demand.

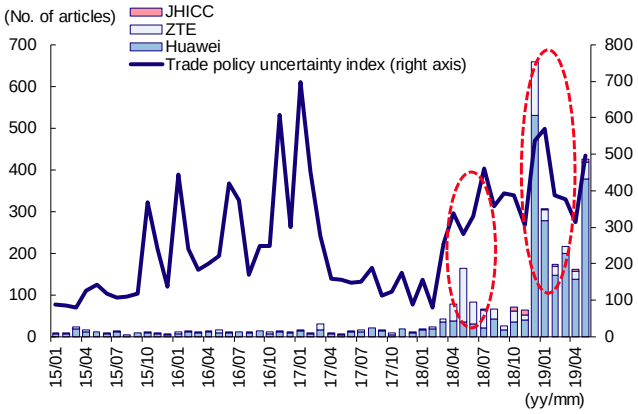
The United States last year launched sanctions against individual companies in China, including ZTE and JHICC. Ever since the sanctions against ZTE were reported in the media in April 2018, the number of articles containing the acronyms "ZTE" and "JHICC"

[7] There is another option to increase the mounting ratio of semiconductors produced by HiSilicon Technologies of the Huawei Group (i.e., raise the internal production ratio). However, HiSilicon outsources the production of its original Kirin semiconductor to the Taiwanese firm TSMC (Taiwan Semiconductor Manufacturing Company), and if TSMC stops shipments, Huawei may not be able to procure semiconductors even if the provider is a group company. It should be noted that TSMC announced on May 23 that it is not subject to export restrictions launched by the US against Huawei products and therefore continues to maintain its business with Huawei.

has gone up. In line with this trend, the trade policy uncertainty index has also risen (**Chart 6**).

When the arrest of Huawei's deputy chairwoman of the board and chief financial officer (CFO), Meng Wanzhou, was covered in the media in December 2018, the number of articles and the trade policy uncertainty index jumped significantly. It should be noted that compared with ZTE and JHICC, the number of articles referencing Huawei is overwhelmingly higher, showing that the impact of the harsher attitude toward Huawei is clearly stronger. Although the upward trend of the uncertainty index paused after January 2019, the number of media articles increased in May to the level recorded in December 2018 with the introduction of sanctions against Huawei, and the uncertainty index is now on the rise again.[8]

Chart 6: Trade policy uncertainty index and number of articles on Chinese firms (IT related) subject to US sanctions



Note: Newspapers covered include *The Nikkei*, *The Asahi Shimbun*, *The Mainichi*, *The Yomiuri Shimbun*, and *The Sankei Shimbun*. Search keywords are "Huawei" or the Chinese name for Huawei, "ZTE" or the Chinese name for ZTE, "JHICC" or the Chinese name for JHICC.
Source: Made by MHRI based upon Arbatli, et al. (2017) and Nikkei Telecom.

There is market speculation that the US will continue to impose sanctions on individual firms in China intermittently. The US' stronger attitude toward China is expected to have a negative impact on the semiconductor market through the rise in uncertainty.

5. Bottoming out of the semiconductor market may be prolonged, and the pace of recovery afterwards will likely be slow

With the implementation of the fourth US tariff increase on Chinese imports becoming more a reality and the US' harsh attitude toward Huawei having a large impact on the uncertainty index, we should be pessimistic about the timing of the semiconductor market bottoming out, which will most likely be delayed to after mid-2019, the timing originally forecasted by Yazawa and Miyajima (2018). Furthermore, even if we see the market bottom out, the subsequent recovery will likely be a gradual one. We anticipate

[8] The reason for the larger volume in December 2018 is thought to be the arrest of Huawei deputy chairwoman of the board and CFO, Meng Wanzhou, at the beginning of the month (December 5).

seeing not a V-shape or U-shape recovery but an L-shape recovery at best.

Until early May when US-China trade friction was not so tense, some people were saying that semiconductor demand would bottom out soon. For example, if we look at South Korea's semiconductor export value,[9] a statistic known for its promptness, there were signs that the export value had stopped falling in April. Also, the Philadelphia Semiconductor Index (SOX index), another representative index related to semiconductors, renewed its historical high in April, and the market interpreted this as a signal that real demand would bounce back soon.[10] Semiconductor companies' earnings reports for the 1st quarter of 2019 also began to indicate that the profits of large memory-related firms were expected to recover from the latter half of the year, as "inventory adjustment of main customers will be over by the end of June."

But with the announcement of the US' fourth tariff increase targeting Chinese products and sanctions against Huawei, this optimistic view has suddenly given way. Few people now expect that American and Chinese leaders will reach some sort of agreement at the US-China summit meeting scheduled to be held during the G20 Summit at the end of June in Japan. The root of the US-China trade war lies not with the US trade deficit with China, but with the growing alarm about the rising position of China competing for economic and technological hegemony. For this reason, the United States is attempting to address the violation of intellectual property rights by Chinese companies in cutting-edge industries such as semiconductors as well as the Chinese government's policy of protecting its domestic industries through subsidies to state-owned companies. Miura (2019) states, based on statements made by China's Vice Premier Liu He, that China shows no intention of compromising given the harsh attitude of the United States, as seen in its decision to ban US technology sales to Huawei, so it is difficult to foresee any significant change in the current policy. At this stage, we cannot expect an easy end to the US-China trade friction.

6. Falling investment in semiconductor manufacturing equipment may damage the Japanese economy

If we analyze the potential adverse impact on Japan's economy due to a delay in the recovery of semiconductor demand, Japan's economy may be affected not only by a decline in semiconductor-related exports,[11] but also by a slowdown in semiconductor

[9] South Korea's trade statistics are released fast on the first day of the next month. With its series titled "semiconductor," it is one of the fasted semiconductor-related macro indicators.

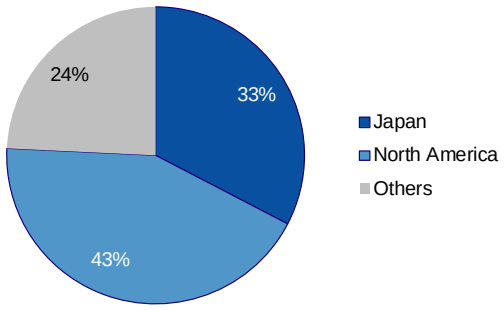
[10] However, of the firms constituting SOX, the stock price of Qualcomm rose substantially reflecting the market's favorable view of the reconciliation with Apple on April 16. We need to pay attention to the fact that this single factor greatly contributed to the strong rise in SOX.

[11] *Trade Statistics of Japan* compiled by the Ministry of Finance confirms that the export value of semiconductors and electronic

manufacturing equipment demand as a result of semiconductor firms curbing their investment.

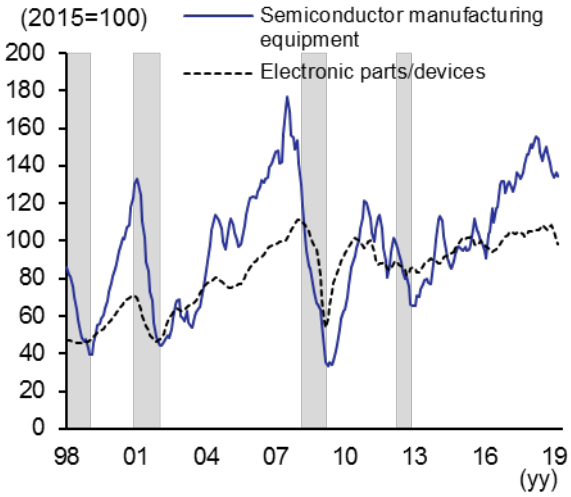
In the global semiconductor manufacturing equipment market, Japan is ranked second after the US and boasts a high share (**Chart 7**). In fact, Japanese companies like Tokyo Electron, Advantest and SCREEN are ranked among the top 10 companies in terms of revenue and are highly competitive in the international market. Also, since semiconductor manufacturing equipment is characterized by their technology intensiveness, firms tend to locate their manufacturing bases in Japan.[12] Hence, semiconductor manufacturing equipment has a high export ratio[13] and is highly susceptible to global trends as a result. If we look at past trends, semiconductor manufacturing equipment production has proven more vulnerable to fluctuating economic trends than electronic parts and devices, including semiconductors (**Chart 8**).

Chart 7: Japan's share in the semiconductor manufacturing equipment market



Note: Data estimated by MHRI.
Source: Made by MHRI based upon SEAJ, SEMI and SEMI Japan, *Semiconductor Equipment Market Statistics*, and CECI data.

Chart 8: Japan's semiconductor manufacturing equipment production and economic recessionary phase



Note: Shaded areas show a recessionary phase. Data are three-month backward moving averages.
Source: Made by MHRI based upon the Ministry of Economy, Trade and Industry, *Indices of Industrial Production*, and the Cabinet Office, *Indexes of Business Conditions*.

Now we want to confirm the impact of the rise in uncertainty and global semiconductor sales on the production of semiconductor manufacturing equipment in

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parts amounts to 4.2 trillion yen, almost the same as automobile parts at 4 trillion yen. It should be noted that the export value of semiconductor manufacturing equipment, one of the biggest export items, is 2.7 trillion yen.

[12] If we make a simplified calculation using the *Current Production Statistics* of the Ministry of Economy, Trade and Industry and the statistics compiled by the Semiconductor Equipment Association of Japan, the domestic production ratio of Japanese semiconductor manufacturing equipment makers is about 70%.

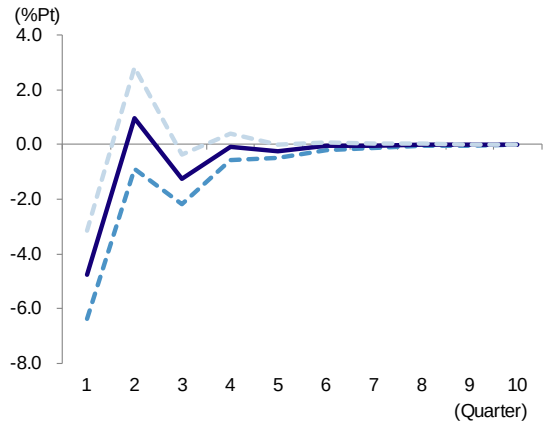
[13] If we make a simplified calculation using the *Current Production Statistics* of the Ministry of Economy, Trade and Industry and the *Trade Statistics of Japan* compiled by the Ministry of Finance, the export ratio of semiconductor manufacturing equipment produced in Japan is about 83%.

Japan using time series data. Here, by referring to Sakai, et al. (2018), we estimated the VAR using the quarterly data (the first quarter in 2003 through the first quarter in 2019) of three variables: (1) trade policy uncertainty index (seasonally adjusted data), (2) Japan's semiconductor manufacturing equipment production index (seasonally adjusted data), and (3) global semiconductor sales (recalculated to real and seasonally adjusted data by MHRI). We included global semiconductor sales in the analysis as a variable that reflects the real demand factor in the semiconductor market. We conducted a Cholesky decomposition that assumes high exogeneity in the order of trade policy uncertainty index, global semiconductor sales, and semiconductor manufacturing equipment production, and calculated the impulse response against the trade policy uncertainty shock of semiconductor manufacturing equipment in **Chart 9**.[14] The results revealed that the uncertainty shock has a negative impact on the production of semiconductor manufacturing equipment (semiconductor-related capital investment) with statistical significance. Hence, we can confirm that a rise in uncertainty leads to a decline in the production of semiconductor manufacturing equipment. Likewise, **Chart 10** shows the impulse response of semiconductor manufacturing equipment production against the global semiconductor sales shock. The outcome is that a fall in global semiconductor sales has a negative impact on the production of semiconductor manufacturing equipment with statistical significance. This suggests that if the supply and demand situation in the global semiconductor market deteriorates, firms will become more prudent in making capital investments in semiconductor-related equipment (in our estimates, a 1% fall in global semiconductor sales will push down semiconductor manufacturing equipment production by 0.9% to 1.3% in the subsequent quarter). In the light of the time series data analysis, we can conclude that the recent drop in global semiconductor sales will exert a downward pressure on Japan's semiconductor manufacturing equipment production.

As Sakamoto, et al. (2018) points out, considering that growth in Japan's industrial shipments in recent years has been driven by industrial robots and semiconductor manufacturing equipment, a drop in Japan's semiconductor manufacturing equipment production would be a serious blow to the Japanese economy.

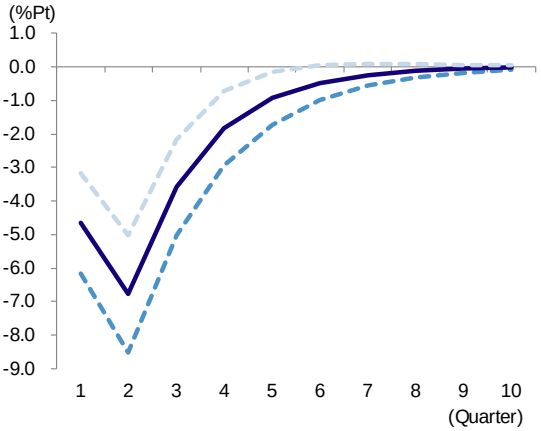
[14] Uncertainty shock is defined as unexpected change in the uncertainty index; semiconductor sales shock as part of the unexpected change in real demand in the semiconductor market that cannot be explained by the uncertainty shock; and semiconductor manufacturing equipment production shock as part of the unexpected change in production that cannot be explained either by uncertainty shock or semiconductor sales shock.

Chart 9: Impulse response of Japan's semiconductor manufacturing equipment against trade uncertainty shock



Note: The chart depicts changes in semiconductor manufacturing equipment production (quarter-on-quarter change) when the policy uncertainty index shock is given by one standard deviation. The dotted lines represent the confidence interval of ±1 standard error. The lag length was made one quarter in accordance with the Hannan-Quinn information standard.
Source: Made by MHRI.

Chart 10: Impulse response of Japan's semiconductor manufacturing equipment against global semiconductor sales



Note: The chart depicts changes in semiconductor manufacturing equipment production (quarter-on-quarter change) toward the minus direction when the policy uncertainty index shock is given by one standard deviation. The dotted lines represent the confidence interval of ±1 standard error. The lag length was made one quarter in accordance with the Hannan-Quinn information standard.
Source: Made by MHRI.

7. Semiconductor manufacturing equipment is now under strong stock adjustment pressure

In recent years, investment in semiconductor manufacturing equipment has been steady thanks to the favorable semiconductor market, referred to as the super cycle. This can be attributed to Chinese firms accelerated investment in semiconductor manufacturing equipment fueled by the Chinese government's plan to improve the self-sufficiency ratio of semiconductors in line with its "Made in China 2025" policy. Large firms like Samsung Electronics have also made aggressive capital investments in fear of Chinese firms catching up, giving a boost to the semiconductor market.

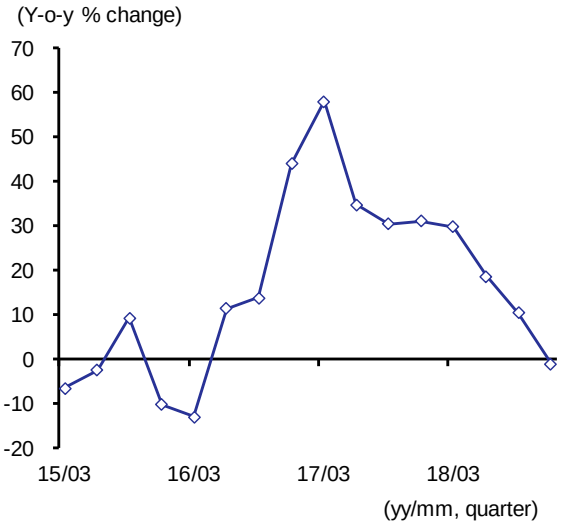
Nonetheless, with a slowdown in global semiconductor sales and the imposition of export restrictions on US-made semiconductor manufacturing equipment to JHICC, semiconductor sales around the world became sluggish in the latter half of last year, recording the first year-on-year decline over the past 11 quarters in the October to December period of 2018 (**Chart 11**).

Moreover, we also need to be alert to the fact that expanded investment in 2017 and 2018 can cause adjustment pressure to rise from a capital stock cycle perspective. If we draw a capital stock cycle chart for semiconductor manufacturing equipment based on certain assumptions (**Chart 12**), the investment stock ratio was high in 2018, and it is highly probable that 2019 and 2020 will be a period of capital stock adjustment.

Under such circumstances, if uncertainty rises as a result of intensified trade friction between the US and China, negative pressure on investment in semiconductor manufacturing equipment will increase as well. Also, if the US imposes stronger sanctions on other Chinese semiconductor makers, Japanese companies may adopt a more cautious stance on conducting business with Chinese makers.

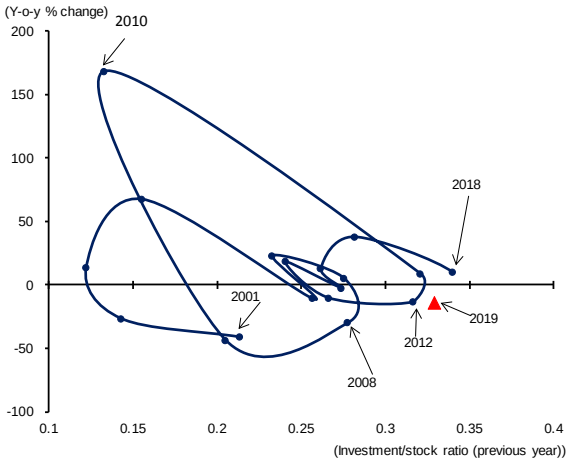
The industry association SEMI announced in March that the investment value of semiconductor manufacturing equipment in 2019 is forecast to fall 14%, a downward revision from the December forecast.[15] Going forward we must pay attention to whether the forecast will be revised downward again with further escalation of the US-China trade war in May. As previously mentioned, Japan represents a large share of the semiconductor manufacturing equipment sector, which means that Japan is more susceptible to semiconductor market trends than other nations. We need to recognize again the possibility that intensification of US-China trade friction may have an even greater negative impact on the Japanese economy than originally anticipated.

Chart 11: Global semiconductor manufacturing equipment sales



Source: Made by MHRI based upon SEAJ, SEMI and SEMI Japan, *Semiconductor Equipment Market Statistics*.

Chart 12: Semiconductor manufacturing equipment stock cycle chart



Note: The value of stock is estimated by the benchmark year method, and the value of stock in the early years is the sum of values from 1991 to 2000. The depreciation rate of capital is 24.7%, referring to materials of the Cabinet Office. Data for 2019 are forecasts.
Source: Made by MHRI based upon SEAJ, SEMI and SEMI Japan, *Semiconductor Equipment Market Statistics*"

[15] From press release materials dated March 12, 2019.

Reference

Refer to the original Japanese report by clicking the URL below for the reference material

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