

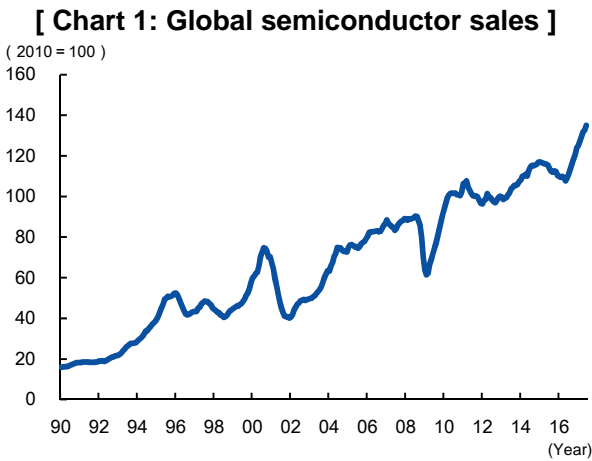
## Forecasting the direction of the semiconductor boom

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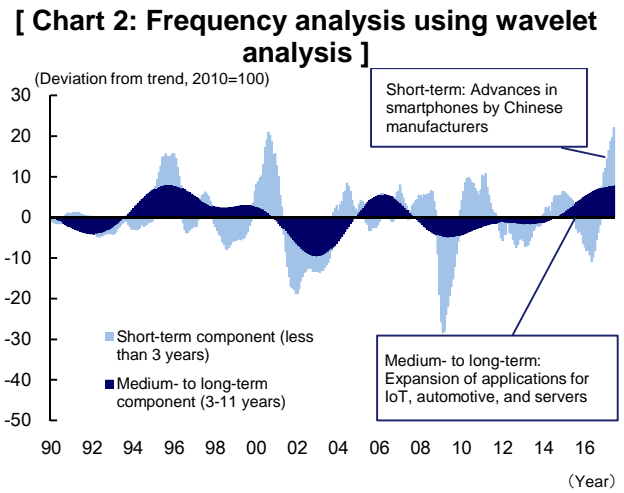
The global economy has been growing steadily since the second half of 2016. One reason for this has been a global rally in the export of electronic components, such as semiconductors, due to improvements in the IT cycle. Looking at global semiconductor sales up to the most recent results (seasonally adjusted figures by MHRI, **Chart 1**), the October-December 2016 quarter saw its highest growth since 2011, growing by more than 6% from the previous quarter. Entering 2017, semiconductor sales continue to record sustaining positive growth from the previous quarter. However, growth rate of sales were somewhat lower compared to the latter half of 2016, and there may be emerging signs that they have reached a plateau.

MHRI conducted frequency analysis using wavelet analysis to discover the variation factors in current semiconductor sales. Wavelet analysis is a method to extract different variations in cycles from time series data. Broadly speaking, it analyzes boost factors by breaking down global semiconductor sales into short-term boost factors, such as economic trends, and medium- to long-term structural changes, such as technological innovations like the birth of the Internet.

**Chart 2** shows the trend in global semiconductor sales after grouping the extracted cyclical variations into 1) short-term components (less than 3 years) and 2) medium- to long-term components (3-11 years). An examination of the trend shows that after the second half of 2016, both the short-term and medium- to long-term components contributed to the boost in sales. Notably, the boost from the short-term components has become larger, the background of which is deemed the recovery of demand for smartphones that can be attributed to significant advances in smartphone sales by Chinese manufacturers such as OPPO and Vivo. In fact, amid demand for replacing smartphones from 3G to 4G in the Chinese market, the share of smartphones from emerging manufacturers with higher performance than those from other traditional Chinese manufacturers has greatly increased. On the other hand, the boost from medium- to long-term components is considered to reflect the expansion of semiconductor applications for IoT (Internet of Things), automotive, and servers.



Note: Seasonally adjusted figures from MHRI  
 Source: Made by MHRI based on *CEIC Data* and *Datastream*



Note: Seasonally adjusted figures from MHRI  
 Source: Made by MHRI based on *CEIC Data* and others

Judging from the past cycle, the effect of the boost from the short-term component appears to be nearing its peak. There is thus a high possibility that future growth in semiconductor sales will slow down.

However, there is no need for excessive concern. First, the boost by the medium- to long-term components is expected to continue for the time being. The composition of expanding applications for IoT, automotive, and servers will boost demand for semiconductors and is not likely to change soon.

Second, Apple’s new iPhone is scheduled to be released and it is expected to offer a boost through replacement demand. As 2017 marks the 10th anniversary of the iPhone, a new design and major updates to functions are anticipated, and a major point of focus will be whether the new iPhone creates large-scale replacement demand among iPhone users. Although it is extremely difficult to predict how much new replacement demand will be generated by the new iPhone, according to a survey (published in May 2017) of 1,000 iPhone users in the United States conducted by the research arm of investment bank Morgan Stanley, 92% of respondents said they were considering replacing their phones with higher-end models within a year, which suggests that there will be replacement purchases at a reasonable level.

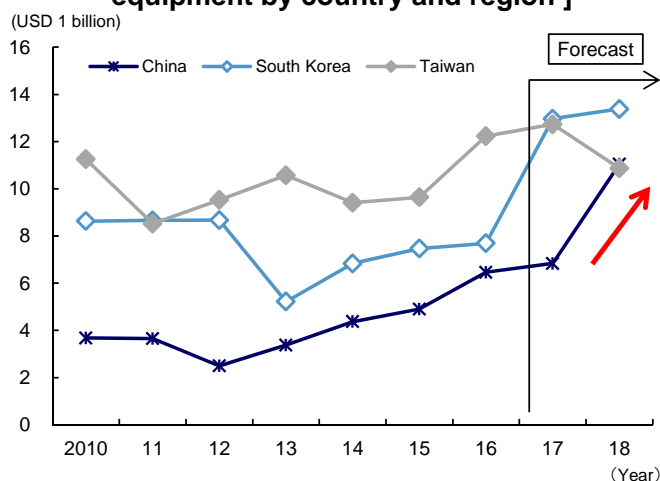
However, the growth of sales after the launch is anticipated to be moderate compared to the past as it is currently difficult to mass produce the OLED display expected on the new iPhone. Even if constraints on component supply hold back growth, it does not mean a decline in replacement demand. Even a meager increase simply means that it will be more sustainable. Therefore, our view that the release of the iPhone will prop up global semiconductor sales is unchanged.

What is causing more concern instead is a medium-term problem of oversupply due to China’s increasing semiconductor production capacity.

At present, China's semiconductor production capacity is limited, so there is no serious concern about oversupply problems. However, as far as the forecast of sales of semiconductor manufacturing equipment is concerned (**Chart 3**), semiconductor manufacturing equipment in China is expected to expand significantly in 2018. We expect the installation of equipment to progress in 2018 with full-fledged operation beginning from 2019, which will lead to an possible oversupply of semiconductors that will be susceptible to inventory adjustments.

There is a possibility in the future that the building up of semiconductor manufacturing facilities through new government policy measures will occur more rapidly. It will be necessary to closely monitor the actions of the Chinese government and Chinese semiconductor-related companies.

**[ Chart 3: Sales of semiconductor manufacturing equipment by country and region ]**



Source: Made by MHRI based on SEMI press releases

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