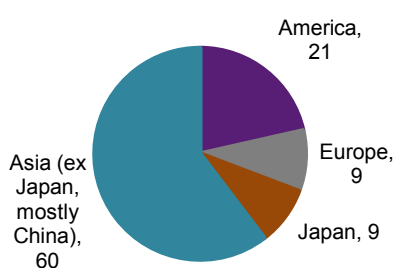


## CHINA HOT TOPICS

17 April 2018

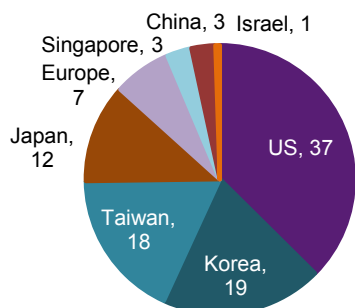


**Demand of Semiconductor (2017, %)**



Source: Natixis, SEMI, WIND

**Supply of Semiconductor (2017, %)**



N.B. Calculated by revenue  
 Source: Natixis, Bloomberg, IC Insights, TrendForce, WIND

## CHINA SEMICONDUCTOR: MONEY RAIN NOT ENOUGH TO ACHIEVE “MANUFACTURING 2025”

There is no secret behind China's appetite for the semiconductor industry and now also the containment from the US on China's ambition. In March 2018, China introduced the second recapitalization round of its flagship semiconductor investment fund of up to 200 RMB billion (32 USD billion) and additional tax breaks. To put the size of this investment fund into context, it is close to Samsung's annual capital expenditure in 2017, also equal to one-third of global investment in the semiconductor industry. In this note, we examine the emerging role of China in the global semiconductor market, the Chinese government support to the domestic industry and evaluate the potential success.

**Money is raining down** from China's government and SOE contributed fund to support semiconductor industry development. Apart from direct funding, the tax rate of Chinese semiconductor firms is only 11%, lower than that of its peers. Funding costs are also kept low at 2.2% and debt is sometimes even waived in extreme cases.

**The reason for such money rain is that China is the largest market for producers of semiconductors, but supply is still dominated by foreign corporates.** The situation is actually much worse with a granular analysis. Chinese manufacturers only have larger market share in lower end of the curve, namely outsourced assembly and test (OSAT). For the higher end, China only has 7-8% market share (wafer supplies, fabless and foundry). At the top of the value chain (integrated device manufacturer and equipment), no Chinese firm can enter the top 10 league table.

**Government money should help Chinese semiconductor producers to put pressure on existing competitors at the lower-end on the value chain and increase market share.** For the higher end, the reality is that M&A will be needed but the key markets (mainly the US, followed by Japan and Europe) are increasingly closed to Chinese acquisitions due to investment scrutiny. Europe remains as the easiest target among the three most relevant ones though.

**All in all, Chinese semiconductor firms will grow rapidly from a small base and pose challenges to lower-end firms, but the technological bottleneck is a big hurdle before confronting global market leaders at the high end of the production chain.** China's goal of 75% domestic production of semiconductors by 2025 seems thus ambitious, even with the massive financial resources offered by the government.



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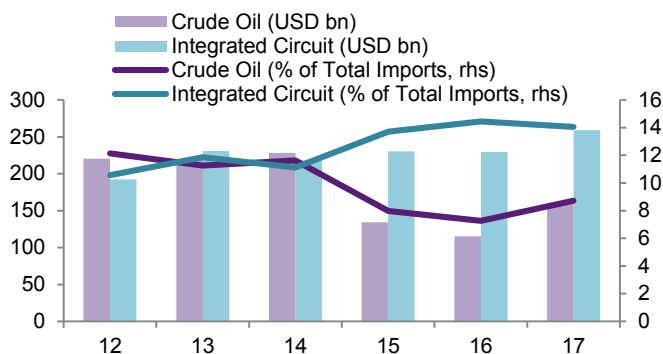
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## China has a dream in semiconductors

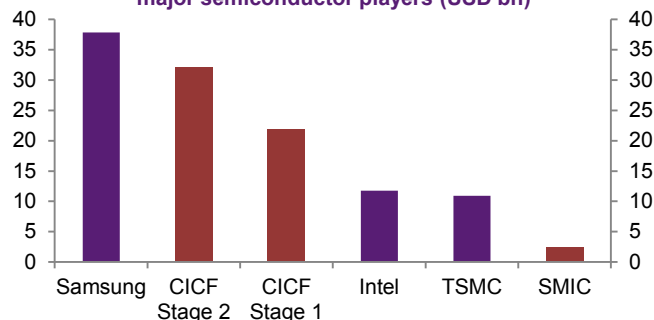
There is no secret behind China's appetite for the semiconductor industry, and now also [the containment from the US on China's ambition](#). Semiconductor has been put as the key priority in the "Made in China 2025" strategy. The goal is difficult but the reason is simple. The semiconductor industry is the most important aspect of the value added chain for electronics and the enabler for future technological application, but China's production capability is rather limited. In fact, integrated circuit has already overtaken oil as China's top imports since 2015 and contributes to 14% of total value (**Chart 1**). Although falling oil price is one of the reasons, this still shows China is very dependent on external sources for semiconductors.

**Chart 1**  
Semiconductor overtook oil as China's top imports



Source: Natixis, CEIC

**Chart 2**  
Size of China Integrated Circuit Industry Investment Fund comparing to annual capex of major semiconductor players (USD bn)



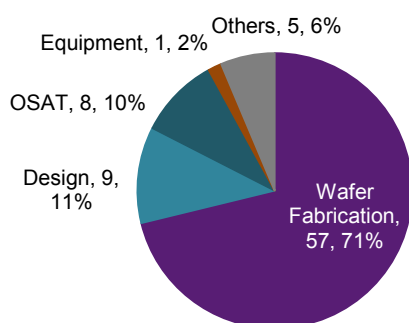
Source: Natixis, Bloomberg

While a successful story in semiconductors may require various elements, there is certainly no shortfall in government support in China, especially in monetary terms. In March 2018, China announced the second recapitalization round of its flagship semiconductor investment fund of up to 200 RMB billion (32 USD billion) and introduce additional tax breaks. To put the size of this investment fund into context, it is close to Samsung annual capital expenditure in 2017, also equivalent to one-third of global investment in the semiconductor industry and as well as one-third of Taiwan Semiconductor Manufacturing Company (TSMC) or Intel (**Chart 2**). In this note, we examine the emerging role of China in the global semiconductor market, the Chinese government support to the domestic industry and evaluate the potential success.

## Money raining down from resolute government support

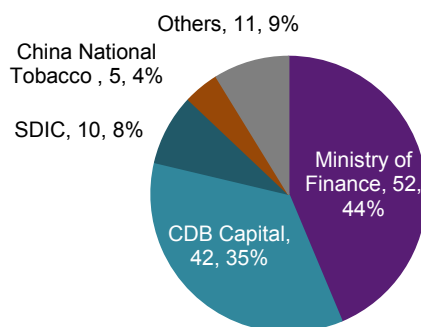
**To achieve the target for innovation-driven development, China is supporting the semiconductor industry through direct capital injections, low tax rate and preferential loan treatment.** Money is raining down from China's government and SOE contributed fund to support the semiconductor industry development. China Integrated Circuit Industry Investment Fund, also known as the "Big Fund", was launched in 2014 with capital of 139 RMB billion (22 USD billion) for investments in wafer fabrication, chip design and outsourced semiconductor assembly and test (OSAT). 71% of the fund is allocated to wafer fabrication due to the domestic production target in the "Made in China 2025" due to the capital intensive nature of the segment (**Chart 3**). This is a very obvious government support initiative as funding source as 44% of the fund is contributed by the Ministry of Finance, with the rest being shared by state-owned enterprises (SOEs), such as China Development Bank Capital Corporation, State Development & Investment Corporation and China National Tobacco Corporation (**Chart 4**). See **Appendix** for the full lists.

**Chart 3**  
China Integrated Circuit Industry Investment Fund Portfolio (RMB bn, %)



Source: Natixis, Company Data

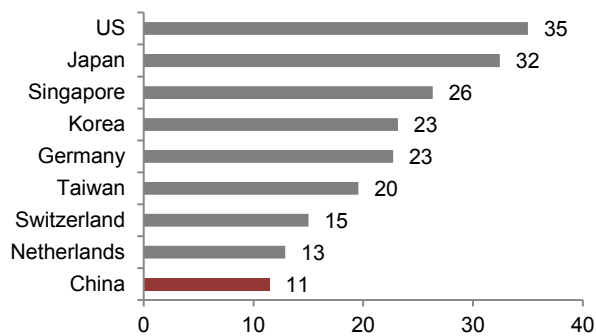
**Chart 4**  
China Integrated Circuit Industry Investment Fund by Investor (RMB bn, %)



Source: Natixis, Company Data

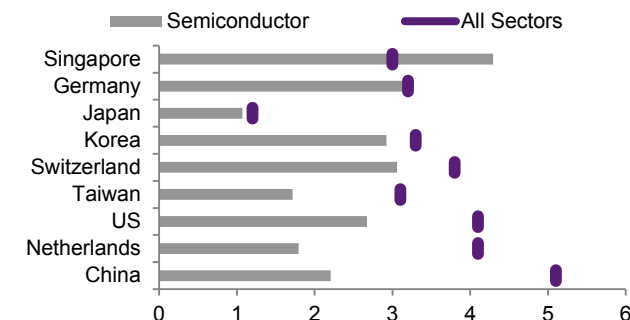
Apart from direct funding, the tax rate of Chinese semiconductor firms is only 11%, lower than that of its global peers (**Chart 5**). The effective tax rate in Chinese semiconductor firms is only 11%, drawing deep contrast to 35% in the US. In addition, Chinese semiconductor firms also enjoy a lower interest rate at 2.2%, which is lower than the asset weighted interest rate of 5.1% (**Chart 6**). Such interest rate differentials also exist in other locations the difference is much smaller than China.

**Chart 5**  
Effective Tax Rate for Semiconductor Firms (%)



N.B. Top 200 listed semiconductor firms. Companies without sufficient data excluded.  
Source: Natixis, Bloomberg

**Chart 6**  
Interest Rate for Semiconductor Firms (%)



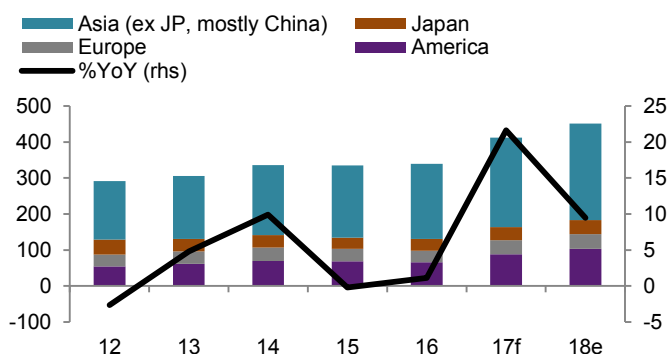
N.B. Calculated from our sample of 3000 Chinese and global corporates by asset size in Natixis China Corporate Monitor  
Source: Natixis, Bloomberg

The exemption of the loan is also apparent in technological or semiconductor industry with the strong support from local government. On 22<sup>nd</sup> Jan 2018, BOE Technology, covering display device, smart system and healthcare services, signed the “Debt Waiver Agreement of the Investment Framework on the 8.5 New Semiconductor Panel” with Fuzhou government and Fuzhou Urban Construction Investment Group. The agreement offered 6.3 RMB billion (1 USD billion) debt relief, amount to 10.6% of debt, thus the BOE Technology’s 2017 financial result gains about 900 RMB million (143 USD million). A previous case is that TCL announced that its subsidiary, China Star Optoelectronics Technology, which produced LCD panels, were agreed to be forgiven 5.1 RMB billion (0.8 USD billion) loans on the 8.5 generation TFT-LCD project by Shenzhen government. The exemption had positive impact on 2013 financial results with 380 RMB million (60 USD million) gain and 27% of debt cleared up.

### China as the largest market for semiconductors but a very limited supplier

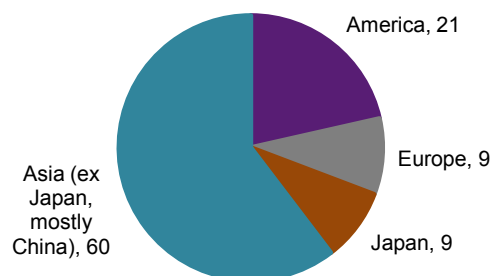
**The reason for the money rain is that China is the largest semiconductor market, but the supplies are very dominated by foreign corporates.** China has become the largest consumer in semiconductors both for external and internal demand. From a global perspective, China is the final stop of the global supply chain and assembly lines, and therefore the demand for semiconductor has risen for production in electronics.

**Chart 7**  
Demand of Semiconductor (USD bn)



Source: Natixis, SEMI, WIND

**Chart 8**  
Demand of Semiconductor (2017, %)

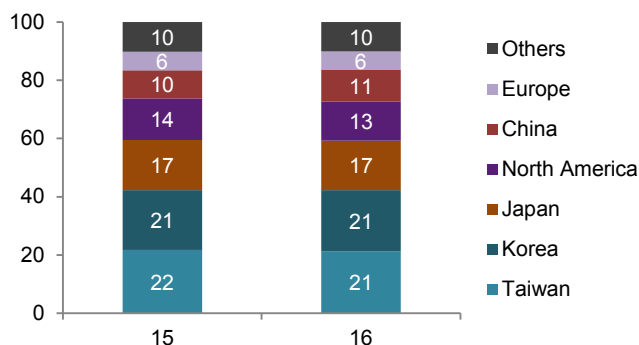


Source: Natixis, SEMI, WIND

More importantly, the evolution in mobile computing, internet of things, virtual reality, big data and new vehicles both from external and internal demand means semiconductors are only going to be increasingly vital to redefine future industrial production. Semiconductor Equipment and Materials International (SEMI) has forecasted that sales of semiconductor products will grow 9.5% in 2018 (**Chart 7**). From a geographical perspective, 60% of sales are located in Asia (excluding Japan) and mostly in China (**Chart 8**).

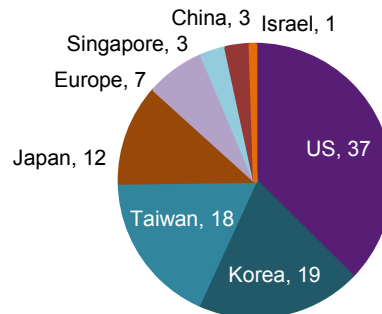
In the “Made in China 2025” plan, domestic production is a clear goal and this hinges on the advancement in wafer fabrication, which China has been working hard to catch up. This multi-step process is used to create integrated circuits on silicon wafers with large barrier to entry due to its high capital and technological intensity. China only owns 11% of worldwide wafer capacity as of 2016 but things are about to change (**Chart 9**). With a stronger push from government policies, 26 out of 62 foundries are going to be built in China in 2017-2020 accordingly the estimate by SEMI. The share of wafer capacity in China is very likely to further increase.

**Chart 9**  
Wafer Capacity (%)



Source: Natixis, IC Insights

**Chart 10**  
Supply of Semiconductor (2017, %)

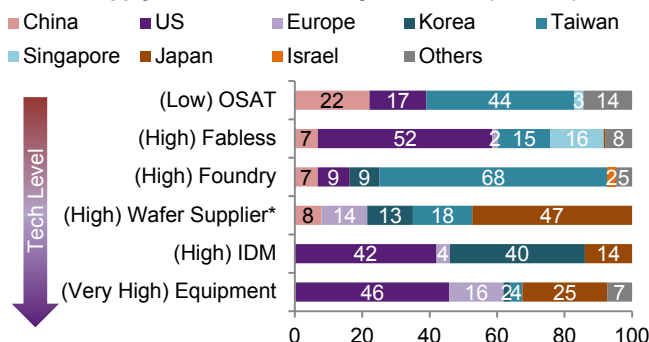


N.B. Calculated by revenue  
Source: Natixis, Bloomberg, IC Insights, TrendForce, WIND

And of course, producing in China does not necessarily mean Chinese corporates are performing well as the industry could be still dominated by foreign capital, especially when the US owns 44% of total market share by revenue, followed by Korea and Taiwan (**Chart 10**).

The situation is actually worse with a more granular analysis. Chinese manufacturers only have larger market share in the lower-end, namely outsourced assembly and test (OSAT) (**Chart 11**). For the higher end, though, China only has 7-8% market share (wafer supplies, fabless and foundry). At the top of the value chain for the manufacturing sector (integrated device manufacturer and equipment), no Chinese producer can enter the top 10 league table. An IDM is a company who combines the designing, manufacturing and selling process instead of pure specialization.

**Chart 11**  
Supply of Semiconductor by Subsector (2017, %)

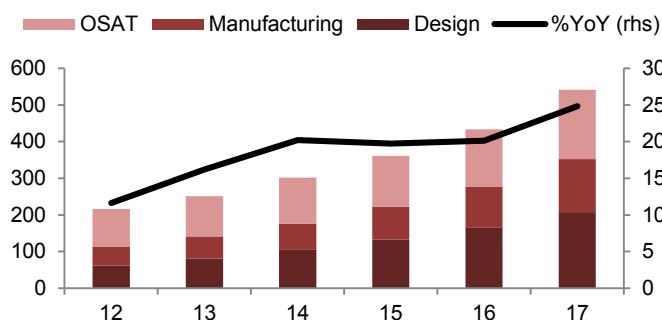


\* Assumed corporates out of the Top 6 are China affiliated corporates  
Source: Natixis, Bloomberg, IC Insights, TrendForce, WIND

### Capital is important, but even more so for technology

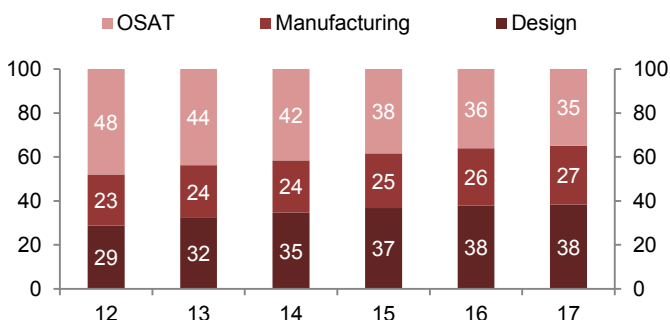
It is also because of the present limited role of Chinese corporates that the Chinese government decides to make a stronger push to growing domestic firms for market share. Therefore, it is necessary to look at the development in China to evaluate the impact on the global semiconductor industry. According to China Semiconductor Industry Association (CSIA), the market for integrated circuits in China is growing rapidly at the speed of 25% YoY in 2017 (**Chart 12**). The increasing share in manufacturing from 23% in 2012 to 27% in 2017 further shows China is moving up the technological ladder instead of assembling and testing (**Chart 13**). To a less extent, taking into account that foreign capital plays a vital part, China has at least managed to lure the production bases to its own land.

**Chart 12**  
China: Sales in Integrated Circuit Industry (USD bn)



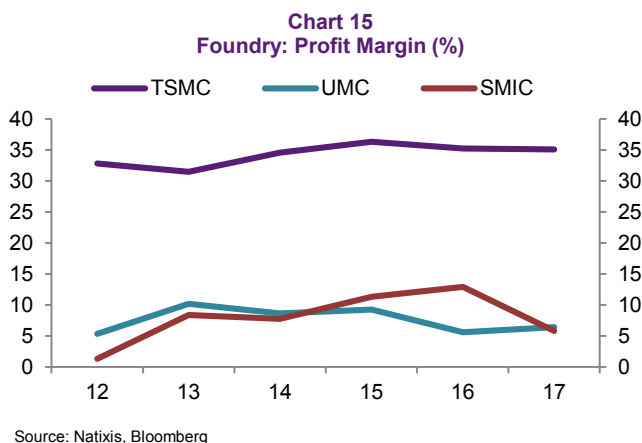
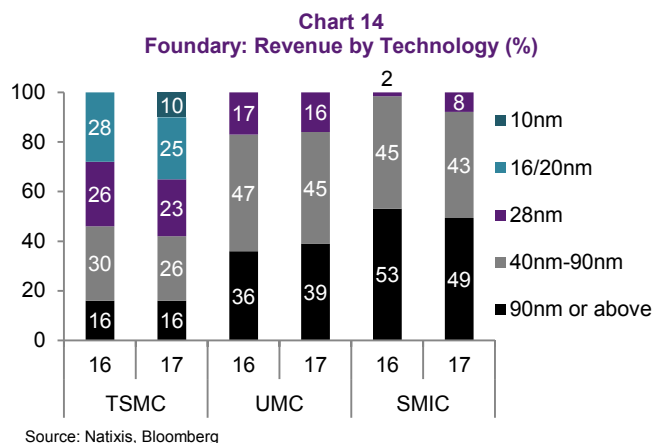
Source: Natixis, WIND

**Chart 13**  
China: Sales in Integrated Circuit Industry (%)



Source: Natixis, WIND

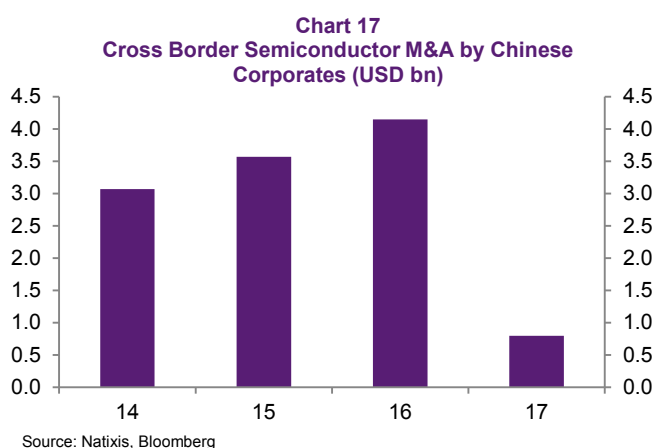
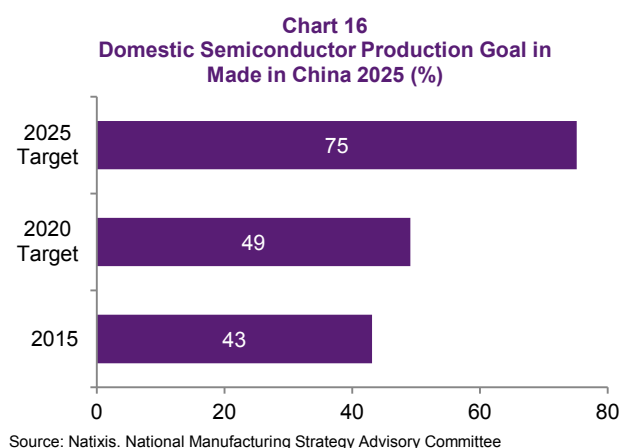
The smaller the wafer size, the more advance it is. However, if we look at the technological progress, the challenges for TSMC, the market leader with 56% of market share among foundries, is still limited as 35% of revenue is already generated from technologies more advanced than 28nm (**Chart 14**). For China, Semiconductor Manufacturing International Corporation (SMIC) is the leader in domestic foundries and observed an increase in the share of revenue from 2% in 2016 to 8% in 2017 from 28nm production. The capacity has expanded from 247,500 units in 2014 to 442,750 units in 2017, equivalent to 179% increase in 3 years. **The quick expansion of capacity means Chinese firms will pressure existing lower-end corporates to increase market share. A small profit margin will not be impediment as government support is increasingly obvious (Chart 15).**



The above shows that it is quite positive for China to gain market share for lower-end products, and market leaders with advanced technologies is still shielded until there is major breakthrough. For the higher-end of the curve, there are three ways to close the technology gap, i.e. a) talents; b) research and development; and a) mergers and acquisitions. The first two ways are inter-correlated and more sustainable. It is very common to hear Chinese firms offer attractive remunerations for talents from current market leaders, aiming at further expanding the R&D capability.

### Money is one thing but the ability to purchase is another

The last option is the quickest way. Acquisition with a premium price was a popular way for Chinese corporates to gain quick access to technologies between 2014 and 2016, but the situation is increasingly difficult due to tougher investment scrutiny. The cross border semiconductor M&A deals by Chinese corporates has fallen 81% in 2017 (**Chart 17**). The tough stance from the Trump administration on investment suggests that it is rather impossible for China to gain technological access from the US.



For the higher end, the reality is that M&A will be needed and the key markets (mainly the US, followed by Japan and Europe) are increasingly closed to Chinese acquisitions due to investment scrutiny. To a lesser extent, China also faces increasing investment barrier in other countries in the EU and Asia Pacific. The two regions have at least 31% of market share in semiconductor equipment, of which China is desperate for. Europe remains as the easiest target among the three most relevant ones though.



All in all, Chinese semiconductor firms will grow rapidly from a small base and pose challenges to lower-end firms, but the technological bottleneck is a big hurdle before confronting global market leaders at the high end of the semiconductor production chain. China's goal of 75% domestic production of semiconductors by 2025 seems thus ambitious, even with the massive financial resources offered by the government.

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[Which Chinese sectors are more exposed to a global trade war?](#) (22 Mar 2018)

## Appendix

**Table 1: Portfolio of China Integrated Circuit Industry Investment Fund**

| Industry          | Ticker     | Company  | Investment Cost (RMB bn) | Ratio of Shareholding (%) |
|-------------------|------------|--|--------------------------|---------------------------|
| Wafer fabrication |            |  |                          |                           |
|                   | 00981.HK   | Semiconductor Manufacturing International Co.        | 16.0                     | 15                        |
|                   | Not listed | Yangtze Memory Technology Co.                        | 19.0                     | 25                        |
|                   | Not listed | Shanghai Huali Integrated Circuit Manufacturing Co.  | 11.6                     | -                         |
|                   | 600703.SH  | Sanan Optoelectronics Co.                            | 9.0                      | 11                        |
|                   | 600460.SH  | Hangzhou Silan Jiwei Microelectronics Co.            | 0.6                      | 49                        |
|                   | 01347.HK   | Hua Hong Semiconductor Limited                       | 0.9                      | 19                        |
|                   | 03355.HK   | Advanced semiconductor manufacturing Co.             | -                        | 14                        |
| IC design         |            |  |                          |                           |
|                   | 000938.SZ  | Tsinghua Unigroup                                    | -                        | -                         |
|                   | 002180.SZ  | Ninestar Corporation                                 | 0.5                      | 4                         |
|                   | 300672.SZ  | Hunan Goke Microelectronics Co.                      | 0.4                      | 16                        |
|                   | 002151.SZ  | Beijing BDStar Navigation Co.                        | 1.5                      | 11                        |
|                   | 000063     | Sanechips Technology Co.                             | 2.4                      | 24                        |
|                   | 02239.HK   | SMIT Holdings  | -                        | 10                        |
|                   | Not listed | Centec Networks                                      | -                        | -                         |
|                   | 603010.SH  | Zhejiang Wansheng Co.                                | -                        | 7                         |
|                   | 603986.SH  | Gigadevice Semiconductor(beijing)                    | 1.5                      | 11                        |
|                   | 603160.SH  | Shenzhen Goodix Technology Co.                       | 2.8                      | 7                         |
| IC packaging      |            |  |                          |                           |
|                   | 600584.SH  | Jiangsu Changjiang Electronics Technology Co.,       | 4.5                      | 19                        |
|                   | 002185.SZ  | Hua Tian Technology (Xi'an)                          | 0.5                      | 27                        |
|                   | 002156.SZ  | TongFu Microelectronics Co.                          | 1.9                      | 16                        |
|                   | 603005     | China Wafer Level CSP Co.                            | 0.7                      | 9                         |
| IC equipment      |            |  |                          |                           |
|                   | Not listed | Advanced Micro-Fabrication Equipment Inc             | 0.5                      | -                         |
|                   | 300604.SZ  | Hangzhou Changchuan Technology Co.                   | 0.0                      | 8                         |
|                   | Not listed | Shenyang Piotech Co.                                 | 0.2                      | -                         |
|                   | 002371.SZ  | NAURA Technology Group Co.                           | 0.6                      | 8                         |
|                   | Not listed | Raintree Scientific Instrument (Shanghai) Co.        | -                        | -                         |
|                   | US: ACMR   | ACM RESEARCH,INC.                                    | -                        | -                         |
| IC material       |            |  |                          |                           |
|                   | Not listed | Silicon industry investment                          | -                        | -                         |
|                   | Not listed | Jiangsu Xinhua Semiconductor Material Technology Co. | -                        | -                         |
|                   | Not listed | Anji Micro (Shanghai) Co.                            | -                        | -                         |
|                   | Not listed | Darbond Technology Co.,                              | -                        | -                         |
|                   | 002409.SZ  | Jiangsu Yoke Technology Co.                          | 0.6                      | 6                         |
|                   | 600160     | Juhua Holding  | 0.4                      | -                         |
|                   | 832990     | Chuangda Advanced Materials Co.                      | 1.0                      | 5                         |
| Others            |            |  |                          |                           |
|                   | 300456.SZ  | NAV Technology Co.                                   | 2.0                      | 11                        |
|                   | 300474.SH  | Changsha Jingjia Microelectronics Co.                | 1.2                      | -                         |


N.B. Investments in 2018 are marked light purple  
 Source: Natixis, Company Data

**Table 2: Decomposition of China Integrated Circuit Industry Investment Fund**

| Institution  | Amount (RMB bn) | Share (%) | Type       |
|--|-----------------|-----------|------------|
| Ministry of Finance  | 52.34           | 43.68     | Government |
| China Development Bank Capital Co.                         | 41.98           | 35.03     | SOE        |
| State Development & Investment Co.                         | 10.00           | 8.34      | SOE        |
| China National Tobacco Corporation                         | 4.99            | 4.16      | SOE        |
| Shanghai Guosheng Group Co.                                | 2.27            | 1.89      | SOE        |
| China Mobile   | 2.27            | 1.89      | SOE        |
| Wuhan Financial Holdings (Group) Co.                       | 2.27            | 1.89      | SOE        |
| Beijing E-Town International Investment & Development. Co. | 1.63            | 1.36      | SOE        |
| China Unicom   | 0.64            | 0.53      | SOE        |
| China Telecom  | 0.64            | 0.53      | SOE        |
| Datang Telecom Technology & Industry Group                 | 0.23            | 0.19      | SOE        |
| China Electronics Corporation                              | 0.23            | 0.19      | SOE        |
| China Electronics Technology Group Co.,                    | 0.23            | 0.19      | SOE        |
| SINO-IC Capital Co.  | 0.05            | 0.05      | POE        |
| Digital Time Investment Co.                                | 0.05            | 0.04      | POE        |
| Tsinghua Unigroup  | 0.05            | 0.04      | SOE        |

Source: Natixis, Company Data


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