

Exceptional relative performance

China's impact on the semiconductor industry 2012 update

Chapter 2: China's
semiconductor
industry

July 2012

About this report

In 2004, PwC released its original report, *China's impact on the semiconductor industry*, in response to our clients' interest in the rapid growth of the semiconductor industry in China. Specifically, clients wanted to find out whether China's production volumes would contribute to worldwide overcapacity and a subsequent downturn in the industry. For the past seven years, we have provided updates that included an analysis of both the semiconductor market (consumption) and industry (production). We also covered design, the value chain and possible production growth scenarios along with a number of other topics.

Because the report relies on a number of data sources, we have been unable to deliver it in full until the fourth quarter of the following year. This year, in an effort to get you this vital information in a more timely fashion, we have chosen to release the report in a tiered fashion. This is the second chapter in the series. Please note that figure and table numbering continue from the first chapter, thus the first figure in this chapter is numbered 8 rather than 1. In the coming weeks, we will release additional chapters, until we have covered as much material as in previous reports. At the end of the release period, you will be able to download a complete pdf file of the full report.

Please visit www.pwc.com/chinasemicon over the next several weeks to read or download each chapter of this year's report.

Chapters released to date include:

- 1. Market and industry overview*
- 2. China's semiconductor industry*
- 3. Design in China*

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China's semiconductor industry grew by 14.4% to reach a record \$43.5 billion—more than 10X greater than that of the total worldwide semiconductor industry.

From 2001-2011 China's semiconductor industry has achieved a 10-year compounded annual growth rate of 24%.

China's IC consumption/production gap increased by \$13.2 billion to reach \$100.5 billion for 2011.

China's IC design sector has grown from less than \$200 million in 2001 to more than \$7 billion in 2011—a 45% compounded annual growth rate.

Of the 160 semiconductor wafer fab facilities in operation in China at the end of 2011, 79 are located in the East China region (64% of capacity).

Strong but variable growth

Chapter 2: China's semiconductor industry

As highlighted in Chapter 1, China's 2011 semiconductor performance far exceeded the worldwide industry! Both China's semiconductor consumption market and semiconductor industry growth were more than ten times greater than worldwide semiconductor industry growth.

A significant portion of that exceptional growth of China's semiconductor industry was attributed to the IC design or fabless sector, which grew by more than 36% in 2011. From the Chinese perspective, five percentage points of that increase was the result of China's continuing revaluation of the RMB. Measured in local (RMB) currency, China's semiconductor industry grew by 9.3% in 2011, less than half of what Chinese officials had forecast, but still several times greater than the total worldwide industry.

Production growth

China's semiconductor industry grew by 14.4% in 2011 to reach a record \$43.5 billion. From 2001 through 2011, China's semiconductor industry has achieved a ten-year compounded annual growth rate (CAGR) of 24% measured in US dollars (or 21% measured in local RMB currency). During 2011, almost \$8 billion of additional fixed-asset investments were made in China's semiconductor industry, down 13% from the slightly more than \$9 billion in investments made in 2010. Of that amount, almost \$5 billion was invested in the integrated circuit (IC) industry, 34% less than in 2010. More than \$3 billion was invested in the optoelectronics-sensors-discretes (O-S-D) sector.

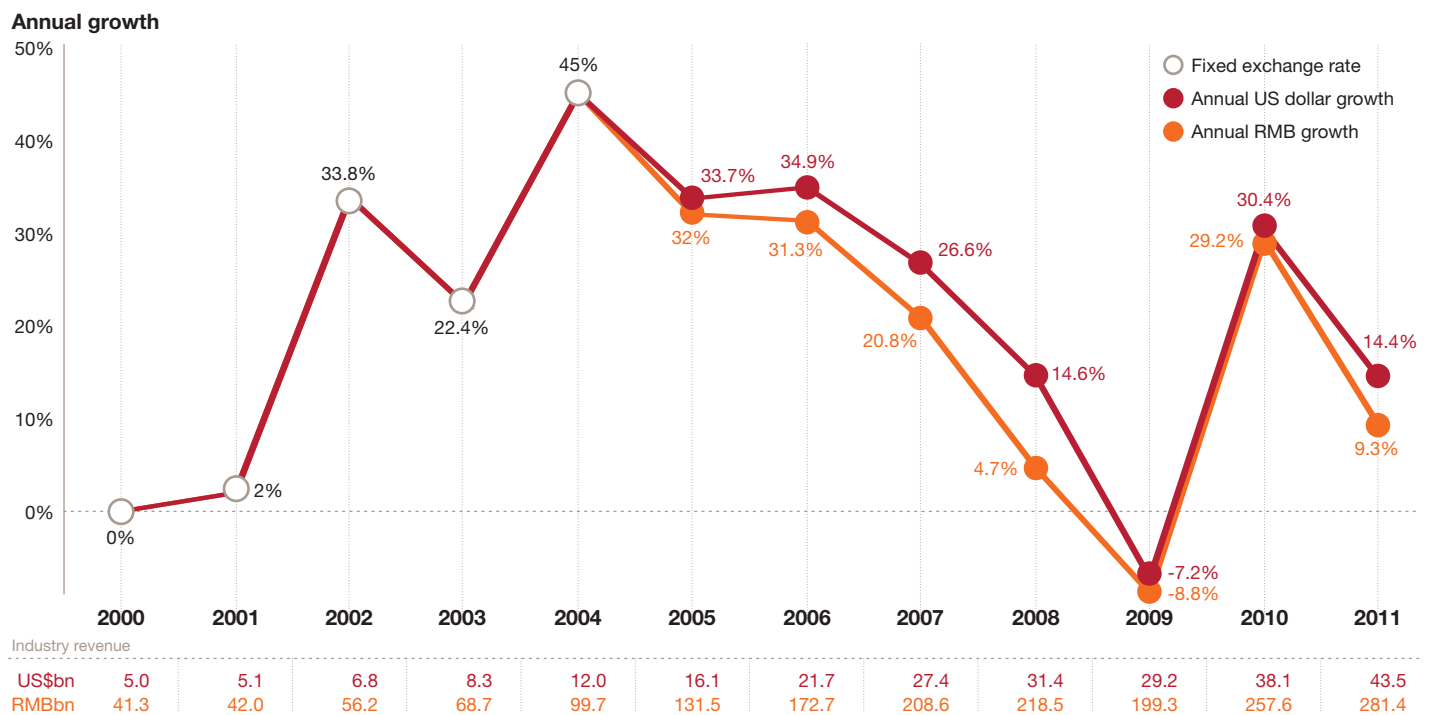
China's semiconductor industry grew by 14.4% in 2011 to reach a record \$43.5 billion. Measured in US dollars, China's semiconductor industry growth was more than ten times greater than that of the total worldwide semiconductor industry.

Because of the way the CCID and CSIA compile their data without any eliminations or offsets, it is very probable that there will be instances of double-counting between sectors.¹ As a result, we have measured China's impact on the semiconductor industry through multiple comparisons. Based upon a comparison between China's reported semiconductor industry revenue and the sum of worldwide semiconductor device sales, plus foundry and semiconductor assembly and test services (SATS) revenue, China's semiconductor industry accounted for 12.2% of the worldwide semiconductor industry in 2011, up from 10.8% in 2010, 11.0% in 2009, 10.7% in 2008 and, more significantly, up from just 2% in 2000.

Alternatively, a more conservative comparison against the sum of device sales revenue, plus the value of all wafer fabrication and packaging, assembly and test production indicates that China's semiconductor industry accounted for at least 9% of the worldwide semiconductor industry in 2011. Both comparisons make it clear that China's share of the worldwide semiconductor industry is growing, becoming noticeable and significant.

The overall performance of China's IC industry (the sum of IC design, IC wafer manufacturing and IC packaging and testing) in 2011 generally corresponded to that of China's total semiconductor industry. China's

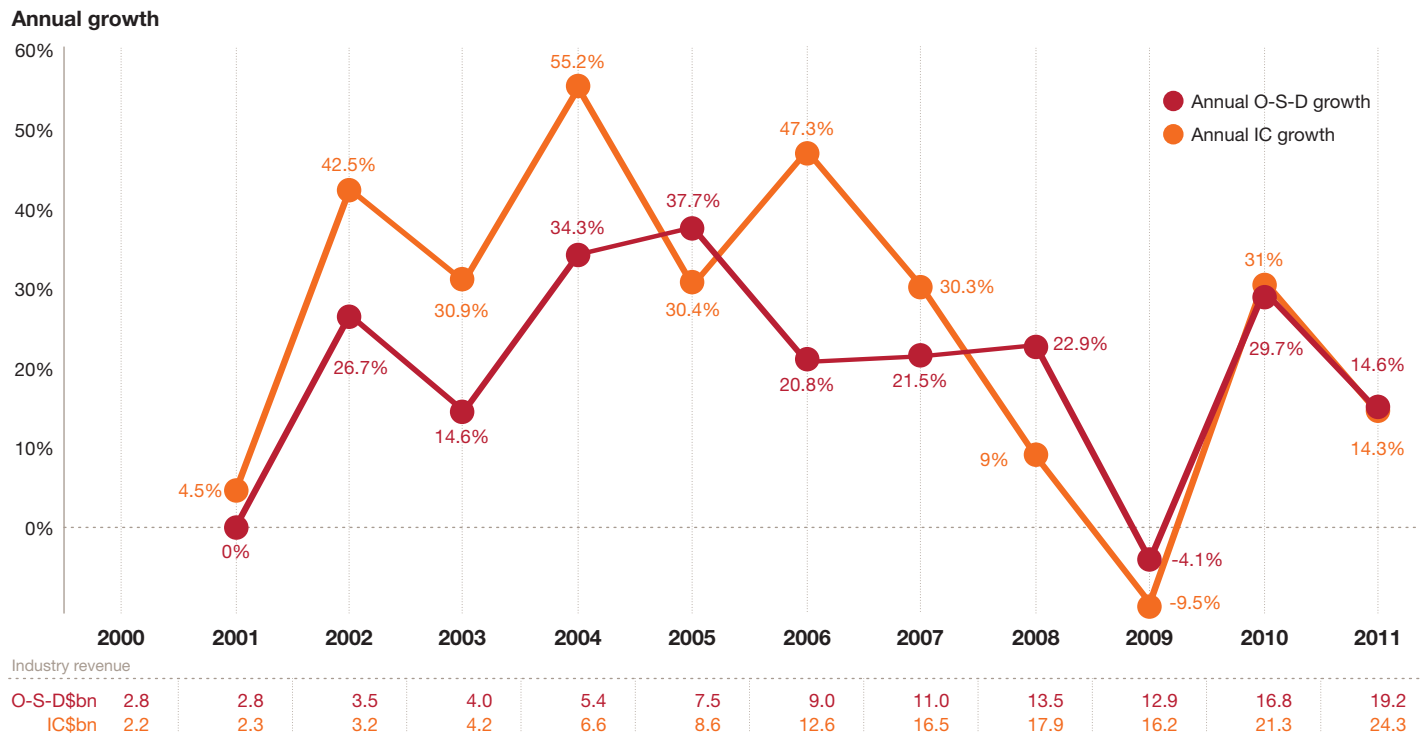
Figure 8: China's semiconductor industry revenue growth, 2000–2011



Source: CCID, CSIA

1 A more thorough discussion of interpreting China semiconductor statistics can be found in the Appendix to our 2011 Update report at www.pwc.com/chinasemicon.

Figure 9: China's O-S-D and IC industry revenue growth, 2000–2011



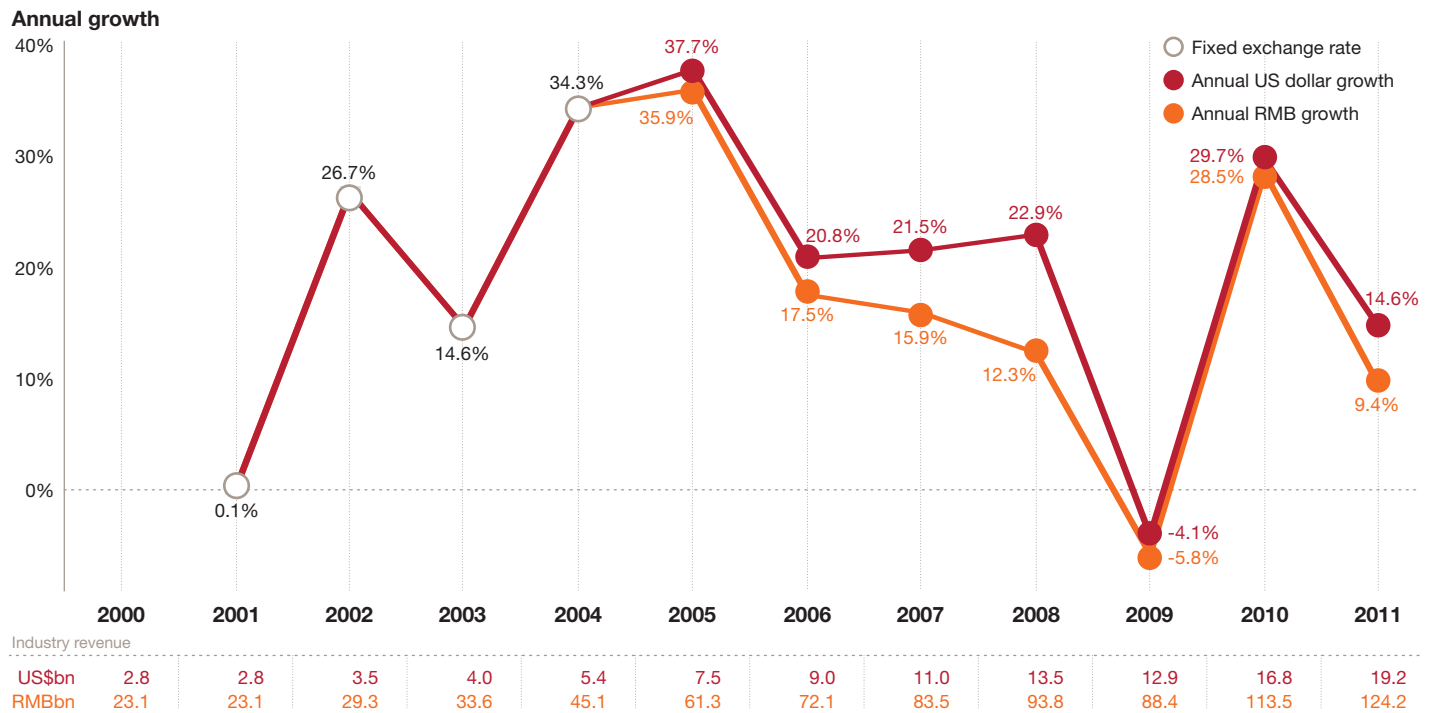
Source: CCID, CSIA

IC industry revenues, measured in dollars, increased by 14.3% to slightly more than \$24 billion in 2011. The same IC industry revenues reported in local RMB currency increased by just 9.2% to 157.2 billion RMB in 2011 after increasing by almost 30% to 144.0 billion RMB as part of the industry recovery in 2010. However, the three sectors of China's IC industry continue to perform quite differently. Thanks to both a booming domestic demand and the worldwide market recovery, China's IC design sector repeated its 2010 performance and grew a further 36% to a new record \$7.3 billion. The other two sectors, which have greater export dependence and multinational company involvement and had been much more adversely affected by the global recession in 2009, were again impacted by the market slowdown in 2011. Despite several companies experiencing revenue declines, IC

manufacturing, which includes China's wafer foundries, reported a 14% dollar revenue growth in 2011 as a result of the successful start up of Intel's 300mm Fab 68 in Dalian. Measured in local RMB currency, IC manufacturing revenues grew by 8.9% in 2011, slightly more than the 8.5% average growth of the past five years. IC packaging and testing, which includes both multinational SATS (semiconductor assembly and test services) and captive facilities, was impacted by a significant reduction in overseas orders and reported a local RMB currency revenue decline of almost 3% and a less than 2% dollar revenue growth in 2011.

According to the China Semiconductor Industry Association (CSIA), China's IC industry unit production increased by 10% in 2011, while unit average selling price (ASP) increased by 3%. Since China's IC industry unit output

Figure 10: China's O-S-D industry revenue growth



Source: CCID, CSIA

is heavily determined by IC packaging and testing output, this change probably reflects changes in relative unit mix rather than individual unit prices. Based upon revenue values, China's IC industry achieved an overall self-sufficiency ratio of about 20% (ratio of production versus consumption value) in 2011, which was about the same as achieved in 2010. However, based upon the CSIA's reported unit volumes, China's IC industry unit self-sufficiency ratio for 2011 could have been much greater.

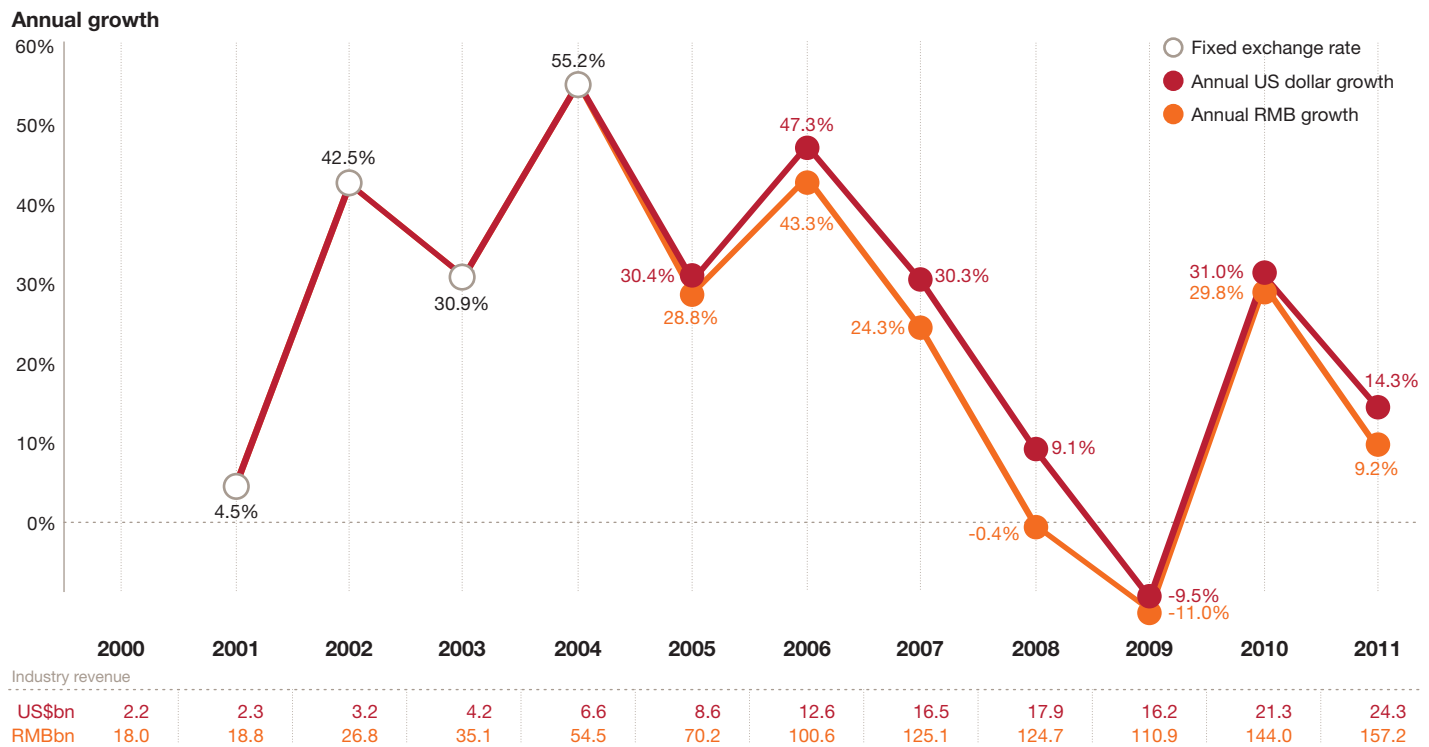
China's O-S-D sector performance in 2011 was slightly better than China's semiconductor industry and much better than the worldwide O-S-D performance. China's O-S-D sector revenues increased 14.6% measured in dollars (or about 9% reported in RMB) in

2011, while the worldwide O-S-D industry grew by 8.5%. Because of CSIA reporting protocols, China's reported O-S-D industry sector revenues may not include optoelectronic devices other than LEDs or sensor devices. As a result, China's O-S-D revenues for 2011 may be understated by as much as 6%. China's reported O-S-D production unit output increased by about 5% in 2011, while unit ASPs increased by 10%. Based upon revenue values, China's reported O-S-D industry achieved an overall self-sufficiency ratio of about 106% (ratio of production versus consumption value) in 2011, which was the highest ever reported and about five percentage points higher than achieved in 2010. 2011 was also the first year in which the value of China's O-S-D exports exceeded the value of China's O-S-D imports.

Power transistors and LEDs were the main contributors to China's O-S-D industry growth in 2011. Power transistors production benefited from the market demand for new energy (wind, solar, etc.), electric vehicles, motor-driven frequency appliances and inverter welder applications, with demand exceeding near-term manufacturing and design capacity. LED production benefited from LEDs achieving a dominant penetration of PC notebook and LCD monitor backlight applications and gradually replacing CCFLs as the mainstream backlighting for large and medium-size LCD panels. At 32%, LED revenue growth in 2011 exceeded that of the overall O-S-D industry growth. LED production revenues grew to more than \$5.5 billion in 2011 and represented 30% of China's O-S-D sector, up from 26% in 2010 and from an average of about 22% during the prior three years.

China's LED industry had been experiencing double-digit growth for several years prior to 2008 since the implementation of China's national semiconductor lighting project. That growth rate, reported in RMB, dropped to 9% in 2008 as a result of the global recession's impact on export production, but recovered to slightly more than 16% in 2009 and 33% in 2010 with the help of government policies. Moreover, during the five-year span from 2006 to 2011 China's LED production dollar revenue has grown at a 28.8% CAGR, one and three quarters times the overall O-S-D CAGR of 16.3% and faster than any other sector of China's semiconductor industry. During 2011, almost 82% of China's LED industry revenues came from packaging and testing and more than 12% from IDM and chip manufacturing.

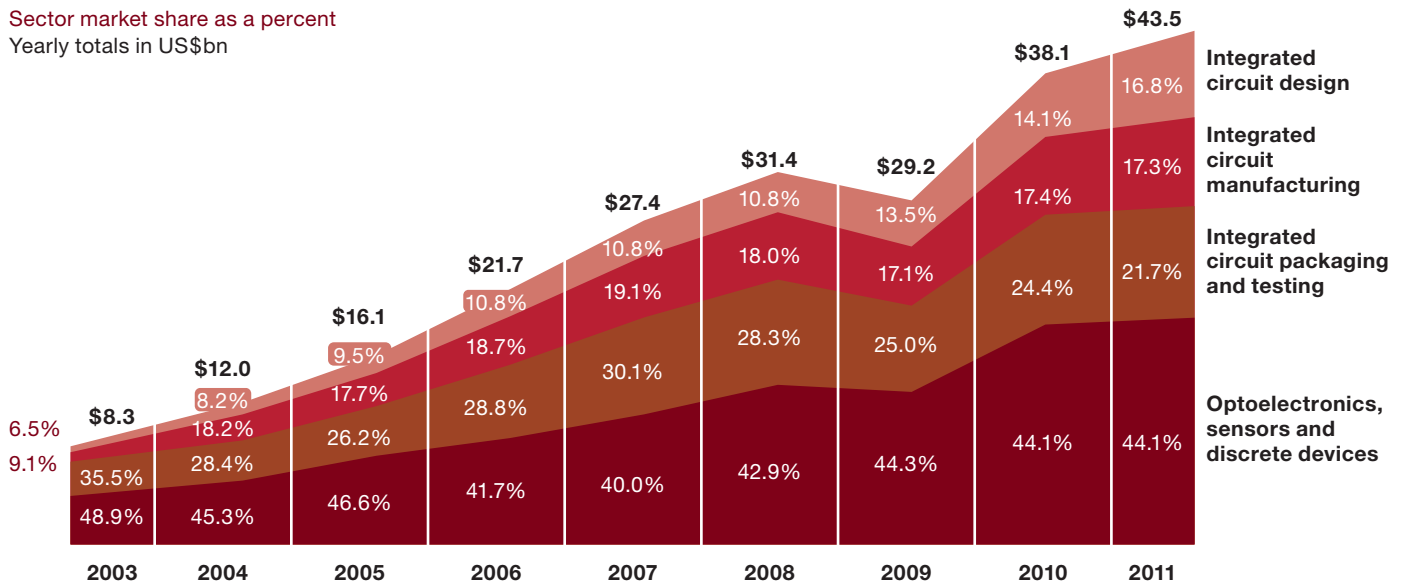
Figure 11: China's IC industry revenue growth



Source: CCID, CSIA

Figure 12: China's semiconductor industry by sector 2003–2011

Sector market share as a percent
Yearly totals in US\$bn



Source: CCID, CSIA, PwC, 2004–2012

An increasing number of foreign LED companies are establishing LED fabs in China. In fact, 25% of the new LED fabs established in China during the last three years were sponsored by foreign LED companies.

China's LED industry has been growing with specific government policy support. China has established 14 national LED industry bases as part of the "National Semiconductor Lighting Project" sponsored by China's Ministry of Science and Technology (MOST). They include Dalian, Hangzhou, Nanchang, Shanghai, Shenzhen, Tianjin, Wuhuan, Xiamen, Yangzhou and Shijiazhuang, among others, where most of China's LED manufacturers are concentrated.

An increasing number of foreign LED companies are establishing LED fabs in China. In fact, 25% of the new LED fabs established in China during the last three years were sponsored by foreign LED companies. Most new LED fabs receive financial support or subsidies from local governments. As of May 2012, there were 83 LED wafer fabrication companies in China, 64 of which were in production, 6 were equipping and ramping into production and 13 were under construction. Most of them have focused on GAN-based epitaxial wafer fabrication and MOCVD (metal organic chemical vapor deposi-

tion) equipment installations. In 2011 the Chinese government instituted a subsidy of 8-10 million RMB on each MOCVD installation in China. That subsidy created a massive increase of MOCVD installations in China. China is rapidly becoming the largest owner of MOCVD systems in the world and is expected to have over a thousand sets of MOCVD tools installed by the end of 2012. However, the rapid influx of MOCVD installations has resulted in concerns about excess capacity, artificially low costs, unfair competition and less concentration on the efficiency of the LED produced. It is estimated that China's current LED fab tool utilization rate is around 35-40%, with 60% of all the MOCVD reactors shipped to China being turned on, with approximately 60% utilization on those tools, implying an overall utilization of between 35%–40%.

In May 2012, China's Ministry of Science and Technology released the 12th Five-Year Plan for Semiconductor Lighting Development, which was designed to address the concerns cited

above, while facilitating continued growth for the LED industry. Increasing the productivity of its LED industry and stimulating LED demand continues to be important to the Chinese government because of LED's potential for positive environmental and economic impact. The Plan calls for an acceleration of LED technology and industrial development with the objective of making China's LED makers more competitive on a global scale and placing China among the world's top three global LED producers.

Industry by sector

The distribution of China's semiconductor industry changed rather significantly in 2011 as a result of the more than double average growth of the IC design (fabless) sector and minimum growth of the IC packaging and testing sector. The IC design sector has been the fastest growing sector over the past ten years, with a dollar revenue CAGR of 45%. It has now grown from less than \$200 million in 2001 to more than \$7 billion in 2011. It had represented almost 11% of China's semiconductor industry for each of the

total semiconductor industry revenue growth. China's IC design sector revenue growth in 2011 represented 46% of China's total semiconductor industry revenue growth.

IC manufacturing, which includes the IC wafer foundries, has been the second fastest growing and most variable sector over the past ten years. It has been noticeably affected by the additions and utilization changes of a relatively few very large wafer fabrication facilities. During the past ten years it has experienced annual dollar revenue growth ranging from a 2004 peak of 190%, down to an almost 12% decrease in 2009, before recovering with a 32% increase in 2010 and a further 14% increase in 2011. The IC manufacturing sector dollar revenue had grown from less than \$400 million in 2001 to \$7.5 billion in 2011, for a ten-year CAGR of 35%. It continued to represent slightly more than 17% of China's semiconductor industry revenue in 2011 as it had in 2009 and 2010, down from 18% in 2008 and 19% in 2007.

IC packaging and testing, which includes multinational and Chinese SATS (semiconductor assembly and test services) as well as multinational captive facilities, continued to remain the second largest sector of China's semiconductor industry in 2011. Over the past ten years, its dollar revenue has grown at an 18.6% CAGR from less than \$2 billion in 2001 to more than \$9 billion in both 2010 and 2011. However, those past ten years includes the largest annual decrease of any sector, a more than 18% drop in 2009 and a nominal 1.8% dollar increase (but 2.8% RMB decrease) in 2011. As a result, the IC packaging and testing share of China's semiconductor industry revenue has further declined to 21.7% in 2011, down from 24% in 2010, 25% in 2009, 28% in 2008 and 30% in 2007, but holding on to the second largest share.

The distribution of China's semiconductor industry changed rather significantly in 2011 as a result of the more than double average growth of the IC design (fabless) sector and minimum growth of the IC packaging and testing sector.

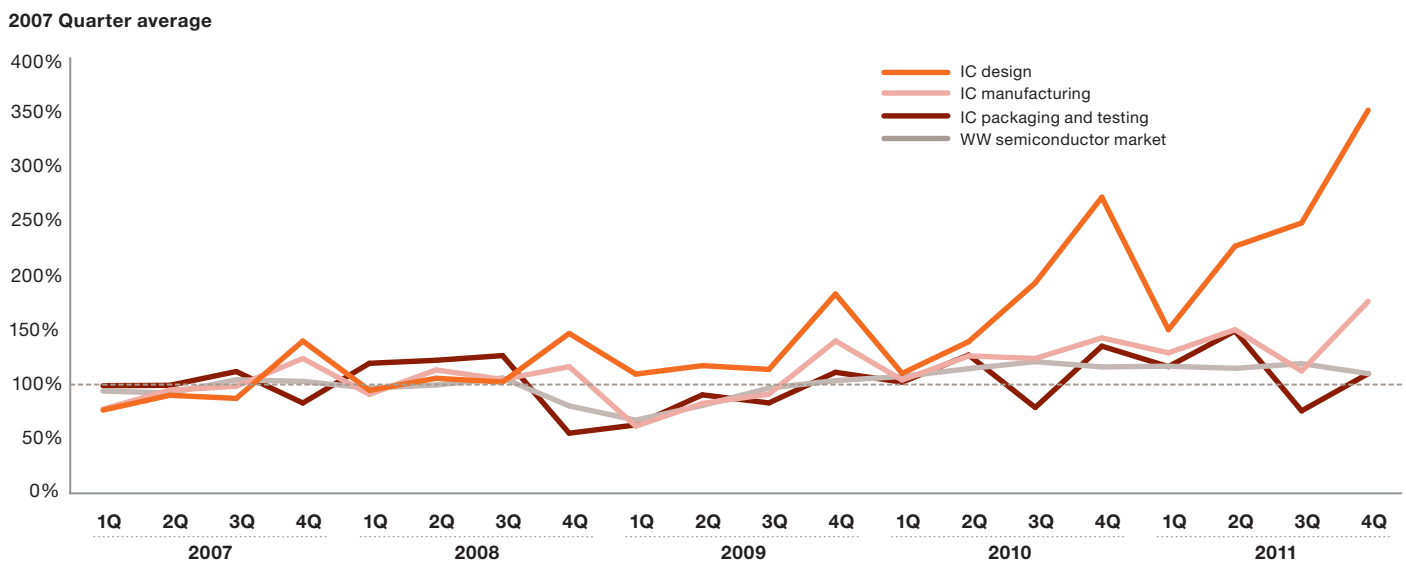
three years 2006, 2007 and 2008, grew to represent 13.5% in 2009, 14.1% in 2010 and now 16.8% in 2011. The sector's growth rate has slowed from 54% in 2006 to 27% in 2007 and 14% in 2008 before increasing to 17% in 2009 and 36% in each of 2010 and 2011. For the first time ever, China's IC design sector revenue growth has contributed more than 20% to the

Although it continues to be somewhat less celebrated or promoted and has often had below-average growth, the O-S-D sector has remained the largest sector of China's semiconductor industry for at least the last ten years since 2001. China's reported O-S-D industry sector revenue consists of just discrete and LED devices and because of CSIA reporting protocols may not include other optoelectronic or sensor devices. As a result, it may be understated. During this ten-year period, the reported O-S-D sector grew from \$2.8 billion in 2001 to more than \$19 billion in 2011 for a CAGR of just over 21%. Measured in dollars, the reported O-S-D sector achieved 14.6% overall growth in 2011 slightly above China's industry average. The LED segment's record 2011 growth of 26.4% was somewhat offset by the larger discrete segment's below-average 3.4% growth. China's O-S-D sector revenue growth in 2011 represented 45% of China's total semiconductor industry revenue growth. As a result, the O-S-D sector remained the largest sector of China's semiconductor industry with slightly more than a 44% share in 2011.

Figure 13 shows the relative performance of the three sectors of China's IC industry during the past five years from 1Q/2007 through 4Q/2011. It compares revenues for each quarter as a percent of 2007 annual average quarter revenue against a similar measure of the worldwide semiconductor market. The dashed reference line is set at 100%. For example, in 1Q/2009 China's IC design sector revenue was 111%, while IC manufacturing dropped to 63%, IC packaging and testing to 64% and the worldwide market to 68% of their 2007 quarter averages.

This figure illustrates the relative strength of China's IC design sector, with all quarters (except 1Q/2008) greater than 100%, and all quarters greater—some quite significantly—than the worldwide semiconductor market. The 4Q/2011 IC design performance was 358% compared to the worldwide semiconductor market's 112%.

Figure 13: Comparison of China IC industry sector growth by quarters, 2007–2011



Note: Comparison of China's IC industry sectors versus worldwide semiconductor market growth by quarter 2007–2011 indexed against 2007 average quarter.

Source: CSIA, SIA quarterly reports

China's IC manufacturing sector, which includes both foundries and IDM wafer fabs, was impacted one quarter later than the worldwide market by the global recession and not quite as extensively. Its relative performance has exceeded that of the worldwide market for 8 of the 12 quarters since 1Q/2009.

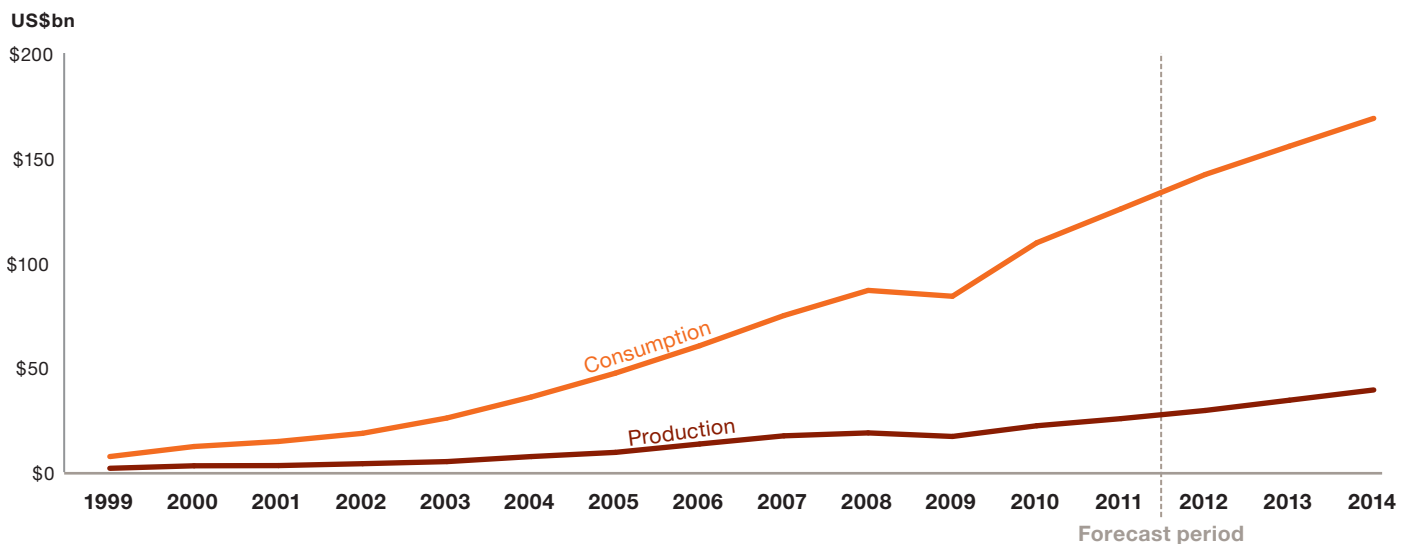
China's IC packaging and testing sector was the most severely impacted by the global recession and has had a weaker and more volatile recovery. It was the first sector to be impacted, with its index dropping more sharply than the worldwide market in 4Q/2008 and had four successive quarters of less than 100%, and three falling below the worldwide market. Its recovery since 1Q/2010 has been variable, with four of the eight quarters through 4Q/2011 being less than the worldwide market, including two, 3Q/2010 and 3Q/2011, when it fell below 100%. It finished 2011 with a 4Q/2011 IC index performance that was fractionally less than the worldwide semiconductor market.

Integrated circuit consumption/production gap

China's exceptional relative semiconductor performance in 2011 was also evident in the continued growth of China's IC consumption/production gap. This gap is the difference between IC consumption and IC industry revenues. Both China's IC market consumption and China's IC industry production increased to new record levels in 2011. As a result, China's IC consumption/production gap also increased to a new record level in 2011. China's IC consumption/production gap increased by more than \$13 billion in 2011 to a new record of \$100.5 billion. Reported in RMB, China's IC industry revenue (production) grew 9.2% in 2011, an increase of 13.2 billion RMB, while China's IC market grew by 9.7%, an increase of 71.6 billion RMB.

Measured in dollars, China's annual IC consumption increased 14.9%, by \$16.2 billion, while IC production increased 14.3%, which was an

Figure 14: Comparison of China's integrated circuit consumption and production, 1999–2014



Actual annual average FX rates used for 1999–2011, and 2011 year-end FX rate used for forecast 2012–2014.

Source: CCID, CISA, PwC 2004–2012

increase of only \$3 billion, Consequently, China's IC consumption/production gap increased by \$13.2 billion to reach \$100.5 billion for 2011. From a Chinese perspective, about one third, 31.5%, of this dollar increase was due to continued revaluation of the RMB. Regardless of the currency, this annual gap had grown dramatically, from \$5.7 billion in 1999 to a record \$100.5 billion in 2011—or from 47 billion RMB in 1999 to 649 billion RMB in 2011—despite all the Chinese government's plans and efforts to contain it. Chinese authorities now expect that it will continue to increase through at least the next three years. According to the China Semiconductor Association (CSIA) 2012 report, China's IC market is forecast to grow to

24% they had forecast for 2013 a year ago. We consider this ratio as more of a measure of parity than one of IC self-sufficiency since China's reported IC industry revenue includes significant production activities, such as foundry wafer fabrication or packaging and testing for IC devices, that are only partially completed in China. As noted in our 2011 Update, one of the stated Ministry of Industry and Information Technology (MIIT) objectives of China's 12th Five-Year Plan is to improve this ratio to 27.5% by 2015.

China's IC consumption/production gap is also reflected in their import/export statistics. In 2011, China's reported imports of ICs increased 8.4% to \$170 billion, while their reported

Measured in dollars, China's annual IC consumption increased 14.9%, to \$16.2 billion, while IC production increased 14.3% which was an increase of only \$3 billion, Consequently, China's IC consumption/production gap increased by \$13.2 billion to reach \$100.5 billion for 2011.

\$168 billion by 2014, with IC industry revenues expected to reach \$38 billion. This forecast implies a further widening of China's IC consumption/production gap to \$130 billion. It is our belief that this gap continues to contribute to the Chinese government's ongoing initiatives to increase indigenous production.

At the same time, the ratio of China's IC production revenue to IC consumption value has shown some further degradation. It had grown with some yearly variability from 16% in 2001 to a peak of 22% in 2007 before declining slightly to 20% in 2009 and 2010 and to 19% in 2011. According to CSIA, this ratio is now expected to increase to 23% by 2014, which is down from the

export of ICs increased 11.4% to \$33 billion. China's IC imports in 2011 accounted for more than 22% of all mechanical and electronic imports and were the second largest amount of all imported products, just 13% less than crude oil imports. In China's foreign trade of mechanical and electrical products, only ICs and LCD panels reported a trade deficit for 2011. The reported deficit for LCD panels was \$18 billion, while that for ICs was \$138 billion. China's reported import/export trade deficit for ICs has more than doubled since 2005. This large and growing deficit reflects China's lack of IC self-sufficiency and its need to rely on imports for core chip and high-end chip products.

China's IC consumption/production gap represents both an opportunity and a challenge for the established multinational semiconductor industry. Over the near term, it continues to represent an unparalleled market opportunity, but over the longer term, it represents a domestic industry void that will inevitably be filled. The question is how will it be filled: will it be a combination transfer and expansion of multinational companies or the emergence and growth of significant Chinese companies?

O-S-D consumption/ production gap and surplus

This is the first update in which we have tried to evaluate China's O-S-D consumption versus production. Actually, it can only be an evaluation of what the CSIA defines as their discrete industry sector since China's reported O-S-D industry sector revenue consists of just discrete and LED devices because the CSIA reporting protocols do not include other optoelectronic or sensor devices. As incomplete as that makes it, we believe that this evaluation may be significant because it is so notably different from the IC consump-

tion/production gap. Since 2005, there has not been a significant difference between China's reported discrete (including LED) production revenues and consumption value. That difference has gone from a moderate \$374 million (5%) gap in 2005 to a modest surplus in 2008 and 2010 and then a notable surplus in 2011.

Both China's O-S-D market consumption and industry production increased to new record levels in 2011. As a result, China's discrete (including LED) production versus consumption surplus also increased to a new record level in 2011. Reported in RMB, China's discrete industry revenue (production) increased 9.6% in 2011, up 10.7 billion RMB, while China's discrete market increased by just 4.1%, up 4.6 billion RMB. Measured in dollars, during 2011 China's annual discrete production increased 14.6%, a rise of \$2.4 billion, to \$19.2 billion, while discrete consumption increased 9.0%, up \$1.5 billion, to \$18.2 billion. Consequently, China's discrete (including LED) production/consumption surplus increased by \$900 million, reaching \$1 billion in 2011. Chinese authorities now expect that this discrete surplus will continue to increase through at least the next three years. According to the China Semiconductor Association (CSIA) 2012 report, China's discrete (including LED) industry revenues are forecast to grow to \$31 billion by 2014, while the discrete market is expected to reach \$24 billion. This forecast implies a continuing growth of China's discrete production/consumption surplus to \$7 billion by 2014.

Over the near term, China's IC consumption/production gap continues to represent an unparalleled market opportunity, but over the longer term, it represents a domestic industry void that will inevitably be filled. The question is how will it be filled: will it be a combination transfer and expansion of multinational companies or the emergence and growth of significant Chinese companies?

China's discrete production/consumption surplus was also reflected in their import/export statistics. In 2011 China's reported imports of discrete (including LED) devices increased 8.3%, to \$17.4 billion, while their exports of discrete devices increased by 11%, to \$33.6 billion. This resulted in a first time ever trade surplus of \$16.2 billion. This implies that China's discrete industry has developed to be of worldwide significance and, although it still needs further improvement in advanced manufacturing technology, is approaching self-sufficiency.

Regional structure

The Yangtze River Delta or East China region has grown to have the heaviest concentration of China's semiconductor industry. It accounted for 56% of China's IC industry revenues in 2011. Of the 160 semiconductor wafer fabrication facilities in operation in China at the end of 2011, 79 are located in the East China region, representing 64% of China's total wafer fabrication capacity. Similarly, East China had 65 of China's 109 semiconductor packag-

China's wafer fabrication and eleven of China's SPAT facilities are located in this region, representing 9% and 6% of China's total wafer fabrication and SPAT capacity. Three of China's top ten IC design firms are also located in this region.

As a result of the continuing strong growth of Chinese IC design firms, the Pearl River Delta or South China region, accounted for 9% of China's IC industry revenue in 2011. The two of China's top ten IC design firms that are located in this area accounted for 41% of the top ten revenue for 2011. The 21 SPAT facilities that are located in this region accounted for 17% of China's SPAT capacity, while the 26 wafer fabrication facilities in the region only represented 7% of China's total wafer fabrication capacity. The majority of the region's semiconductor manufacturing plants are located in Shenzhen, Dongguan and Zhuhai.

The four other regions accounted for the remaining 13% of China's IC industry revenues in 2011. Of China's 160 semiconductor wafer fabrication facilities, twelve are located in North-

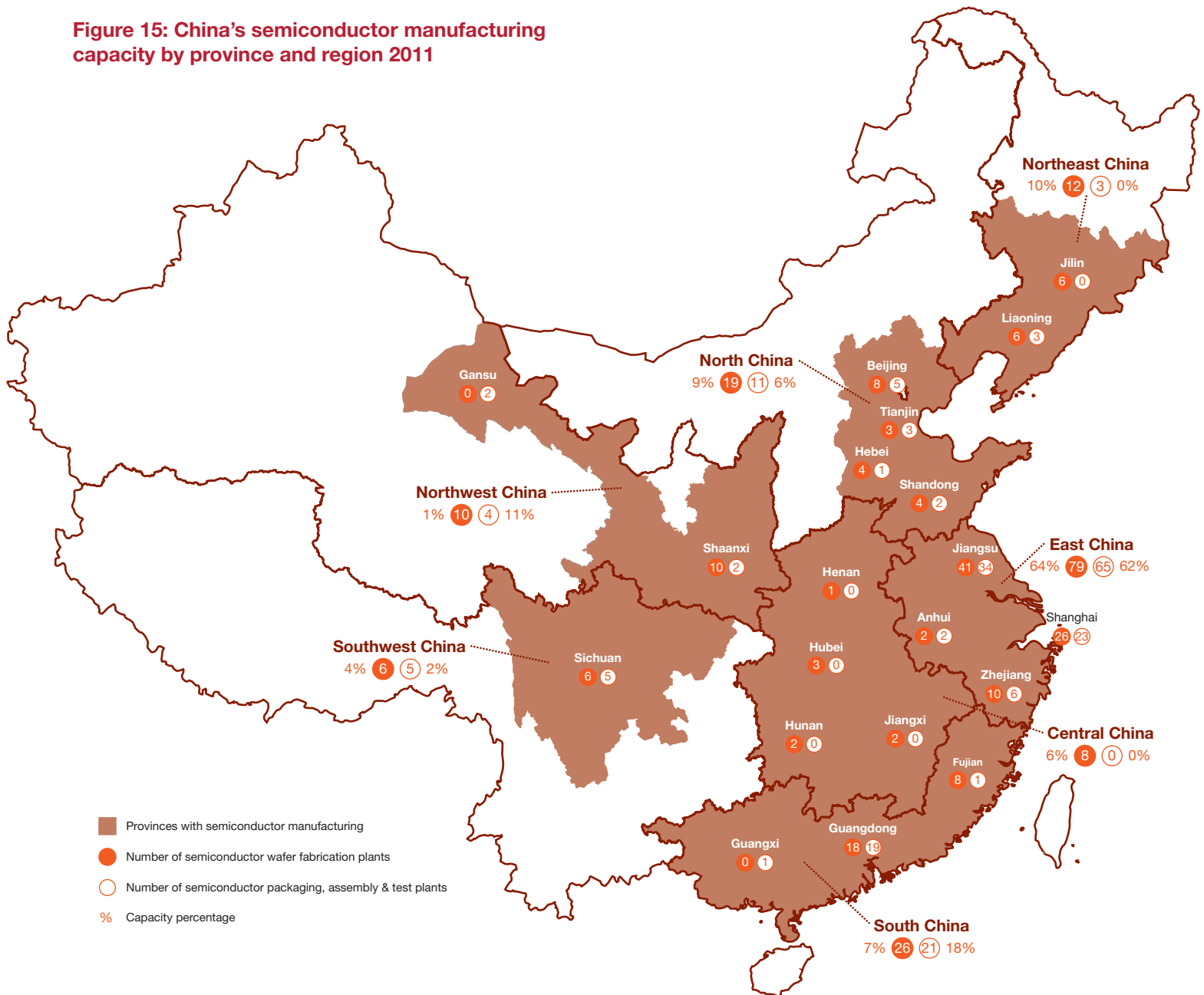
Of the 160 semiconductor wafer fabrication facilities in operation in China at the end of 2011, 79 are located in the East China region, representing 64% of China's total wafer fabrication capacity.

ing, assembly and test (SPAT) facilities in operation during 2011, representing 62% of China's total SPAT capacity. The majority of these plants are located in Shanghai, Suzhou and Wuxi. Five of China's top ten IC design firms are also located in this region.

The Bohai Ring or North China region, which is mainly constituted by Beijing, Tianjin, Hebi, Shangdong and Liaoning, accounted for 23% of China's IC industry revenues in 2011. Nineteen of

east China, including Dalian and Jilin, representing 10% of China's capacity; eight in Central China for 6% of capacity; six in Southwest China including Chengdu, Chongqing and Leshan for 2% of capacity and ten in Northwest China for 1% of capacity. Four of China's 109 SPAT facilities are located in Northwest China for 11% of China's capacity; five in Southwest China for 4% of capacity and three in Northeast China for 0.1% of capacity.

Figure 15: China's semiconductor manufacturing capacity by province and region 2011



China's IC industry revenue from the four other regions of Central, Southwest, Northeast and Northwest China, increased by more than 500% in the last two years.

During the past couple of years, there has been a modest shift in the regional location of China's IC industry with South China and the four other regions gaining share and the East China region losing share. China's IC industry revenue from the four other regions of Central, Southwest, Northeast and Northwest China, increased by more than 500% in the last two years. It has grown from 3% of China's total IC industry revenues in 2009 to 13% in 2011. East China's IC industry revenue only grew 15% during those two years and, as a result, has decreased from 69% to 56% of China's total IC industry revenue.

The above summary is based upon CCID's current definition of the seven regional ICT (information and communications technology) markets in China which is slightly different from the six "traditional regions" grouping of China's 31 provincial-level divisions by its former administrative areas from

1949 to 1952. The CCID definition includes the same 31 provincial-level divisions with the earlier South Central China traditional region divided into two regions, South China and Central China and three provinces reassigned from the East China traditional region to South China, Central China and North China.

The above summary is not intended to simplify or dismiss the challenging geographic diversity and dispersion of China's semiconductor industry that suppliers and customers need to address for success. There are at least 270 semiconductor wafer fabrication or packaging and testing plants currently in production spread across 20 different provinces in China. They span from Jilin in the North to Guangdong in the South and from Zhejiang in the East to Sichuan in the West across an area of about 1,700,000 square miles (4,400,000 square kilometers).

Coming soon

Check back at www.pwc.com/chinasemicon for our next chapter in this series coming in a few weeks. It will highlight IC design and major Chinese semiconductor companies.

PwC can help

If your company is facing challenges doing business in China, or you just want to have a deeper discussion about what's happening in the market and how we can help, please reach out to one of the technology industry leaders listed below.

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