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China's impact on the semiconductor industry: 2015 update

Technology Institute

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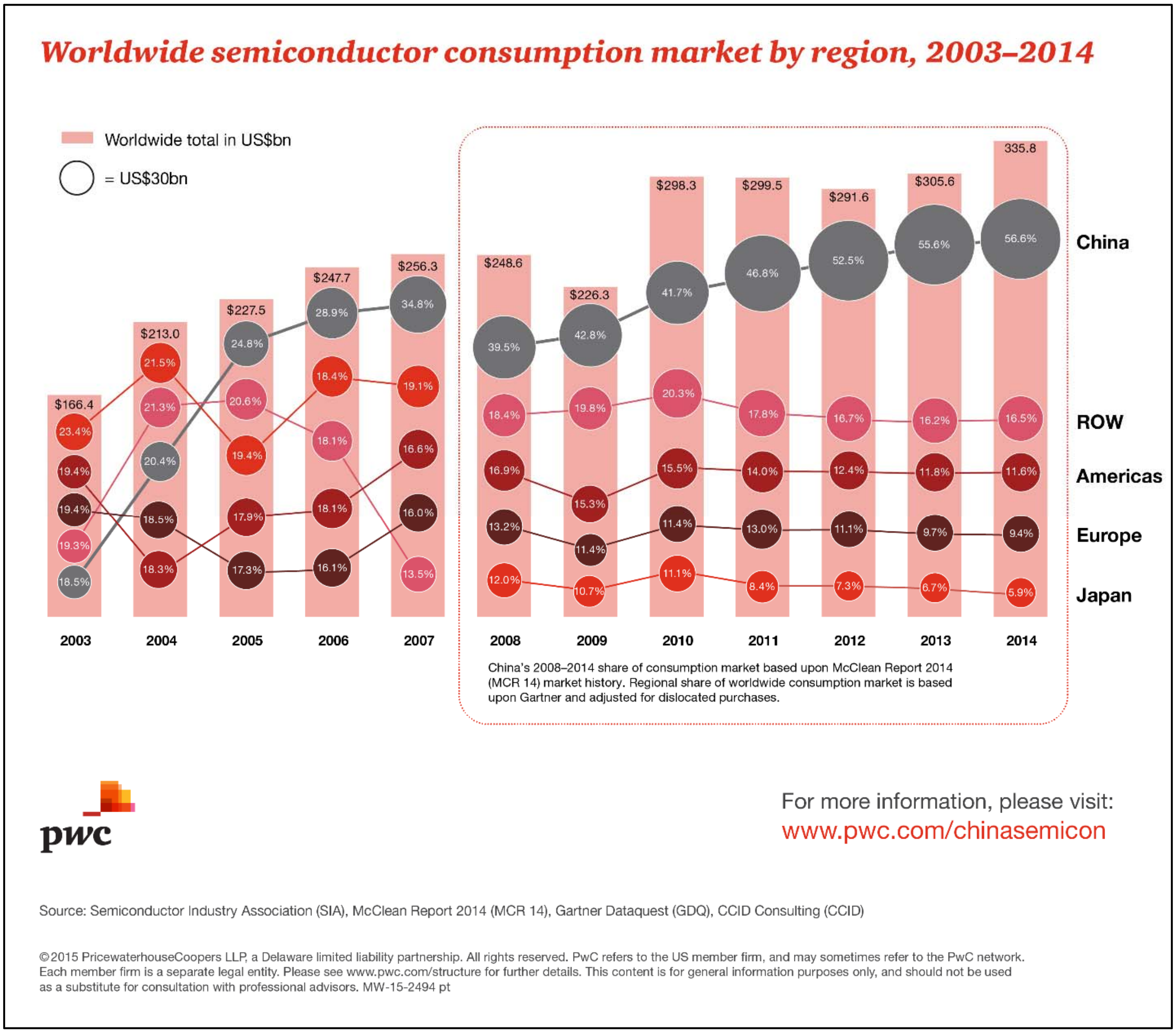
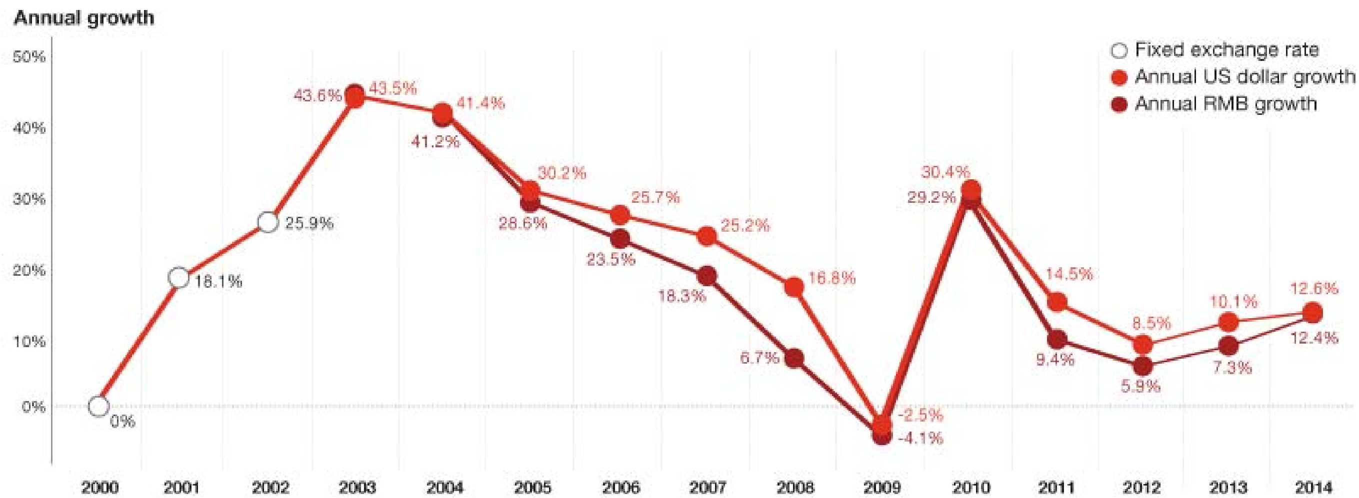
Group 1: China's semiconductor market



For the fourth consecutive year China's semiconductor consumption growth continued to far exceed worldwide semiconductor market growth in 2014. While the worldwide semiconductor market increased 9.8% in 2014, China's semiconductor consumption market grew by 12.6% in 2014 to reach a new record of 56.6% of the global market. During the past eleven years, China's semiconductor consumption has grown at an 18.8% compounded annual growth rate (CAGR), while total worldwide consumption has only grown at a 6.6% CAGR. The worldwide semiconductor market as reported by World Semiconductor Trade Statistics (WSTS) has grown by US$169bn from 2003 to 2014 while China's semiconductor consumption as reported by the China Semiconductor Industry Association (CSIA) has grown by US$173bn.

China's semiconductor market growth, 2000–2014



Market value

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
US$bn	14.4	17.0	21.4	30.7	43.4	56.5	71.0	88.9	103.8	101.2	132.0	151.2	164.1	180.8	203.5
RMBbn	119.5	141.1	177.6	255.1	360.0	463.0	571.7	676.1	721.5	691.6	893.4	977.5	1,035.6	1,111.7	1,249.9

Note: Market reporting has changed since 2003 with sensors and optical semiconductors included as part of the optoelectronics-sensors-discrete (O-S-D) segment which along with integrated circuits make up the total semiconductor market.

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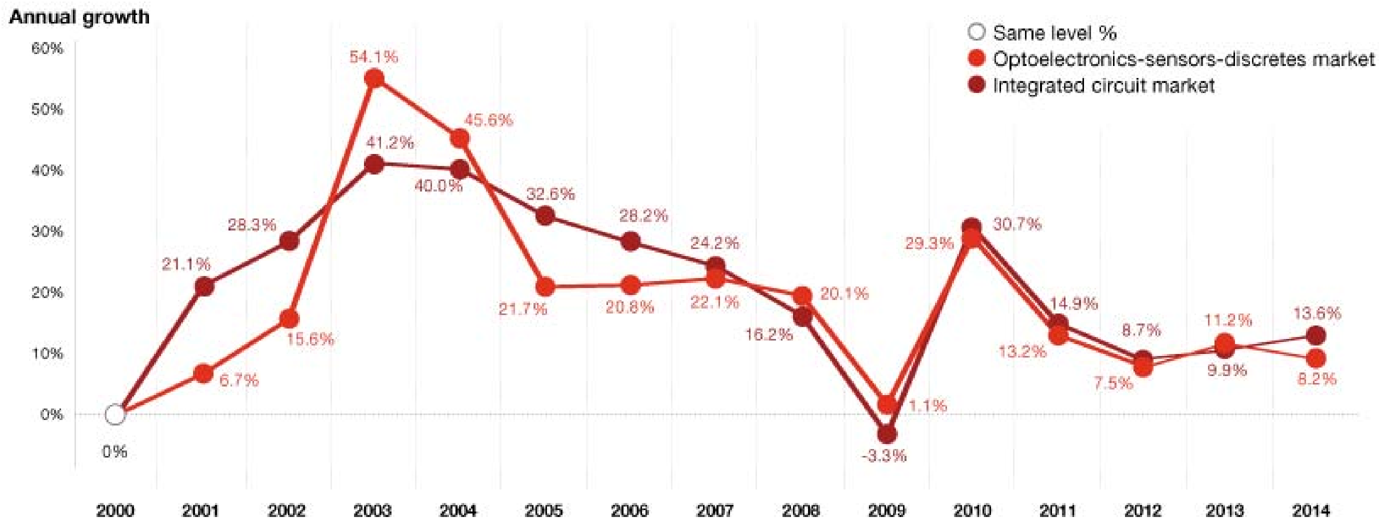
Source: CCID Consulting (CCID), Semiconductor Industry Association (SIA)

China's semiconductor consumption market continues to grow many times faster than the worldwide market as a result of two driving factors—the continuing transfer of worldwide electronic equipment production to China and the above-average semiconductor content of that equipment. Most industry analysts predict that the trend of an increasing share of electronic equipment production in China will moderate but continue over the next several years. According to Gartner, China's share of electronic equipment production is forecast to increase to more than 38% by 2017; the semiconductor content of that production to gradually increase to over 35% while the worldwide average content increases to 25%; and China's share of worldwide semiconductor consumption to increase by a further 4%.

China's IC and O-S-D market growth, 2000–2014



Market value	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
US$bn	3.0	3.2	3.7	5.7	8.3	10.1	12.2	14.9	17.9	18.1	23.4	26.5	28.5	31.7	34.3
US$bn	11.4	13.8	17.7	25.0	35.0	46.4	59.5	73.9	85.9	83.1	108.6	124.8	135.6	149.0	169.2

Note: Market reporting has changed since 2003 and the definition of O-S-D (optoelectronics-sensors-discretes) now includes sensors and optical semiconductors.

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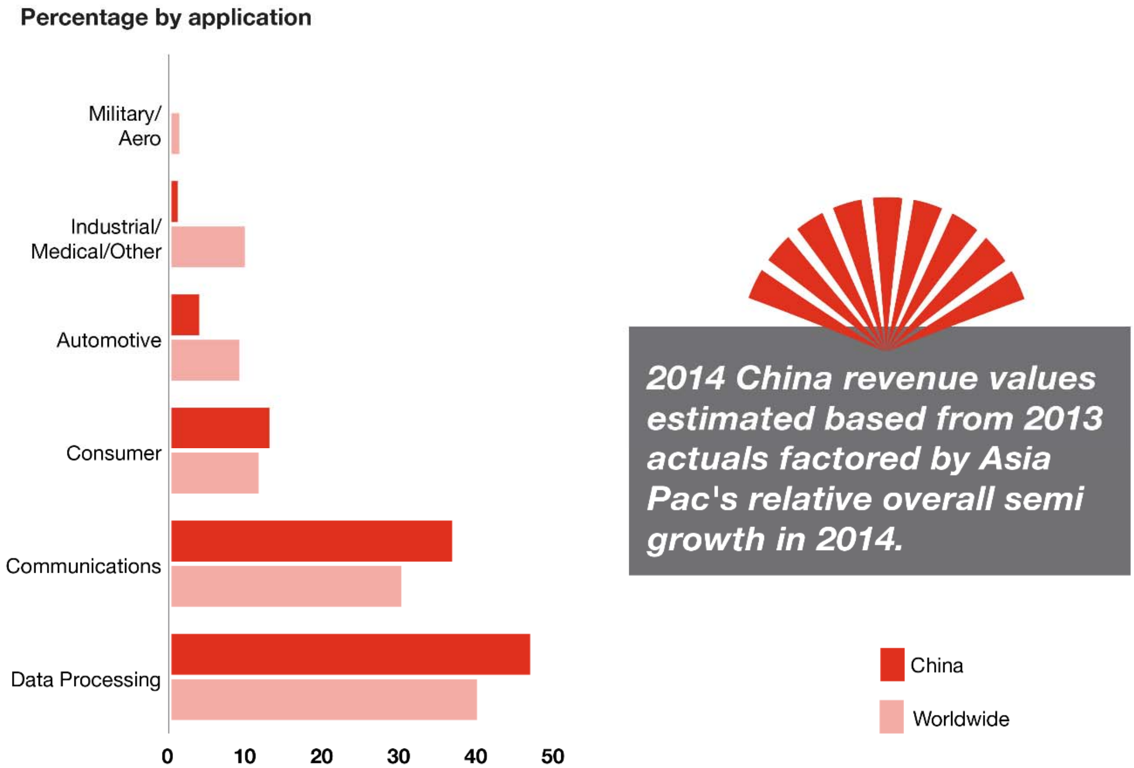
Source: CCID Consulting (CCID), Semiconductor Industry Association (SIA)

The integrated circuit (IC) consumption market in China grew 13.6% to US$169bn in 2014 while the worldwide IC market saw only a 10.1% increase. As a result, China's IC consumption represented almost 57% of worldwide consumption in 2014. During 2014 China's IC consumption increased by more than US$20bn while the worldwide market increased by US$26bn. However during the past ten years China's IC consumption has grown by more than US$134bn while the worldwide market increased by only US$99bn. China's IC consumption has grown at the expense of IC markets in other regions although China's rate of IC consumption market growth is gradually moving closer to the worldwide rate.

In 2014 China's O-S-D (optoelectronics-sensor-discrete) consumption market grew 8.1% to reach a new peak of US$34.3bn. For the first time in four years this increase was slightly less than the worldwide O-S-D market increase. As a result, China's share of that market remained relatively flat at 56% in 2014.

China compared with worldwide semiconductor market by application, 2014



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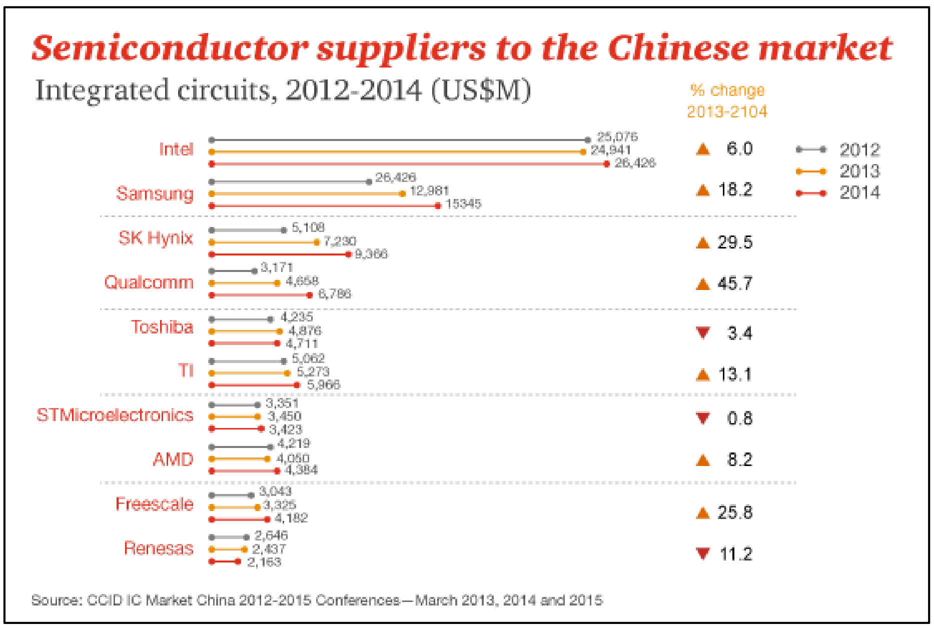
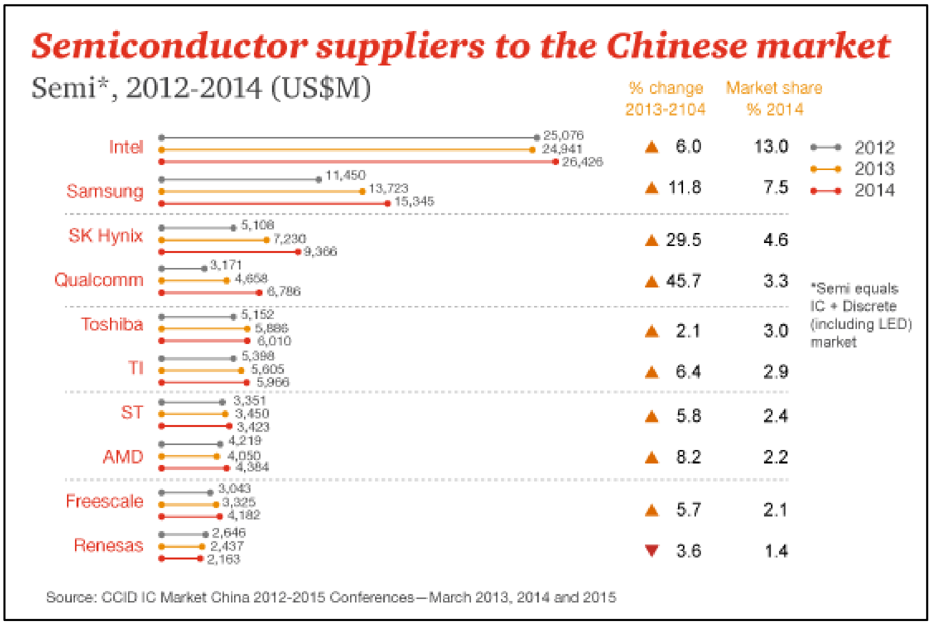
Source: Gartner Dataquest

During 2014 China's semiconductor consumption continued to be more concentrated in the data processing (computing) and communications applications sectors and became slightly more concentrated in the consumer sector than the worldwide market while remaining less concentrated in the automotive and noticeably less concentrated in the industrial/medical/other and military/aerospace sectors. China's share of 2014 worldwide semiconductor consumption was largest for the communications (computing) sector where it increased along with China's share of the 2014 worldwide data processing and consumer sectors. China's share of the worldwide automotive, industrial/medical/other and mil/aero sectors decreased during 2014.


Semiconductor suppliers to the Chinese market
Top 10 ranking, 2013-2014
2013
2014
1
2
3
4
5
6
7
8
9
10
1 Intel
2 Samsung
3 SK Hynix
4 Qualcomm
5 Toshiba
6 TI
7 STMicroelectronics
8 AMD
9 Freescale
10 Renesas
Source: CCID IC Market China Conferences—March 2014 and 2015


Semiconductor suppliers to the Chinese market
Integrated circuits, 2012-2014 (US$M)
% change
2013-2104
2012
2013
2014
Intel
25,076
24,941
26,426
6.0
Samsung
26,426
12,981
15345
18.2
SK Hynix
5,108
7,230
9,366
29.5
Qualcomm
3,171
4,658
6,786
45.7
Toshiba
4,235
4,876
4,711
3.4
TI
5,062
5,273
5,966
13.1
STMicroelectronics
3,351
3,450
3,423
0.8
AMD
4,219
4,050
4,384
8.2
Freescale
3,043
3,325
4,182
25.8
Renesas
2,646
2,437
2,163
11.2
Source: CCID IC Market China 2012-2015 Conferences—March 2013, 2014 and 2015

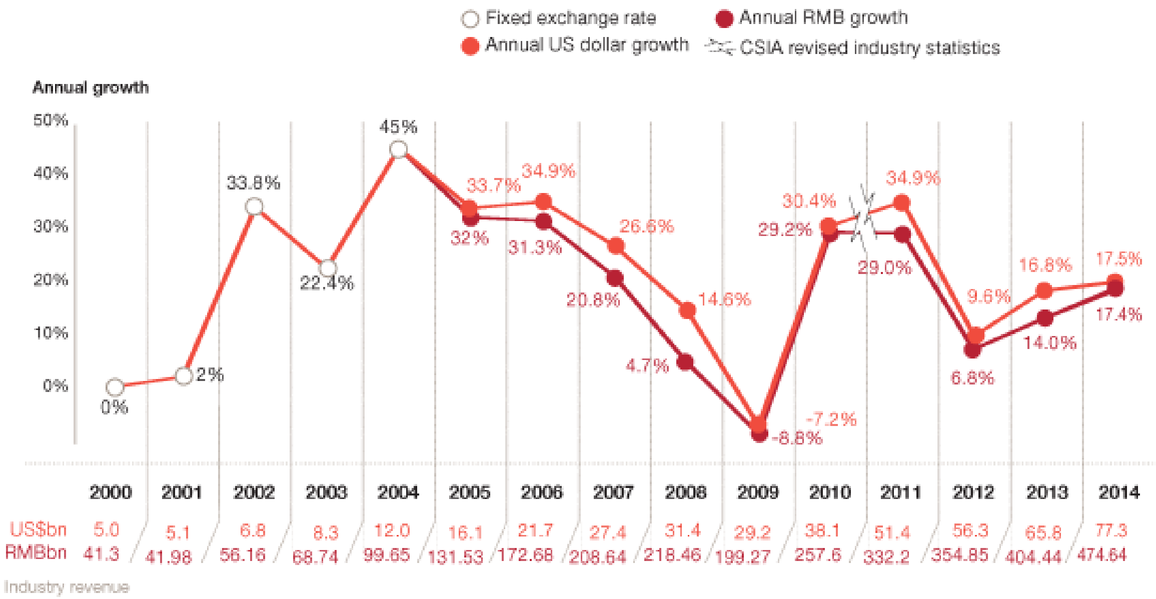


The major global semiconductor companies continue to dominate the Chinese market. The three graphs above shows the top 10 suppliers with the largest value of semiconductors consumed in China during 2014. There have only been 14 different companies among these top ten suppliers over the past eleven years. Seven companies have been among the top ten suppliers to China every year from 2003 through 2014: Intel, Samsung, TI, Toshiba, SK Hynix, ST and Freescale. AMD joined the list in 2004 and has been among the top ten suppliers to China for the last ten years. Qualcomm, which joined the list in 2012 at number 10, moved up to number 6 in 2013 and to number 4 in 2014. During 2014 China's consumption of semiconductor products from these ten largest suppliers increased by 11%, somewhat less than the growth of the overall semiconductor market in China. The Chinese semiconductor consumption market continued a trend of becoming less concentrated than the worldwide market as the top 10 suppliers' share of China's consumption declined to 42.4% in 2014, down from 43% in 2012 and 45% in 2011.

Group 2: China’s Semiconductor Industry

China’s semiconductor industry revenue and growth

2000-2014



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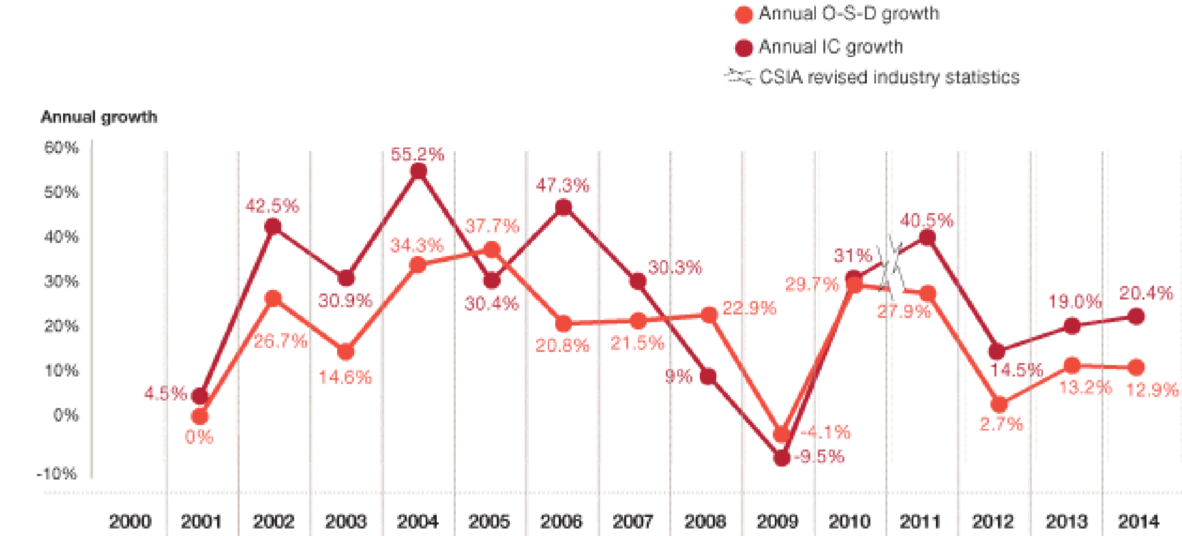
Source: CCID, CSIA

China’s reported 2014 semiconductor industry revenue growth continued to exceed both its semiconductor consumption and the worldwide semiconductor market growth. China’s semiconductor industry grew by 17.5% in 2014 to a record US$$77.3bn. China’s semiconductor industry has grown at an equal or greater rate than its semiconductor market consumption for eight of the past ten years. From 2004 through 2014 China’s semiconductor industry grew at a ten-year compound annual growth rate (CAGR) of 20.5% while its semiconductor consumption grew at a 16.7% and the worldwide semiconductor market at a 4.7% CAGR. China’s share of the worldwide semiconductor industry is continuing to grow and become significant. Compared to the sum of worldwide semiconductor device sales revenue plus the value of all wafer fabrication and packaging, assembly and test production, China’s 2014 semiconductor industry revenues accounted for 13.4% of the worldwide semiconductor industry, up from 12% in 2013 and 11.6% in 2012.

China's O-S-D and IC industry revenue and growth
2000-2014



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
O-S-D$bn	2.8	2.8	3.5	4.0	5.4	7.5	9.0	11.0	13.5	12.9	16.8	21.5	22.1	25.0	28.2
IC$bn	2.2	2.3	3.2	4.2	6.6	8.6	12.6	16.5	17.9	16.2	21.3	29.9	34.3	40.8	49.1

Industry revenue

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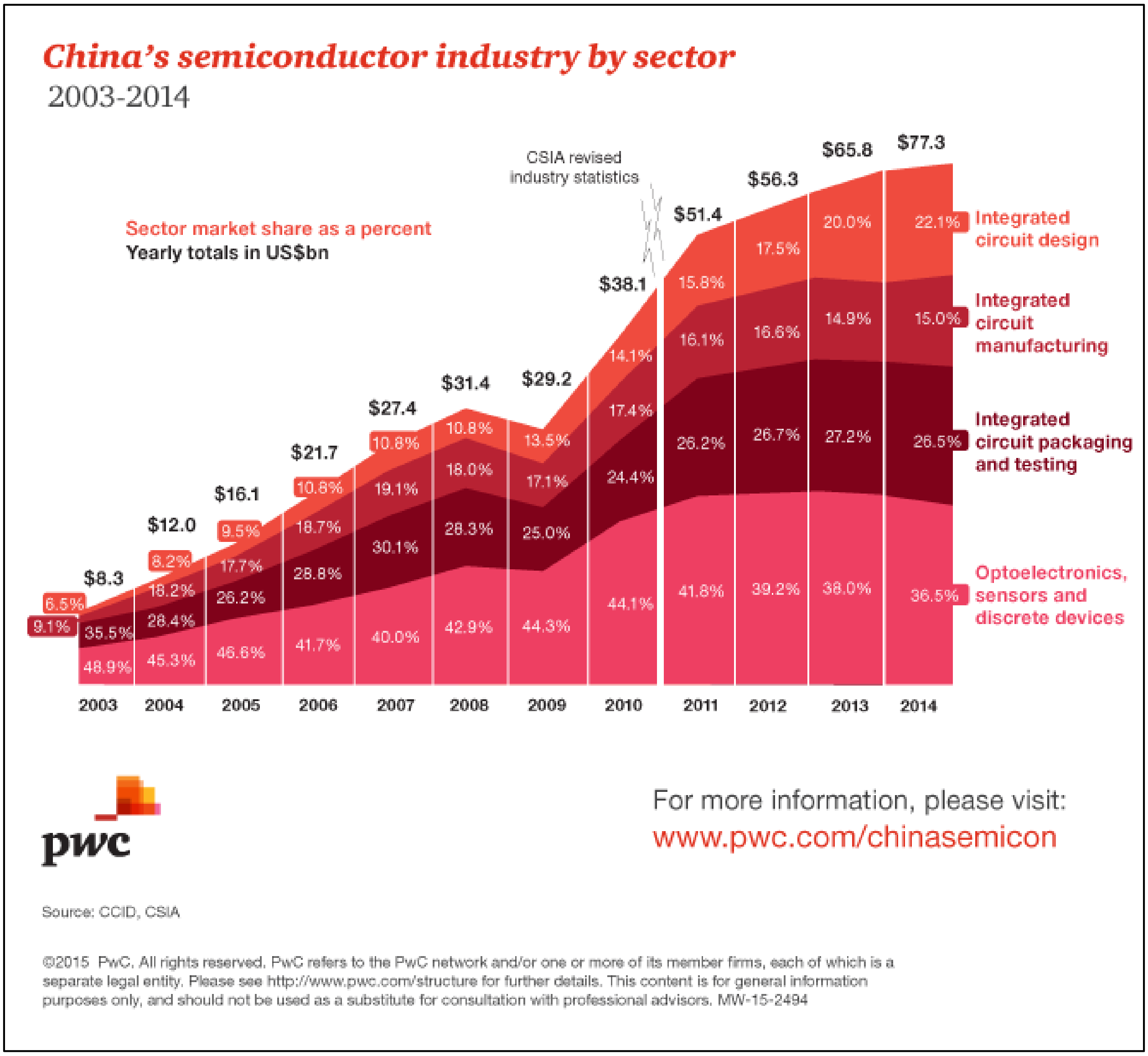
Source: CCID, CSIA

The overall performance of China's IC (integrated circuit) industry (the sum of IC design, IC wafer manufacturing and IC packaging and testing) continued to be the major contributor to China's overall semiconductor industry growth in 2014. It grew by 20.4% in 2014 while China's O-S-D (optoelectonics-sensors-discretes) industry revenue only grew by 12.9%. Since 2010 China's IC industry revenues have more than doubled, growing 130%, while China's O-S-D industry revenues only increased by two-thirds, growing 68%. China's 2014 IC industry revenues of US$49.1bn were nearly twice their O-S-D revenues of US$28.2bn.

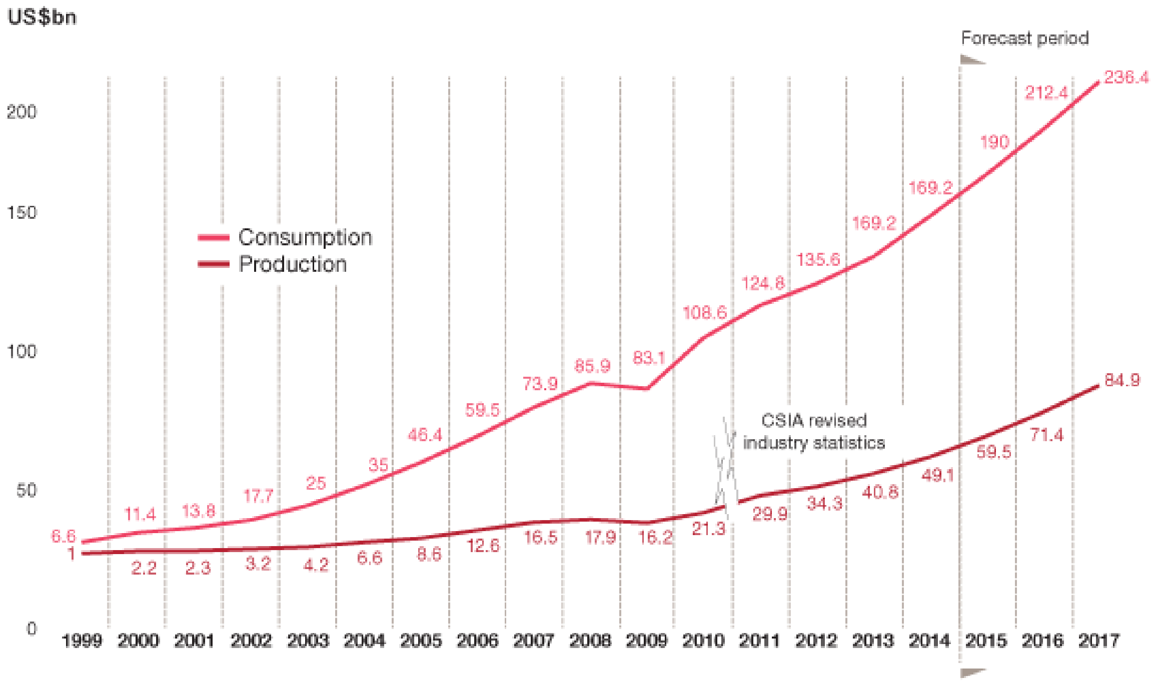


The distribution of China's semiconductor industry revenue continued its gradual shift towards the IC sectors in 2014. From 2004 through 2014 the once small IC design sector has grown at a 33% CAGR while the larger IC packaging and test sector achieved a 19.6% CAGR. The much larger O-S-D and smaller IC manufacturing sectors have only grown at an 18% CAGR. As a result, China's three IC industry sectors have grown from 51.5% to 63.6% of China's total semiconductor industry.

During 2014 IC design grew 29.7%, IC manufacturing 18.7%, IC packaging and test 14.4% and O-S-D 12.8%, slightly changing their relative share but not the order of their distribution which became:

1. O-S-D devices 36.5%
2. IC packaging and testing 26.5%
3. IC design 22.0%
4. IC manufacturing 15.0%

Comparison of China's integrated circuit consumption and production 1999-2017



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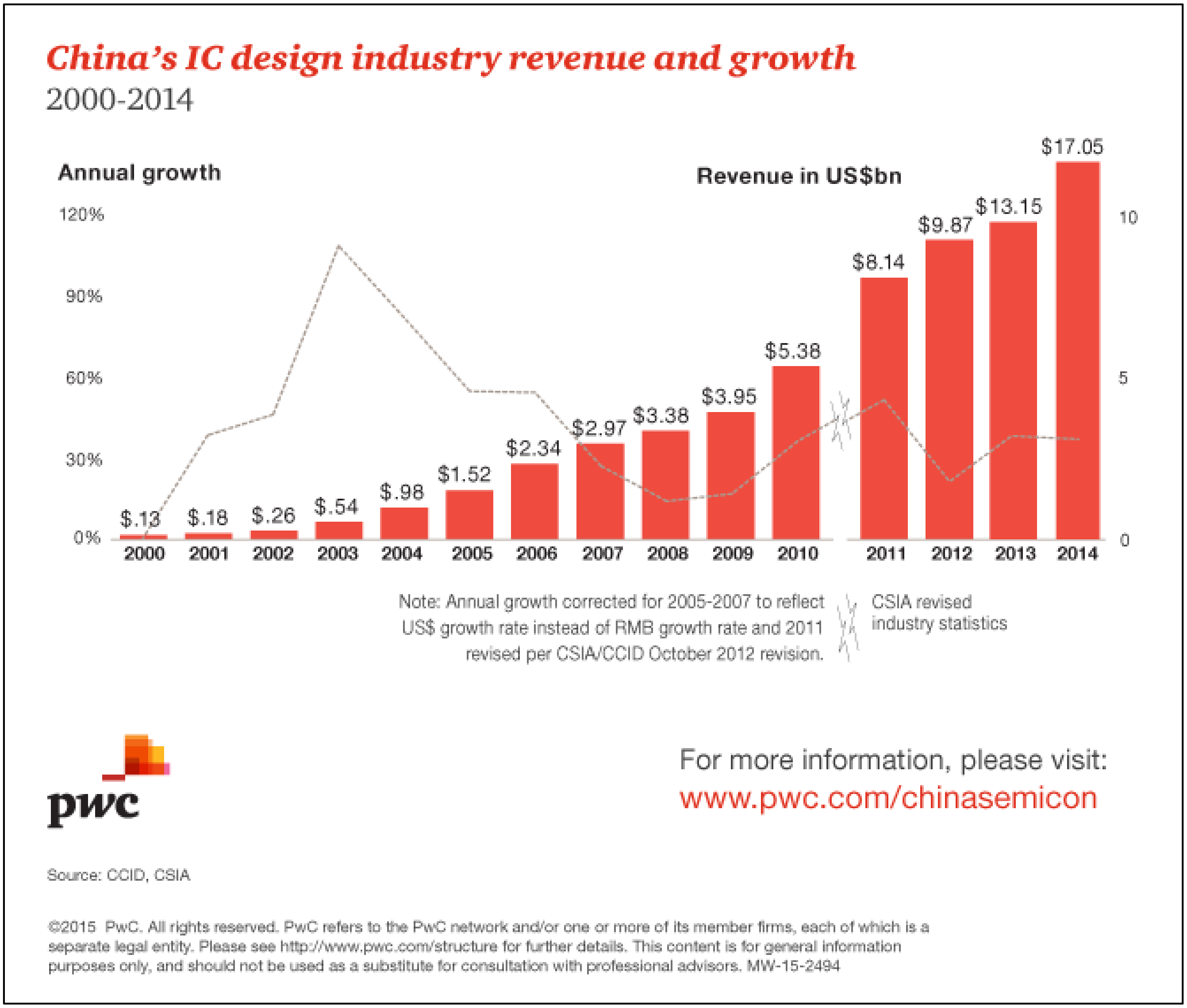
Note: Actual annual average FX rates used for 1999-2014 and 2014 average FX rate used for forecast 2015-2017

Source: CCID, CISA, PwC 2004-2015.

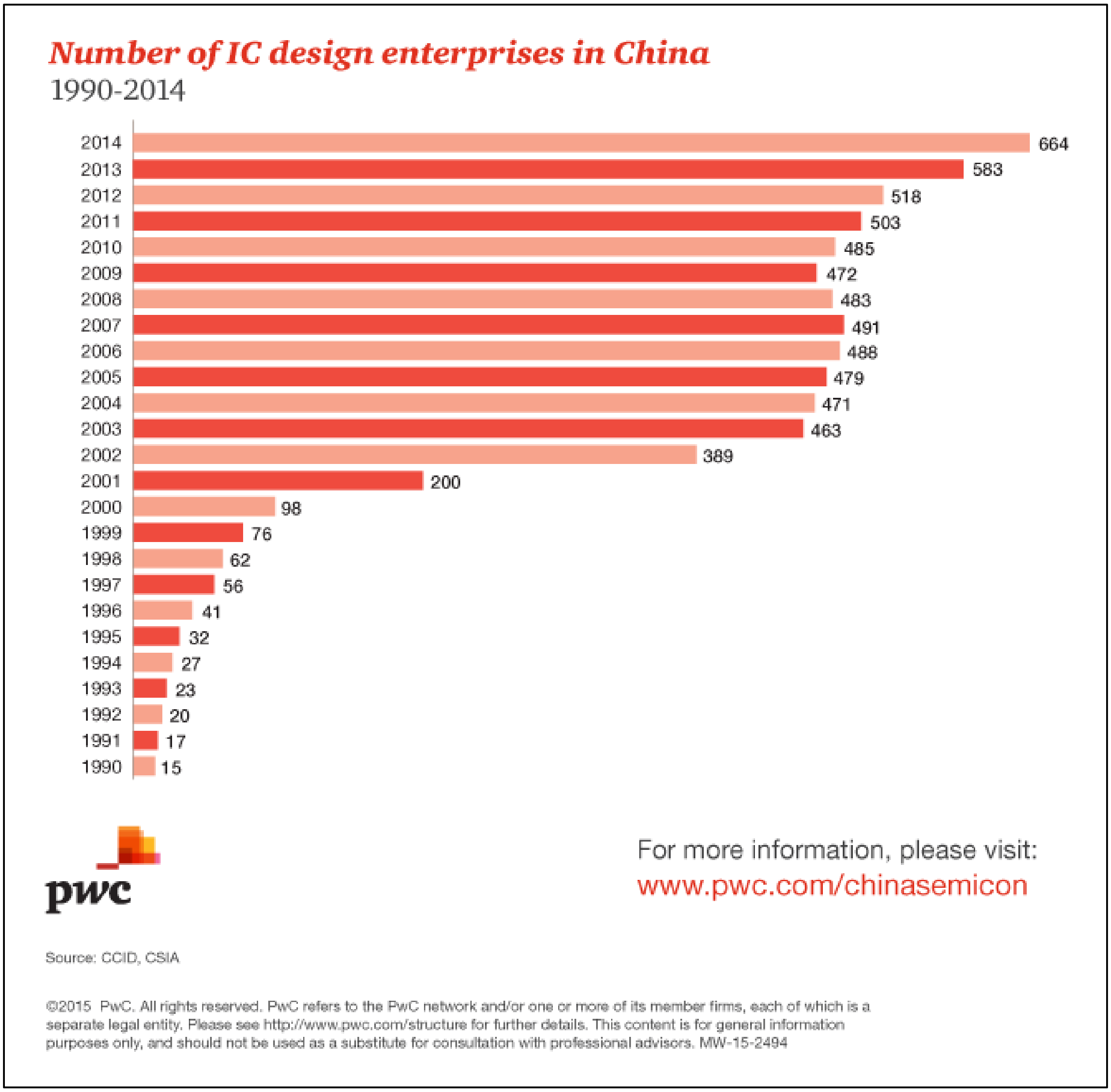
China's IC consumption/production gap increased again in 2014 to a new record annual high despite all the various government plans and efforts to reduce it. This gap is the yearly difference between IC consumption and IC industry revenues. Based upon the most recent CSIA industry statistics, this annual gap grew by a further US$11.9bn (11.0%) in 2014 to reach US$20.1bn. During the eleven year span of our reports on China's semiconductor industry, this gap has grown from US$20.8bn in 2003 to US$120.1bn in 2013, widening every year except 2009. The ratio of China's IC production revenue to IC consumption has shown some improvement. It had grown with yearly variability from 17% in 2001 to a peak of 29% in 2014. According to CSIA, this ratio is now expected to increase to 36% by 2017, which is up from the 32% they had forecast for 2016 a year ago. However, this will still result in a further increase in China's IC consumption/production gap which is now forecast to reach US$151.5bn in 2017 despite all the Chinese government's plans and efforts to reduce it. It is our belief that this gap continues to contribute to the Chinese government's ongoing initiatives to increase indigenous IC production.

Group 3: China’s design industry



Integrated circuit (IC) design continues to be the fastest growing segment of China’s semiconductor industry. It grew by 30% in 2014 to reach record revenues of US$17.1bn. During the eleven years from 2003 through 2014 China’s IC design (fabless) industry has grown at a 36.8% compound annual growth rate (CAGR) from US$541mn to over US$17.1bn.

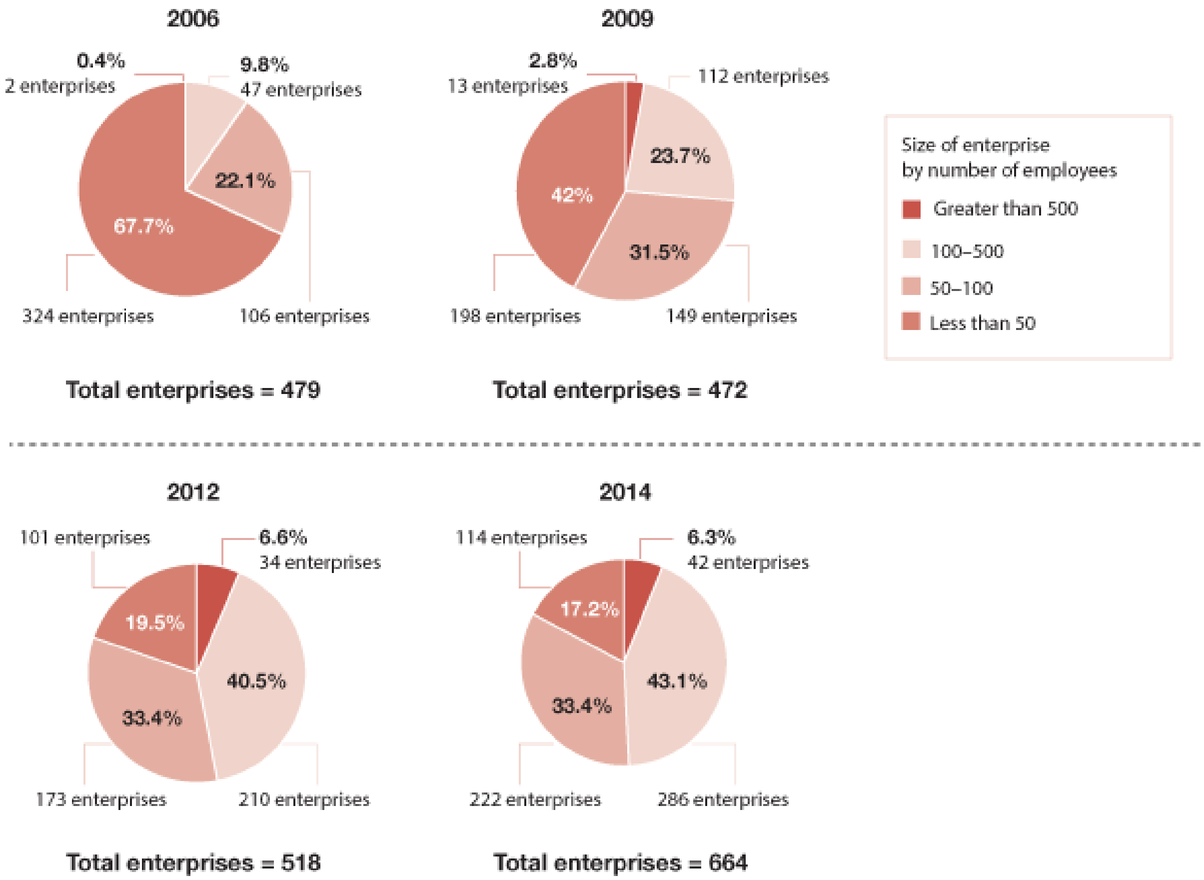
According to the China Center of Information Industry Development (CCID) and the China Semiconductor Industry Association (CSIA), IC design sector revenue contributed more than 34% to China’s semiconductor industry revenue growth in 2014 and has grown from 20% in 2013 to represent 22% of China’s total semiconductor industry. During the last eleven years China’s IC design industry has grown from representing just 0.4% of the worldwide IC market and 2.5% of the worldwide fabless IC industry in 2003 to representing almost 6% of the worldwide IC market and 19.4% of the worldwide fabless IC industry in 2014.



According to the China Center of Information Industry Development (CCID), the number of China's IC design enterprises increased from 583 in 2013 to 664 by the end of 2014. That increase of 81 additional IC design enterprises during 2014 is by far the largest net increase in the last ten years. However, it has been exceeded at least two times in China's earlier semiconductor history by the reported increase of 111, and 189 IC design enterprises in 2001 and 2002. The number of reported IC design enterprises increased from less than 500 in 2010 to more than 660 in 2014. The Chinese government policy of offering tax incentives to promote the development of its semiconductor industry since the implementation of its 12th Five-Year plan in 2011 seems to have played a key role in the growth of IC design enterprises in China. There continues to be considerable debate about the size and make-up of these 664 enterprises as well as a great diversity among this group. Of the 664 IC design enterprises reported at the end of 2014 as many as 250 could be the design or research and development (R&D) units or activities of foreign invested or subsidiary multinational companies (MNC). It is still estimated that there are no more than 100, possibly less, local indigenous IC design enterprises that are truly viable fabless semiconductor companies.

China's IC Design Enterprises by Employee Count

2006-2014



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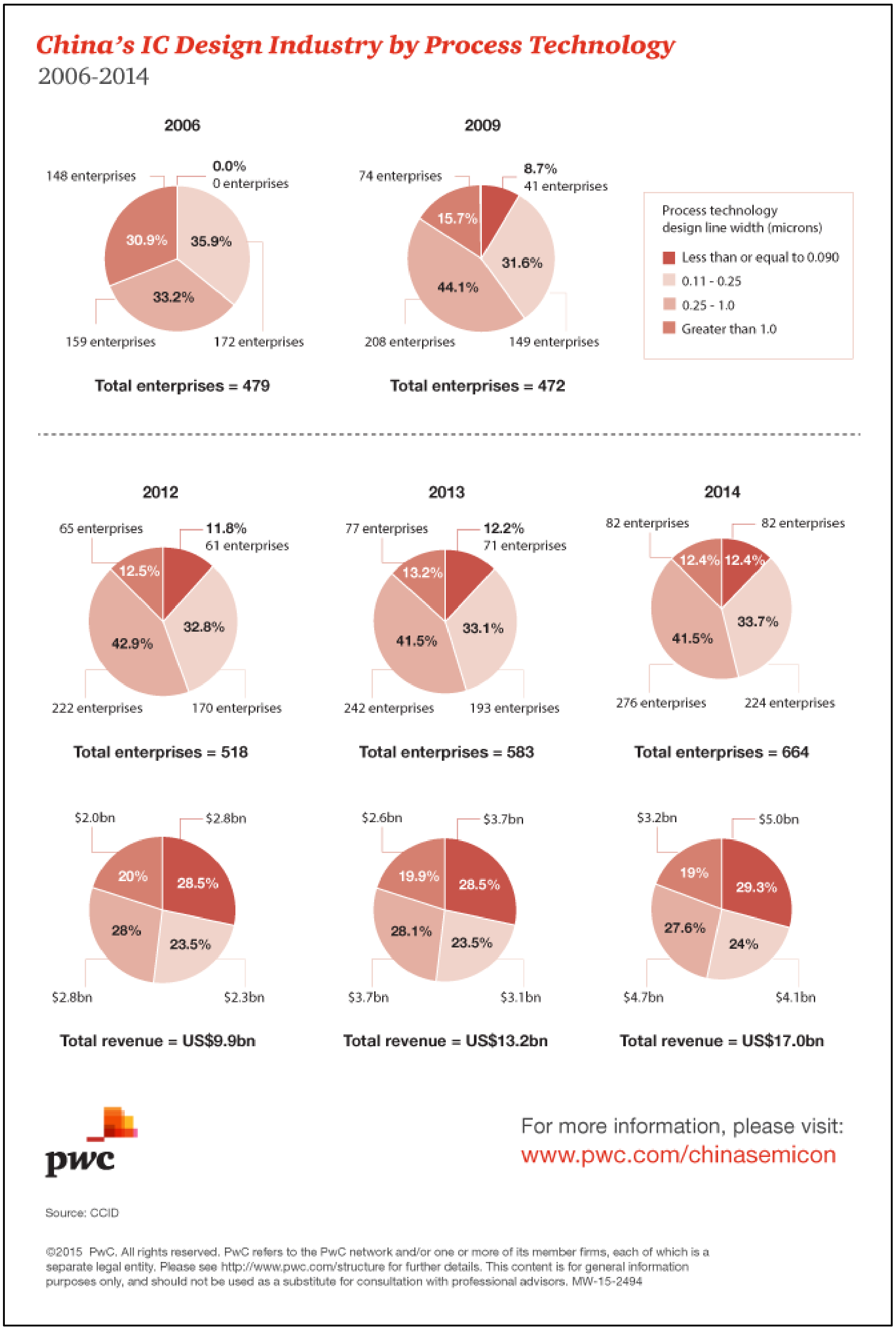
Source: CCID

From 2013 to 2014, employment in China's IC design sector increased along with the significant addition of IC design enterprises. According to the China Center of Information Industry Development (CCID), the total number of employees in the IC design sector increased by almost 15% in 2014 to about 147,000 with the distribution shifting slightly to the mid-size companies with 100 to 500 employees. This year-over-year growth represents relative stability in employee density, resulting from the 13.9% increase in the number of enterprises accompanied by an 11% increase in the number of employees, along with a significant, 30% increase in revenue, a slight 0.9% increase in the average number of employees per enterprise, and a positive 13% increase in average sales per employee to US$116,000.



China's IC design industry continued to make a further modest migration to finer design line widths in 2014. The number of design enterprises with design capabilities equal to or less than 0.25 microns increased by 16% in 2014 to 306 which represents slightly more than 46% of China's total IC design enterprises, up slightly from 45% in 2013. More significant, the total revenues of these enterprises with finer design line widths increased by almost 34% in 2014 to account for more than 53% of total IC design revenues.

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