Section 2 Response to global excess production capacity

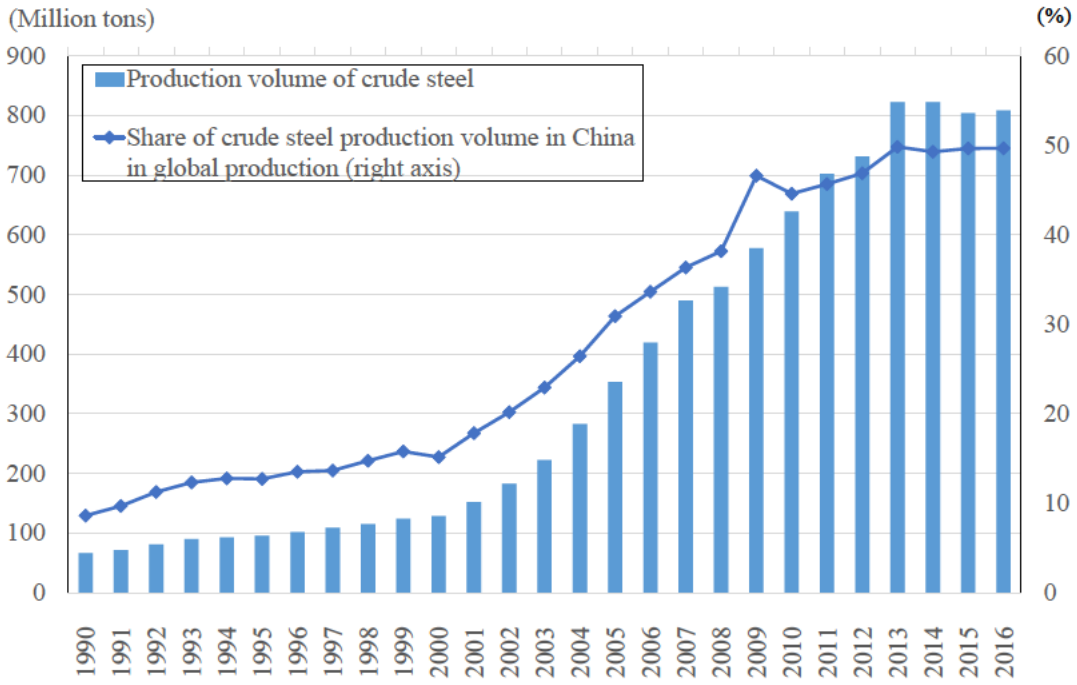
1. Analysis of various factors that caused the excess production capacity problem

In the previous section, we mentioned that production capacity became excessive in some industries worldwide as investment in particular increased amid the rapid development of emerging and developing economies since around the 2000s. The excess production capacity problem has become an important international challenge. For example, this problem has become a major topic of the G20 Summit (see Part III, Chapter 1, Section 5) and other international conferences, and countries are sharing information and conducting mutual reviews with respect to the actual state of the problem and their activities to resolve it. In this paragraph, we will analyze various factors that caused the excess production capacity problem based on reviews at the industrial and company levels, taking up the Chinese steel industry as an example case of the problem.

(1) Development of the Chinese steel industry in the past 15 years

The Chinese steel industry has historically been a key industry as it has been positioned as a priority industry since the period of the first Five-Year Plan.[40] In particular, since 2001, when China acceded to the WTO, the Chinese steel industry has achieved rapid development, with the current crude steel volume at around 800 million tons, which is equivalent to around half of the global crude steel production volume (Figure II-2-2-1).

Figure II-2-2-1 Changes in crude steel production volume in China and share of the volume in global production



Source: *Steel Statistical Yearbook* (World Steel Association).

40 State Council (1955). In the 1st Five-Year Plan for National Economic Development, the development of heavy industries was cited as the central task and the steel industry was mentioned first among heavy industries.

Here, we will provide an overview of the rapid development of the Chinese steel industry as divided into four periods shown in Figure II-2-2-2 based on financial reports, etc. by 33 steel companies which were listed as of the end of 2016.

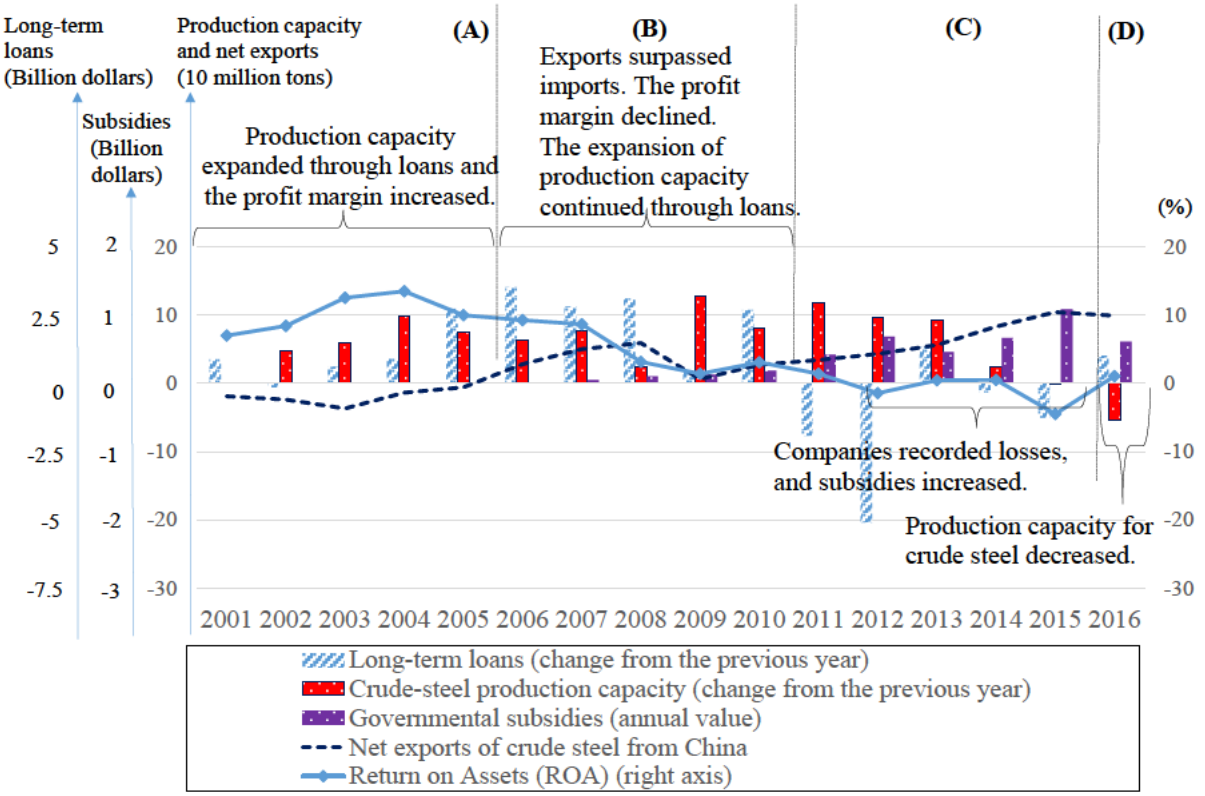
(A) Period between 2001, when China's entry into international markets accelerated as a result of its accession to the WTO, and 2005, the last year when China recorded a crude steel import surplus

(B) Period between 2006, when China recorded a crude steel export surplus for the first time, and 2010, the last year of the 4-trillion-yuan economic package

(C) Period between 2011, the first year after the end of the 4-trillion-yuan economic package, and 2015, when loss-recording companies increased and the value of governmental subsidies peaked

(D) Period since 2016, when crude steel capacity started to decline.

Figure II-2-2-2 Development of the Chinese steel industry (2001 -2016)



Notes: Only the figures for crude-steel production capacity are based on data from 2002 to 2016.

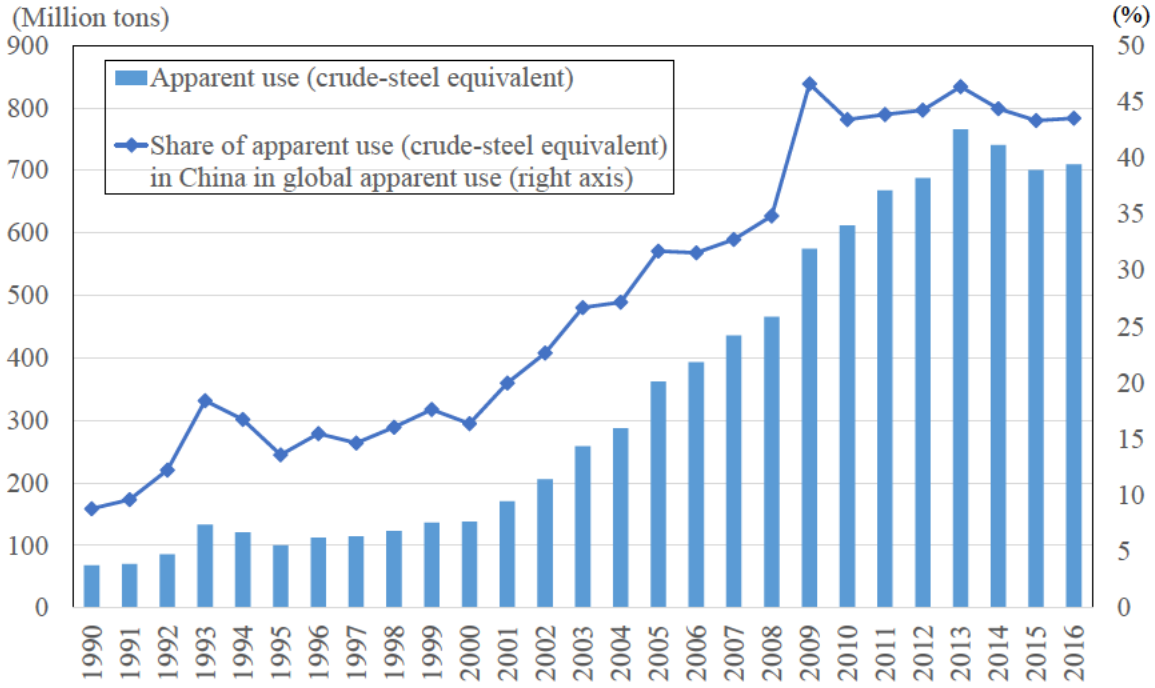
Source: Data on production capacity: National Bureau of Statistics of China, CEIC Database; data on net exports of crude steel: World Steel Association; data on long-term loans and governmental subsidies: Financial reports issued by 33 listed-steel companies in China.

(A) Period of production capacity expansion and profit margin improvement

Between 2001 and 2005, China was a net steel importer. In 2001, Beijing was selected as an Olympic host city (2008), and in 2002, Shanghai was selected as a World Expo host city (2010). Meanwhile, domestic steel demand continued to increase against the backdrop of the continuous fiscal stimulus policy maintained by the government of President Hu Jintao (Figure II-2-2-3). In addition, China's accession to the WTO in 2001 increased the need for the Chinese steel industry to strengthen its

international competitiveness.[41] Against the backdrop of these factors, large commercial banks and policy banks (see Part II, Chapter 3, Section 1, Column 4) increased low-interest loans to steel companies, which expanded their production capacity and enhanced production lines to create higher value added. Between 2001 and 2005, as the production capacity expansion made it possible to capture robust domestic demand, companies not only increased production volume but also improved the profit margin. The return on assets, which was 7% in 2001, rose to 13.5% in 2004 ((A) in Figure II-2-2-2).

Figure II-2-2-3 Changes in apparent steel use in China and share of the volume in global consumption (based on crude steel)



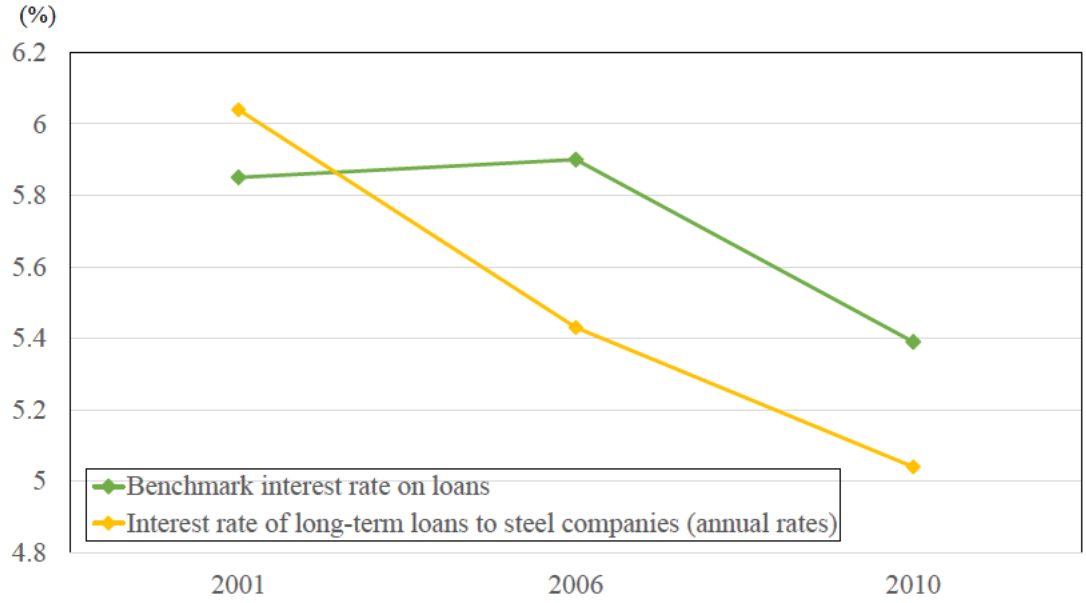
Notes: The apparent use is a result of subtracting net exports from the total production.
Source: *Steel Statistical Yearbook* (World Steel Association).

(B) Period of export surplus and declining profit margin

In 2006, China recorded a steel export surplus for the first time and has continued to do so since then. Even during the period of export surplus, when domestic demand production exceeded domestic demand, banks continued to provide low-interest loans to steel companies. In contrast to the rise in the benchmark interest rate on loans between 2001 and 2006, interest rates (annual rates) on long-term loans to steel companies declined, so the loans were provided at interest rates lower than the benchmark rate on loans (Figure II-2-2-4).

41 In individual companies' annual reports, the need to strengthen competitiveness associated with the entry into international markets following the accession to the WTO is mentioned in sections reporting on business conditions.

Figure II-2-2-4 Changes in interest rates of long-term loans to steel companies and policy interest rates in China



Notes:

1. The benchmark interest rate on loans is an interest rate for processing a loan that People's Bank of China publicizes. Many banks in China set their own interest rates in reference to the benchmark interest rate as a standard interest rate.
2. The average interest rate is a weighted average of the interest rate, as for the respective case for the Chinese listed steel companies, of a loan with the largest loan value and based on the currency of the target country, based on the weight of the loan amount.

Source: *Fiscal Financial Reports* (listed-steel companies in China), People's Bank of China, National Bureau of Statistics of China, CEIC Database.

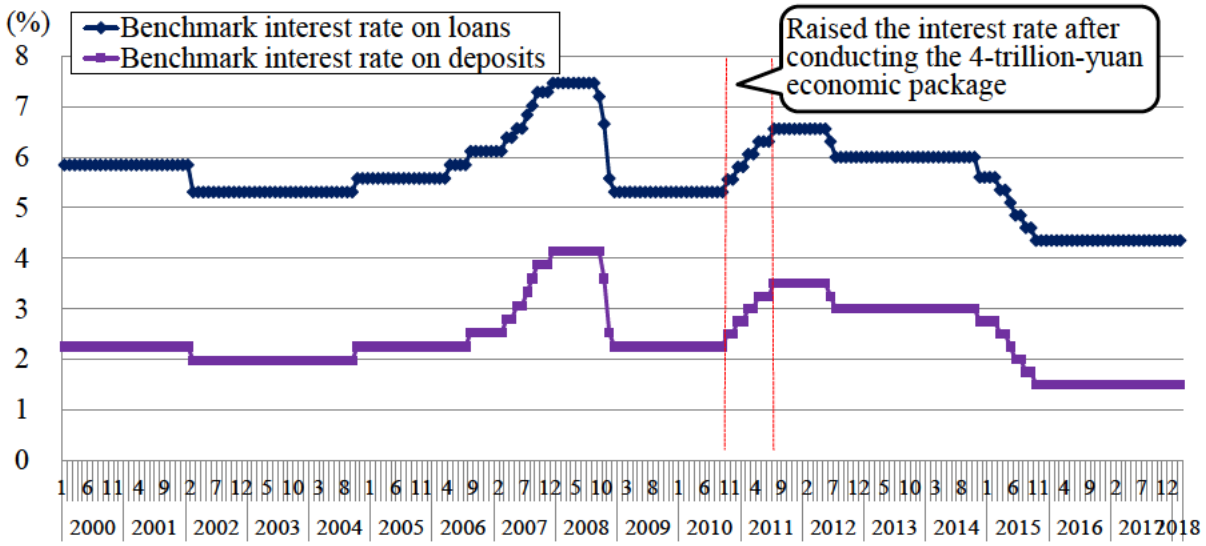
Against the backdrop of the increase in low-interest loans provided by banks, Chinese steel companies' borrowings and production capacity continued to expand. Later, global steel demand weakened due to the global financial crisis in 2008, but the government of China implemented the 4-trillion-yuan economic package through public investments in 2009-2010, resulting in a temporary increase in domestic steel demand. As a result, steel companies continued to expand production facilities based on low-interest long-term borrowings. On the other hand, from 2008 onwards, the return on assets for steel companies stayed below 5% ((B) in Figure II-2-2-2).

(C) Increase in loss-recording companies and expansion of governmental subsidies

While steel demand in China grew because of the 4-trillion-yuan economic package, the government of China implemented monetary tightening in 2010-2011 in order to rein in the overheating of investments in some segments of the economy (Figure II-2-2-5). As a result, steel companies reduced the balance of long-term borrowings from banks, which they had continued to increase until 2010 ((C) in Figure II-2-2-2). On the other hand, the growth in domestic steel demand started to weaken around

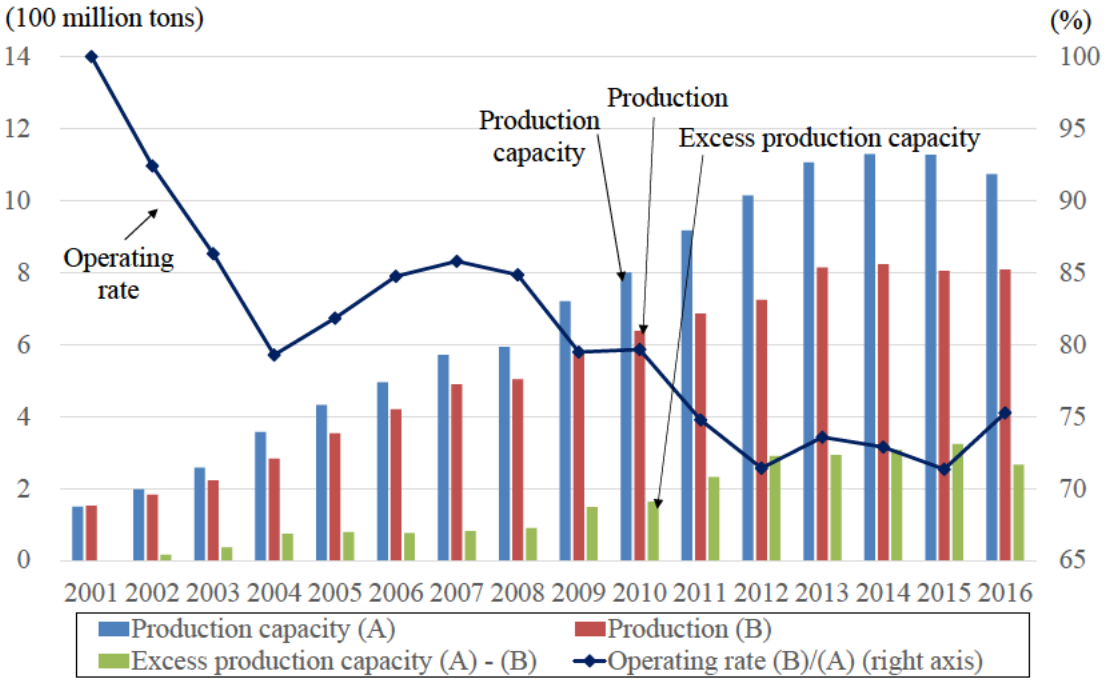
2011, and in 2013, the domestic consumption volume in China peaked out[42] (Figure II-2-2-3). In line with the weakening of domestic demand, the operating rate of production facilities stayed below 75% from 2011 onwards (Figure II-2-2-6), while the value of net exports increased ((C) in Figure II-2-2-2).

Figure II-2-2-5 Changes in policy interest rates in China



Source: People's Bank of China, National Bureau of Statistics of China, CEIC Database.

Figure II-2-2-6 Excess production capacity and operating rates of production facilities in the Chinese steel industry (crude steel)



42 The 12th five-year plan for the development of the Chinese steel industry (2011-2015) formulated by the Ministry of Industry and Information Technology (MIIT) forecast that crude steel demand in China will peak after 2015, by around 2020, but it actually peaked out earlier than this forecast.

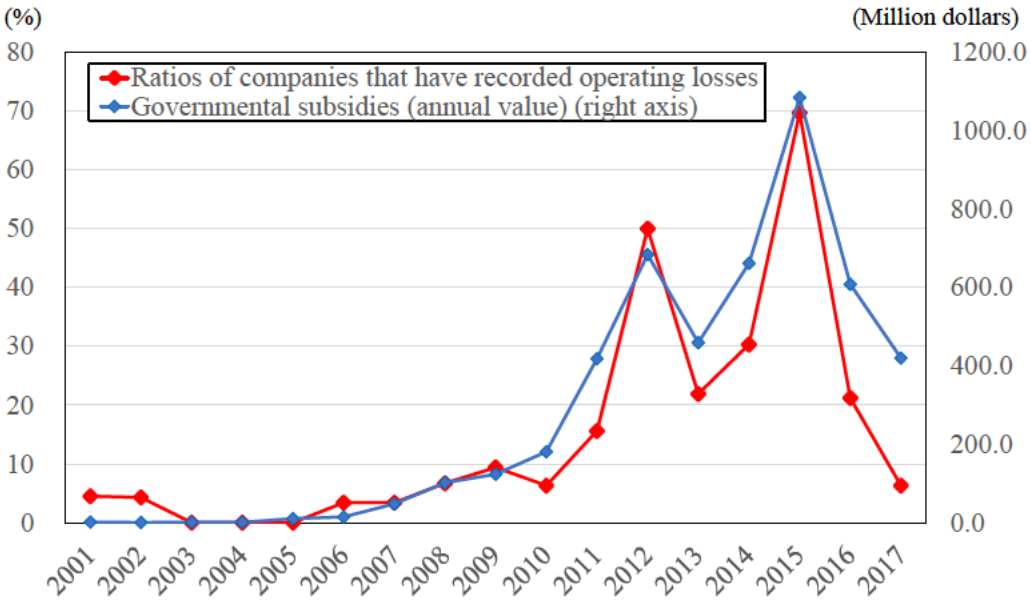
Notes:

1. The figures for excess production capacity are calculation results of: production capacity - production, while those for operating rates are calculation results of: production / production capacity.
2. The figures are based on the statistics publicized by the National Bureau of Statistics of China. However, data in 2009 and 2010 are based on the statistics publicized by the China Iron and Steel Association since the data on production capacity of crude steel in these years was not released by the National Bureau of Statistics of China.

Source: National Bureau of Statistics of China, China Iron and Steel Association, CEIC Database.

In line with the steel market slump, around half of listed steel companies recorded operating losses in 2012. Meanwhile, the value of governmental subsidies[43] increased considerably in the same year (Figure II-2-2-7) ((C) in Figure II-2-2-2). In 2015, around 70% of 33 listed steel companies recorded operating losses, while the value of governmental subsidies to the 33 listed companies reached 1 billion dollars (Figure II-2-2-7). The subsidies include not only those for research and development and capital investments related to the environment and energy conservation but also large amounts of incentive money and subsidies for participation in governmental projects[44] (Figure II-2-2-8). Since 2012, the return on assets stayed around zero or in the minus column ((C) in Figure II-2-2-2). Even in this severe management situation, the Chinese steel industry's production capacity continued to expand until 2014.

Figure II-2-2-7 Ratios of 33 listed-steel companies that have recorded operating losses in China

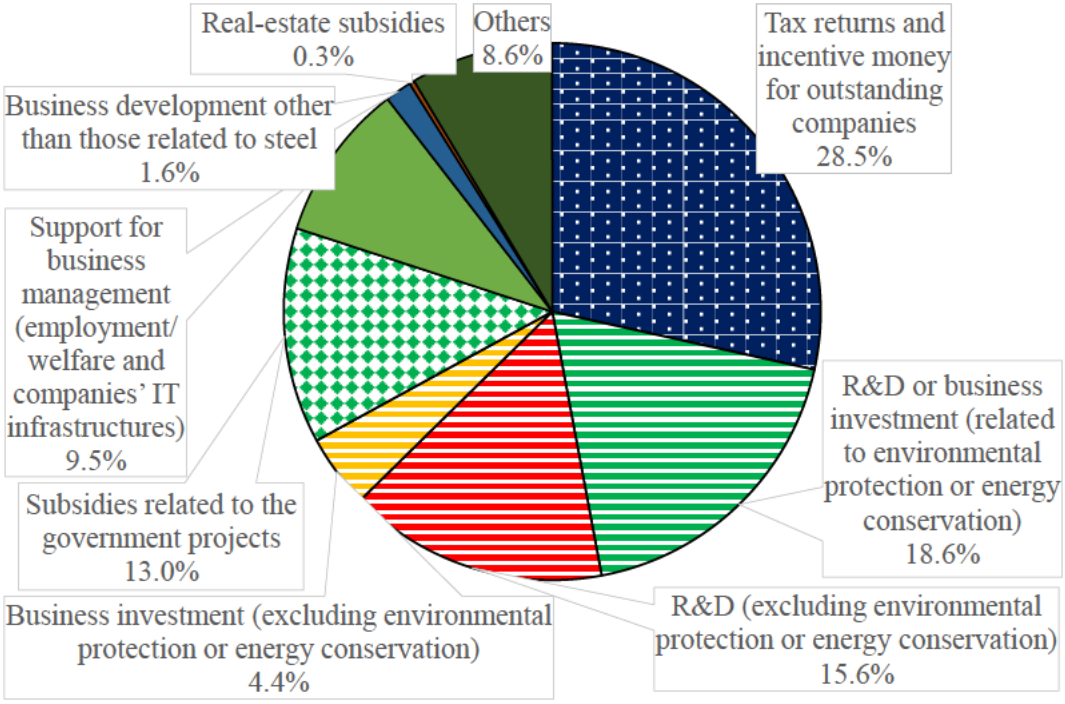


Source: *Fiscal Financial Reports* (33 listed-steel companies in China).

43 The value of governmental subsidies in 2001-2006 was cited from the supplementary income column of the profit-loss statement of the annual reports of 33 listed Chinese steel companies and the value in 2007-2016 was cited from the government subsidy sub-column under the non-operating income column. Due to an accounting standard change, the value in 2017 represents the total sum of "other income" and government subsidies under the non-operating income column.

44 It has been pointed out that the increase in subsidies that followed companies' operating losses tended to aggravate operating income in the following year as well. See Watanabe (2017), p.27.

Figure II-2-2-8 Use-based ratios of 33 listed-steel companies in China that have received subsidies (2015)



Source: *FY2016 Survey for International Economy to establish the Growth Strategy harmonizing domestic and international Economy (Survey for Business Environments and Market Trends: Structural Analysis of Excess Production Capacity in Emerging Countries)* (METI).

(D) Reduction of excess production capacity

The central government of China has regarded excess production capacity in the Chinese steel industry as a problem since the 2000s. In 2005, the Policies for Development of Iron and Steel Industry,[45] formulated by the State Council, called for the need to make structural adjustments in the steel industry and gave an instruction for the disposal of small facilities, among other measures. In 2013, the Guiding Opinion on Eliminating Severe Excess Capacities[46] prohibited the construction of new facilities and set a reduction target. These are some of the many production capacity adjustment policy measures implemented by the central government (Figure II-2-2-9).

45 National Development and Reform Commission (NDRC) (2005), "Policies for Development of the Iron and Steel Industry (钢铁产业发展政策)" (http://www.ndrc.gov.cn/zcfb/zcfbl/200507/t20050719_52618.html).

46 State Council (2013), "Guiding Opinions on Eliminating Severe Excess Capacity (关于化解产能严重过剩矛盾的指导意见)" (http://www.gov.cn/jrzg/2013-10/15/content_2507507.html).

Table II-2-2-9 List of policies for the steel industry after 2005 and related annual notices

Month, year	Titles of policies and notices for structural adjustments of the steel industry
Jul. 2005	NDRC, Iron and Steel Industry Development Policy (to the end of 2010)
Dec. 2005	NDRC, Catalog for Guiding Industrial Restructuring (Version 2005)
Mar. 2006	NDRC, Notice of the State Council Regarding Hastening and Promoting Structural Adjustment of Industries with Overcapacity
Jun. 2006	NDRC, Notice of the State Council Regarding Suppressing Entire Capacity, Sorting Old-Fashioned Systems and Accelerating Structural Adjustment in the Steel Industry
Apr. And Dec. 2007	NDRC, (Primary and Secondary) Lists of Responsibilities Concerning Closure and Sorting of Old-Fashioned Steel Production Capacity
Aug. 2007	NDRC, Urgent Notice of the Issue of Diversion of Sorted Old-fashioned Iron-Making Blast Furnaces and Other Facilities as Targets of Selection
Mar. 2009	MIIT, Plan for Adjustment and Upgrading of the Steel Industry (to the end of 2011)
May 2009	MIIT, Urgent Notice of Suppressing Excess Production in the Steel Industry
Sep. 2009	State Council, Some Opinions to Suppress Excessive, Duplicated Construction of Facilities for Steel and Other Production Capacity and Leading Efforts to Sound Development
Dec. 2009	MIIT, 2009 Notice of Duties for Sorting Old-Fashioned Facilities in the Steel and Other Industries by Region
Jun. 2010	State Council, Some Opinions to Increase Attention to Energy Saving and Reduction of Emissions and to Adjust and Accelerate Structures in the Steel Industry
Jun. 2010	MIIT, Production and Operation Norms in the Steel Industry
Apr. 2011	NDRC, Catalog for Guiding Industrial Restructuring (Version 2011)
Sep. 2013	State Council, Action Plan for Prevention of Air Pollution China set a goal to further reduce 15 million tons of production capacity for each of pig iron and crude steel by 2015.
Oct. 2013	State Council, Instructive Opinions to Solve Serious Problems of Excess Production Capacity China strictly prohibited projects for new construction of facilities with production capacity. China reduced production capacity with over 80 million tons in the Shandong, Hebei, Liaoning, Jiangsu, Shanxi and Jiangxi Provinces.
Feb. 2016	State Council, Opinions on Development Toward Solving Excess Production Capacity and Realizing Overcoming of Difficulties in the Steel Industry
Nov. 2016	MIIT, Notice of Plan for Adjustment and Enhancement of the Steel Industry (2016-2020) This set a goal of the steel-making capacity at one billion tons or less and a goal of the operating rate of production facilities at 80% as barometers in 2020.

In 2015, when around 70% of listed steel companies recorded operating losses, the Central Economic Work Conference[47] in December positioned the resolution of excess production capacity as the top priority task. Based on this, in February 2016, the central government set a reduction target.[48] In addition, in order to support the resolution of the unemployment problem associated with capacity reduction, the central government determined policy measures,[49] including the establishment of a dedicated fund. Furthermore, the central government strictly managed the implementation of the target, for example by dispatching monitoring teams to local regions and punishing senior local government officials who violated its policy guidelines on addressing excess steel production capacity.[50] As a result of these efforts, the target for the reduction of production capacity was achieved in 2016 and 2017 (Figure II-2-2-10). Moreover, at the Global Forum on Steel Excess Capacity (see Part III, Chapter 1, Section 5), the government of China explained the above reduction efforts to countries participating in the forum.[51]

Table II-2-2-10 Targets for the reduction of crude steel production equipment in China and the results

Long-term target	2016		2017	2018
	Target	Result	Target	Target
Reduction of 100 million to 150 million tons over five years from 2016	45 million tons	65 million tons	Around 50 million tons	Around 30 million tons

Notes: Some press releases that China achieved the 2017 goal.

Source: *Government Activity Report* (National People's Congress of China) and other materials.

47 The Central Economic Work Conference is an annual conference held by the Communist Party of China and the State Council and is invested with the highest authority to determine macro-economic policies for the following year. The Central Economic Work Conference is attended by leaders of the Communist Party of China and the State Council; leaders of the National People's Congress and the Chinese People's Political Consultative Conference; senior party and government officials of provinces, autonomous regions and directly administered cities; senior officials of divisions of central government and national organizations; senior officials of military districts and services; and senior officials of companies directly controlled by the central government (see the economic glossary of the People's Daily).

48 State Council (2016), "Opinions on Development for Solving the Excess-Production-Capacity Problem in the Iron and Steel industry and Overcoming Related Difficulties (关于钢铁行业化解过剩产能实现脱困发展的意见)" (http://www.gov.cn/zhengce/content/2016-02/04/content_5039353.htm).

49 Ministry of Finance of the People's Republic of China (2016), "Method for Managing Special Incentives for Adjusting Structures of Industrial Companies (工业企业结构调整专项奖补资金管理办法)" (http://jjs.mof.gov.cn/zhengwuxinxi/zhengcefagui/201605/t20160519_1998021.html).
Ministry of Finance of the People's Republic of China (2016), "Notice of Issues on Special Incentives Exclusively for Adjusting Structures of Industrial Companies (关于征收工业企业结构调整专项资金有关问题的通知)" (http://www.mof.gov.cn/zhengwuxinxi/caizhengwengao/wg2016/wg201603/201607/t20160705_2344745.html).

50 State Council (2016), "Opinions on Development for Solving the Excess-Production-Capacity Problem in the Iron and Steel industry and Overcoming Related Difficulties (关于钢铁行业化解过剩产能实现脱困发展的意见)" (http://www.gov.cn/zhengce/content/2016-02/04/content_5039353.htm).

51 BMWi & OECD (2017) "Global Forum on Steel Excess Capacity report."

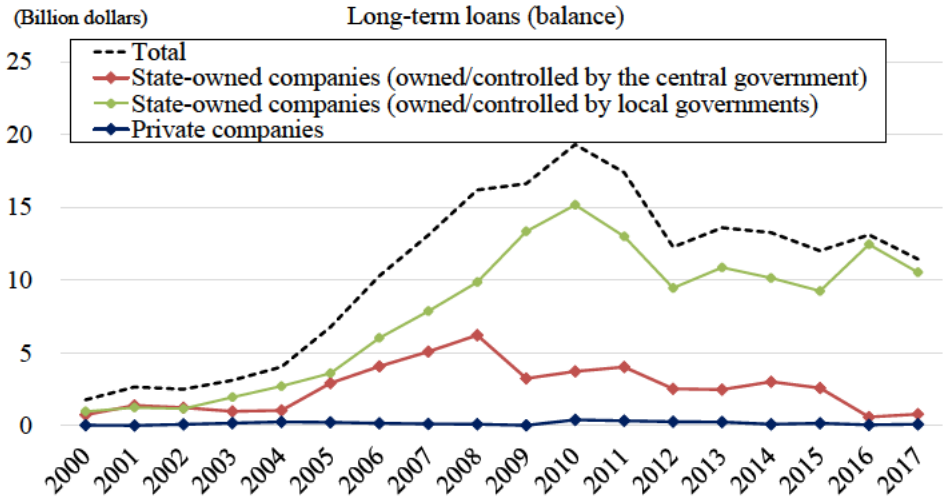
The development of the Chinese steel industry since 2001 as described above indicates that the increase in production capacity is related to banks' provision of excessive amounts of low-interest loans that was in conflict with the market conditions. It also indicates that the provision of governmental subsidies was in effect a measure to make up for companies' losses and extend the life of companies with low profitability.

(2) Trends by corporate ownership type

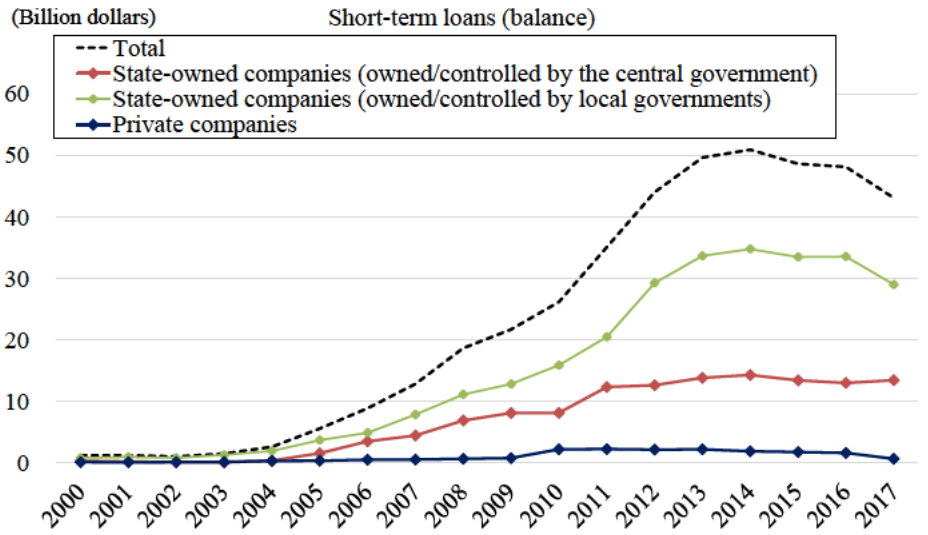
Most loans and governmental subsidies have been allocated to steel companies owned/controlled by local governments, according to a comparison of three groups of companies [52] --companies owned/controlled by the central government, companies owned/controlled by local governments, and private companies--in terms of the balance of bank loans, the value of governmental subsidies provided, and the value of fixed assets held (Figure II-2-2-11).

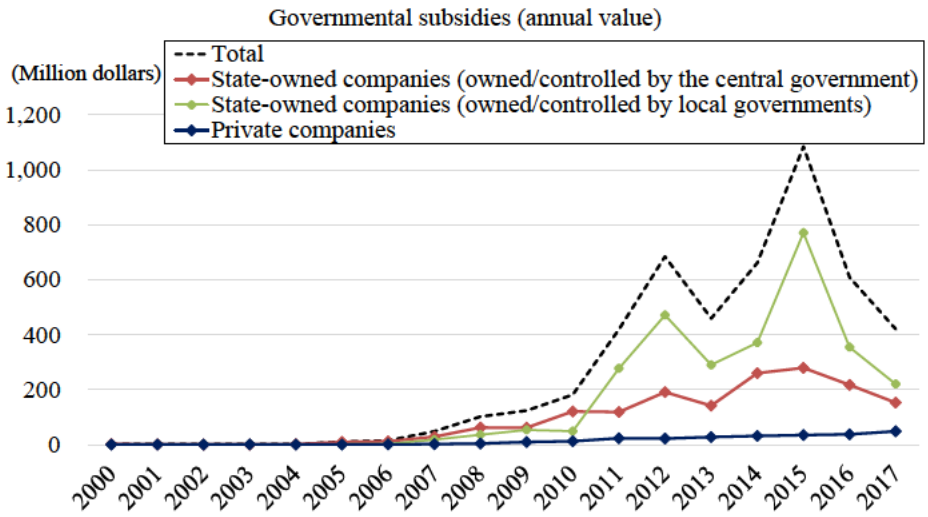
Since 2003, the balance of long-term loans relative to total assets has stayed larger for companies owned/controlled by local governments than the average for all three groups of companies (Figure II-2-2-12). The balance of long-term loans relative to fixed assets has also remained relatively large for companies owned/controlled by local governments compared with the levels for the other groups. From this, it is clear that bank loans have been provided to companies owned/controlled by local governments in large amounts relative to their sizes (Figure II-2-2-13).

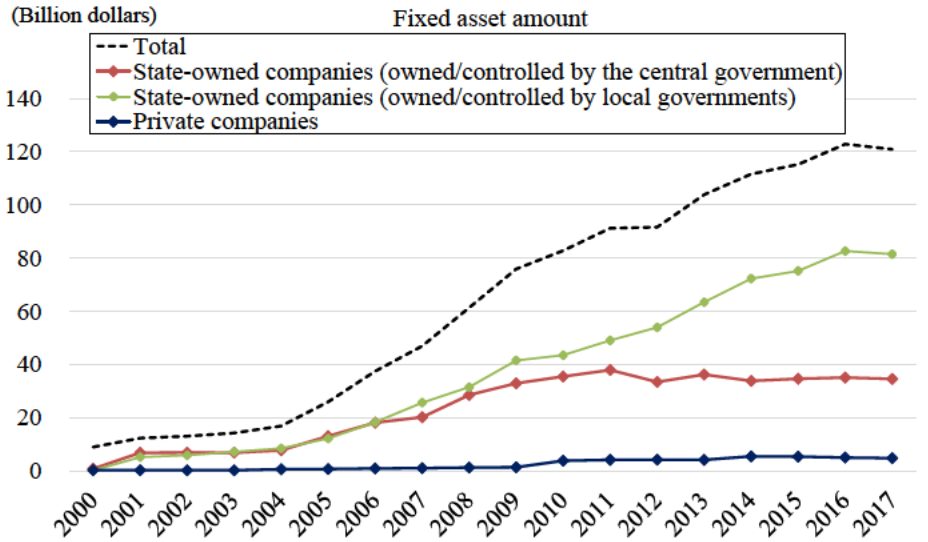
Figure II-2-2-11 Changes in loan balances, governmental subsidies and fixed assets of 33 listed-steel companies in China (by corporate ownership type)



[52] Judged based on the largest shareholder in the shareholder composition indicated in individual companies' annual reports.



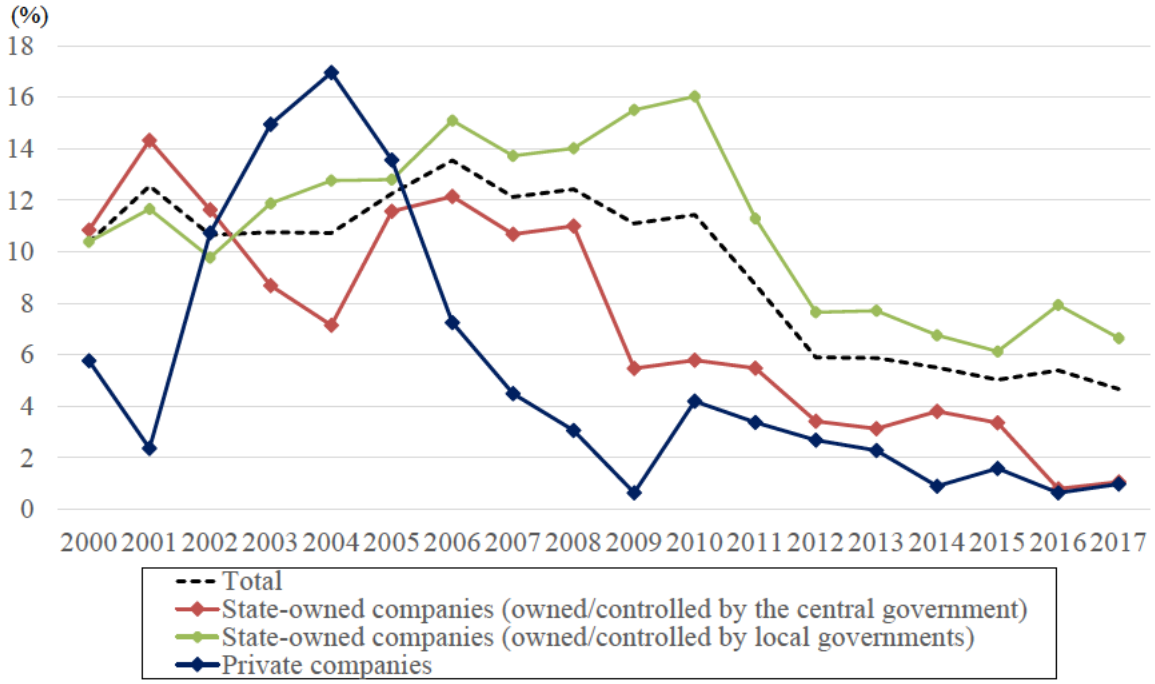




Notes: The number of companies owned/controlled by the central government was five as of the end of 2016. The number of companies owned/controlled by local governments was 21, while that of private companies was seven.

Source: *Fiscal Financial Reports* (33 listed-steel companies in China).

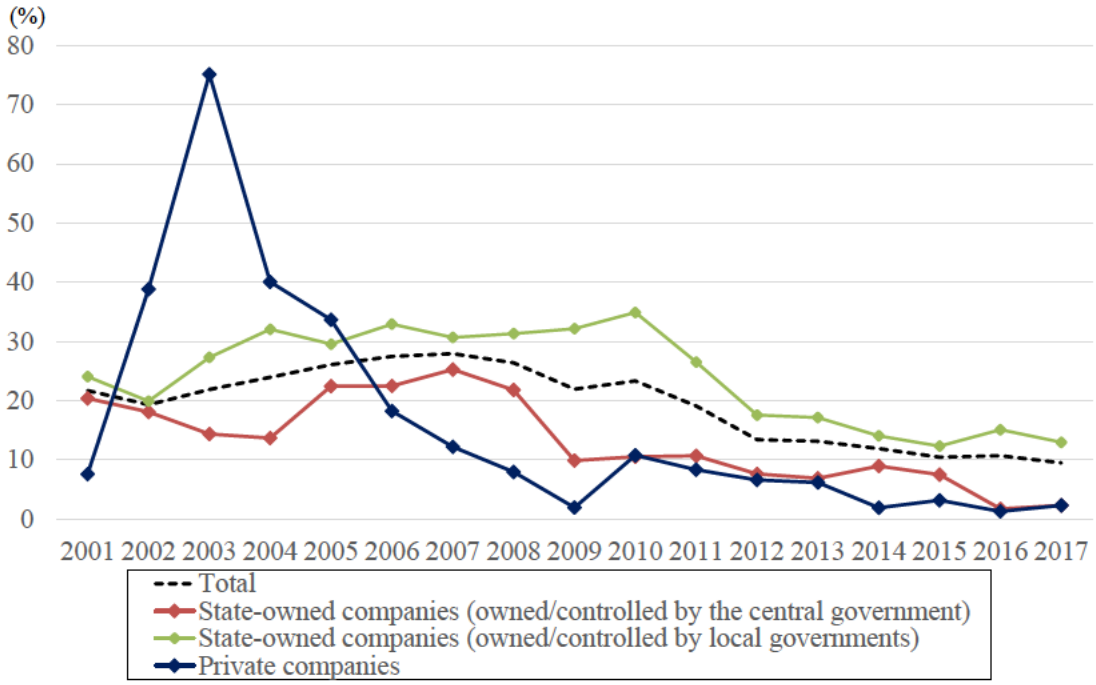
Figure II-2-2-12 Changes in proportions of balance of long-term loans to total assets of 33 listed-steel companies in China (by corporate ownership type)



Notes: The number of companies owned/controlled by the central government was five as of the end of 2016. The number of companies owned/controlled by local governments was 21, while that of private companies was seven. The figures are the results of division by group of company of the sum of long-term loans by the sum of total assets.

Source: *Fiscal Financial Reports* (33 listed-steel companies in China).

Figure II-2-2-13 Changes in proportions of long-term loans to fixed assets of 33 listed-steel companies in China (by corporate ownership type)

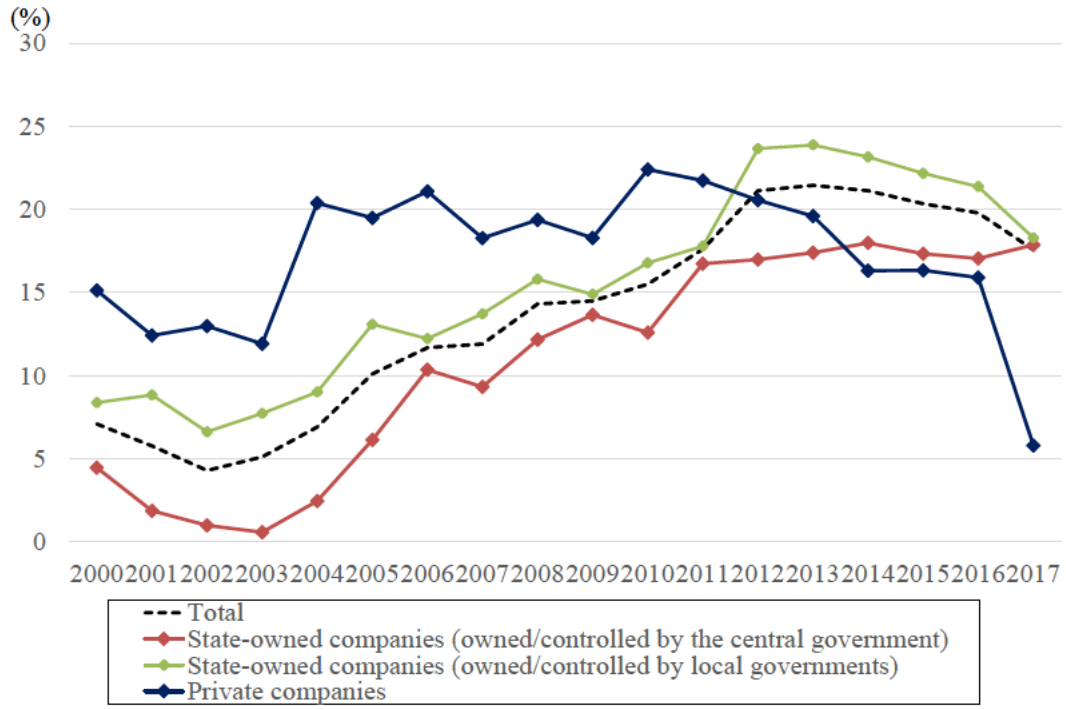


Notes: The number of companies owned/controlled by the central government was five as of the end of 2016. The number of companies owned/controlled by local governments was 21, while that of private companies was seven. The figures are the results of division by group of company of the sum of long-term loans by the sum of fixed assets.

Source: *Fiscal Financial Reports* (33 listed-steel companies in China).

The balance of short-term loans as a proportion of total assets has stayed higher for companies owned /controlled by local governments than for the average for all three groups since 2001. It was equivalent to around 20% of total assets between around 2012 and 2016, when companies' management situation deteriorated (Figure II-2-2-14). The value of governmental subsidies relative to the company size (sales) trended upward for all three groups of companies, but the value was particularly large for companies owned/controlled by local governments between 2012 and 2015, when the conditions of the steel industry deteriorated especially severely (Figure II-2-2-15).

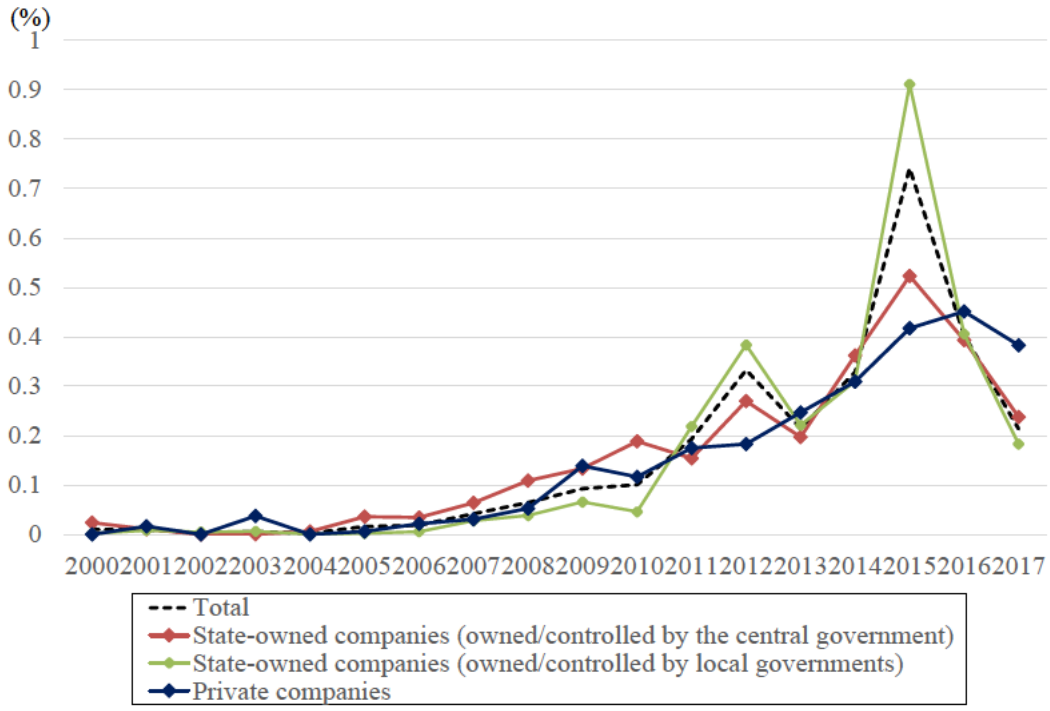
Figure II-2-2-14 Changes in proportions of short-term loans to total assets of 33 listed-steel companies in China (by corporate ownership type)



Notes: The number of companies owned/controlled by the central government was five as of the end of 2016. The number of companies owned/controlled by local governments was 21, while that of private companies was seven. The figures are the results of division by group of company of the sum of short-term loans by the sum of total assets.

Source: *Fiscal Financial Reports* (33 listed-steel companies in China).

Figure II-2-2-15 Changes in proportions of governmental subsidies to sales of 33 listed-steel companies in China (by corporate ownership type)

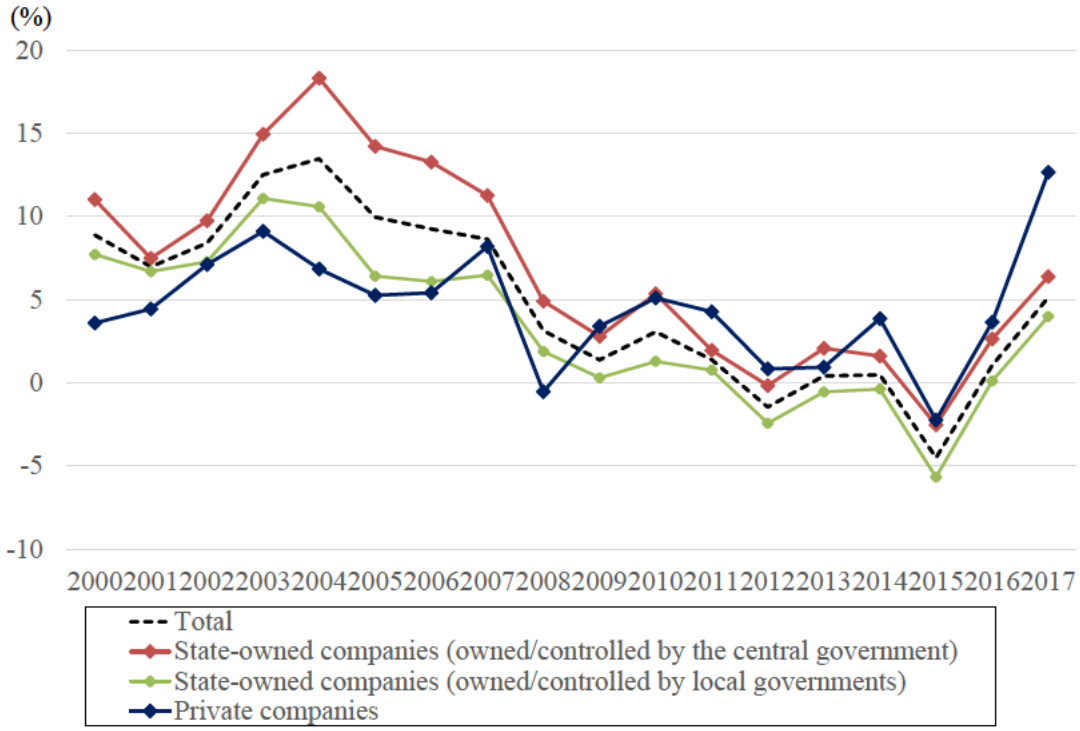


Notes: The number of companies owned/controlled by the central government was five as of the end of 2016. The number of companies owned/controlled by local governments was 21, while that of private companies was seven. The figures are the results of division by group of company of the sum of governmental subsidies by the sum of sales.

Source: *Fiscal Financial Reports* (33 listed-steel companies in China).

In light of the above trends, it is clear that companies owned/controlled by local governments have been given priority as recipients of support, including loans to and investments in the steel industry between the accession to the WTO in 2001 and the implementation of the 4-trillion-yuan economic package and lending of operating funds and governmental subsidies provided in response to the sluggish business performance since 2012. It is also clear that the support did not necessarily contribute to the improvements of companies' profitability and value added. In particular, although companies owned/controlled by local governments received support as priority recipients, their management capability did not improve, with their return on assets remaining lower than the return for other companies (Figure II-2-2-16).

Figure II-2-2-16 Return on assets of steel companies in China (by type of company)



Notes:

1. The number of companies owned/controlled by the central government was five as of the end of 2016. The number of companies owned/controlled by local governments was 21, while that of private companies was seven. The figures are the results of division by group of company of the sum of operation profit by the sum of total assets.
2. It should be noted that the operation profit in 2017 includes the government subsidies due to an accounting standard change. Accordingly, the operation profit in 2017 is the result of deducting the government subsidies from the operation profit.

Source: *Fiscal Financial Reports* (33 listed-steel companies in China).

A large portion of the long-term loans provided to steel companies came from large commercial banks, policy banks and local branches of joint stock commercial banks.[53] It has been pointed out that local branches of those financial institutions tend to be lenient in making decisions on loans to local companies in some cases.[54]

Meanwhile, more than half of governmental subsidies were provided by local governments (Figure II-2-2-17). The stance of local governments and banks on support may have been a factor that led steel companies to expand production facilities excessively and made them reluctant to reduce excess production capacity.

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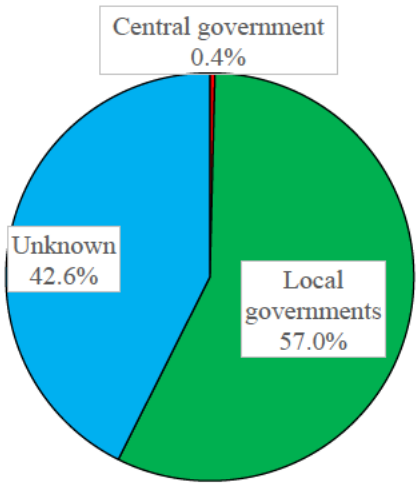
53 In individual companies' annual reports, the top five banks in terms of the balance of loans are indicated in the section that explains the details of long-term borrowings. In particular, see the reports in 2010, when the balance of long-term borrowings was the largest.

54 Source: unbank.info (银行联合信息网) (October 9, 2016), "Banks' Agony: Continuous Funding Amid a String of Financial Defaults (银行诉苦丨债务违约潮下被迫放贷)" (http://blog.ricoh.co.jp/RISB/china_asia/post_152.html).

Figure II-2-2-17 Breakdowns of governmental subsidies provided to 33 listed-steel companies in China (2015)

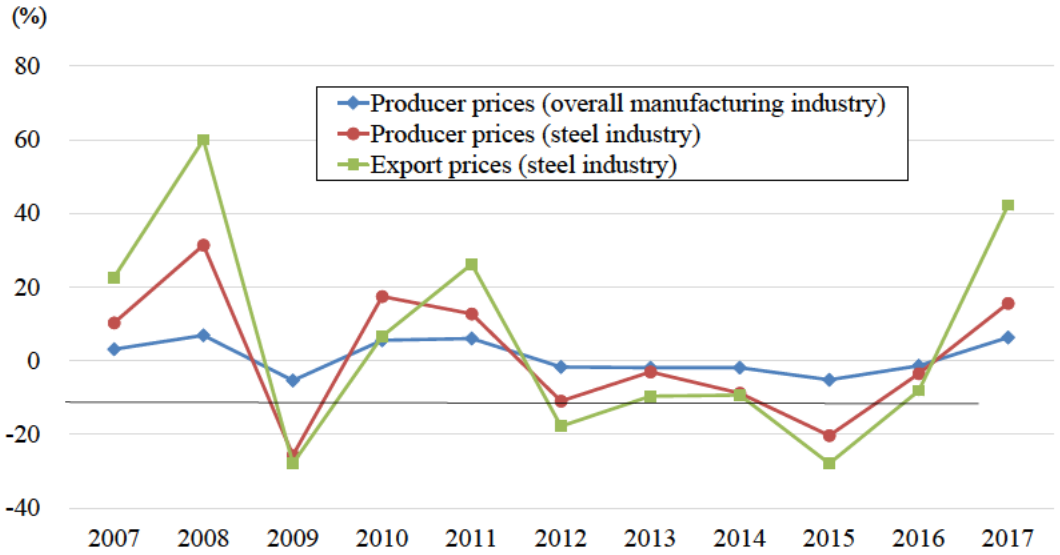


Source: *FY2016 Survey for International Economy to establish the Growth Strategy harmonizing domestic and international Economy (Survey for Business Environments and Market Trends: Structural Analysis of Excess Production Capacity in Emerging Countries*) (METI).

(3) Steel export price and impact on export share

A decline in companies' profitability associated with the excess production capacity problem in the steel industry caused the international market condition to deteriorate. After 2012, when around half of steel companies recorded operating losses, the steel price in China fell steeply relative to general prices in the overall manufacturing industry and the steel export price dropped even more sharply (Figure II-2-2-18). Between 2008 and 2012, the price of steel exported from China was similar to or higher than the average price of steel exported from Japan, the United States and Europe, but it later dropped steeply. This is considered to be one of the factors that lowered global steel export prices. As a result of the export price decline, in 2015, China's share in the global steel export volume reached around 25% (Figure II-2-2-19). Amid this trend, the number of investigations of trade remedy measures (e.g., anti-dumping measures) related to steel and the number of such measures implemented have increased worldwide (Figure II-2-2-20).

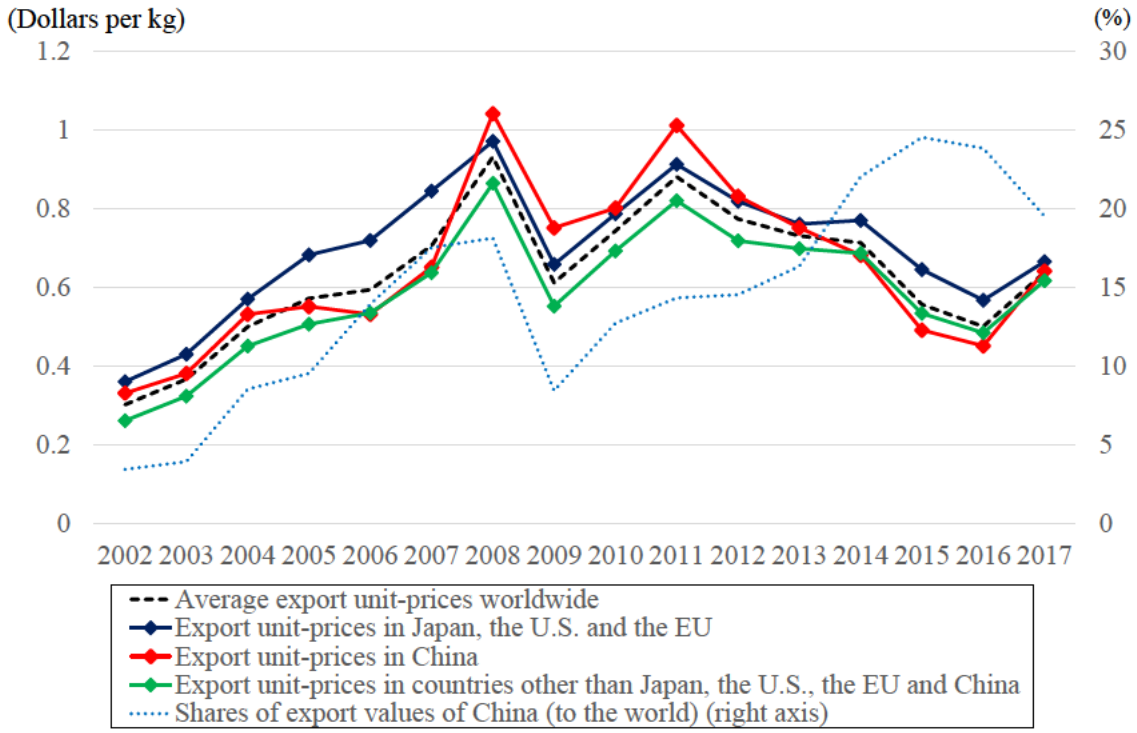
Figure II-2-2-18 Changes in producer prices and export prices in the steel industry in China (year-on-year)



Notes: The values of producer prices are based on the data released by the National Bureau of Statistics of China. The export prices are the calculation results based on the average unit-price of steel classified in HS code 72 according to the Global Trade Atlas Database.

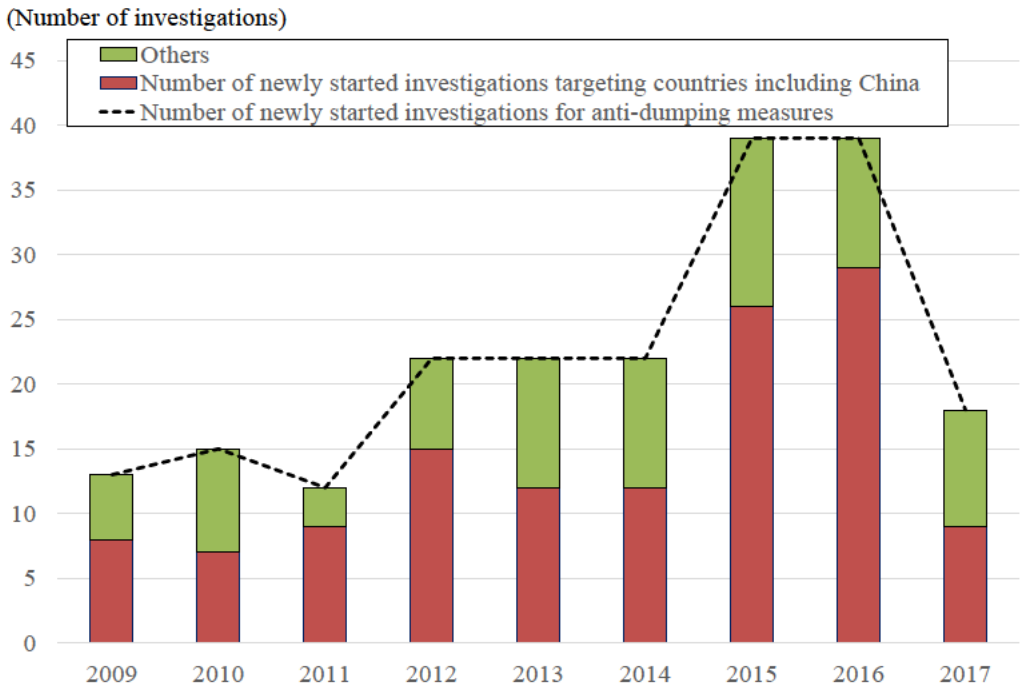
Source: National Bureau of Statistics of China, CEIC Database, Global Trade Atlas.

Figure II-2-2-19 Export prices of steel in China and average unit-prices of steel in Japan, the United States and the EU (2015)



Source: Global Trade Atlas.

Figure II-2-2-20 Changes in the number of newly started investigations for anti-dumping measures in the steel industry



Source: Japan Iron and Steel Federation.

In 2017, the steel export price rose as the business performance of Chinese steel companies recovered against the backdrop of the recovery of the global economy and China's initiative to reduce production capacity. As a result, the number of anti-dumping measures implemented decreased.

As described above, in this paragraph, we reviewed the history of the excess production capacity problem in the past 15 years and the factors behind the problem, taking up the Chinese steel industry as an example. The review shows that in the Chinese steel industry, investments increased rapidly following China's accession to the WTO, resulting in excess capacity. The rapid increase in investments is considered to have been caused mainly by excessive amounts of loans and governmental subsidies provided to companies owned/controlled by local governments.

In recent years, under international frameworks such as the Global Forum on Steel Excess Capacity, the countries concerned started activities to provide a comprehensive solution to the excess production capacity problem, including explaining the current status and improvement measures to each other and conducting mutual reviews. We believe that the review of the example case in this paragraph also provides an important perspective for the implementation of improvement measures and mutual reviews between the countries concerned.

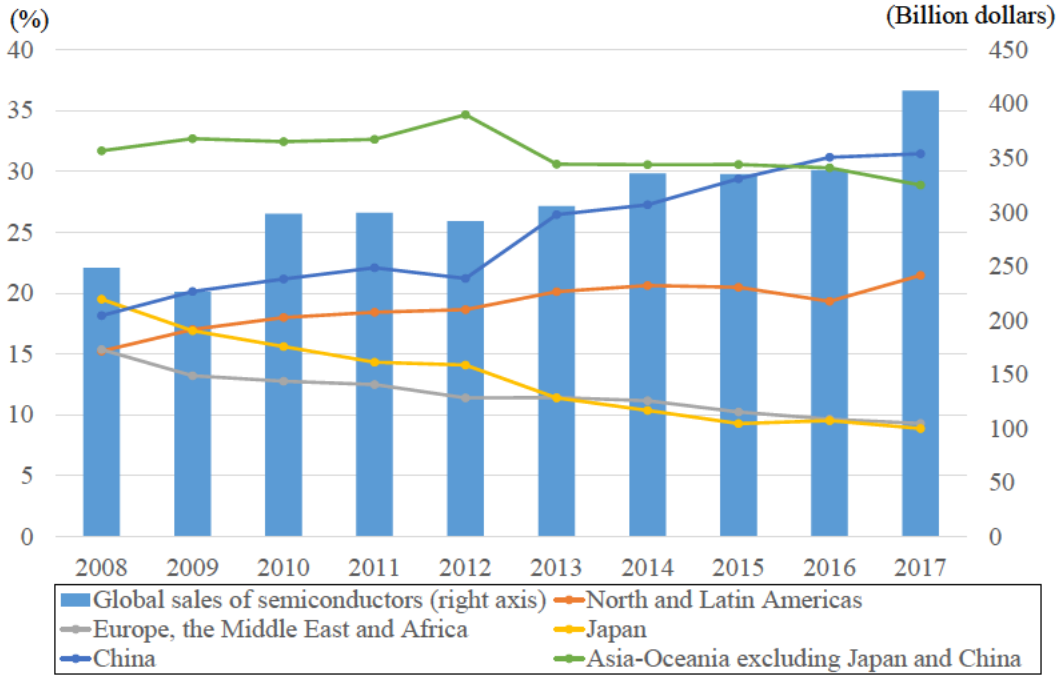
2. Possibility of a new excess production capacity problem

The excess production capacity problem that arose in the Chinese steel industry may be replicated in other industries in the future.[55]

55 The European Commission (2017; p 82; http://trade.ec.europa.eu/doclib/press/index.cfm?id=1774) cited

Analysis similar to the examination of past example cases provides an important perspective for the review of the possibility of future problems and implementation of countermeasures. In this paragraph, we will discuss the integrated circuit (IC) industry, a backbone industry essential for the expansion of digital economy, which was taken up in Part II, Chapter 1. In particular, we will analyze trends in the IC industry in China, which is the largest semiconductor market in the world (China's share in global sales is higher than 30%) (Figure II-2-2-21) through a method similar to the one used in the analysis of the steel industry in the previous paragraph and examine the possibility that excess production capacity will be created in the IC industry in the future.

Figure II-2-2-21 Changes in global market scales of semiconductors and shares by region/country



Source: The figures are based on the data from the World Semiconductor Trade Statistics (WSTS). However, the data on sales in China in 2016 and 2017 are based on the data from the Semiconductor Industry Association (SIA).

(1) Trends concerning Chinese IC-related companies in the past nine years (Figure II-2-2-22)

Many Chinese IC-related companies[56] recorded operating losses and their return on assets turned negative at the time of the global financial crisis. Later, because of the 4-trillion-yen economic package, their business performance temporarily improved, but their management conditions remained unstable, with the return on assets dropping to 0.2% in the following year.

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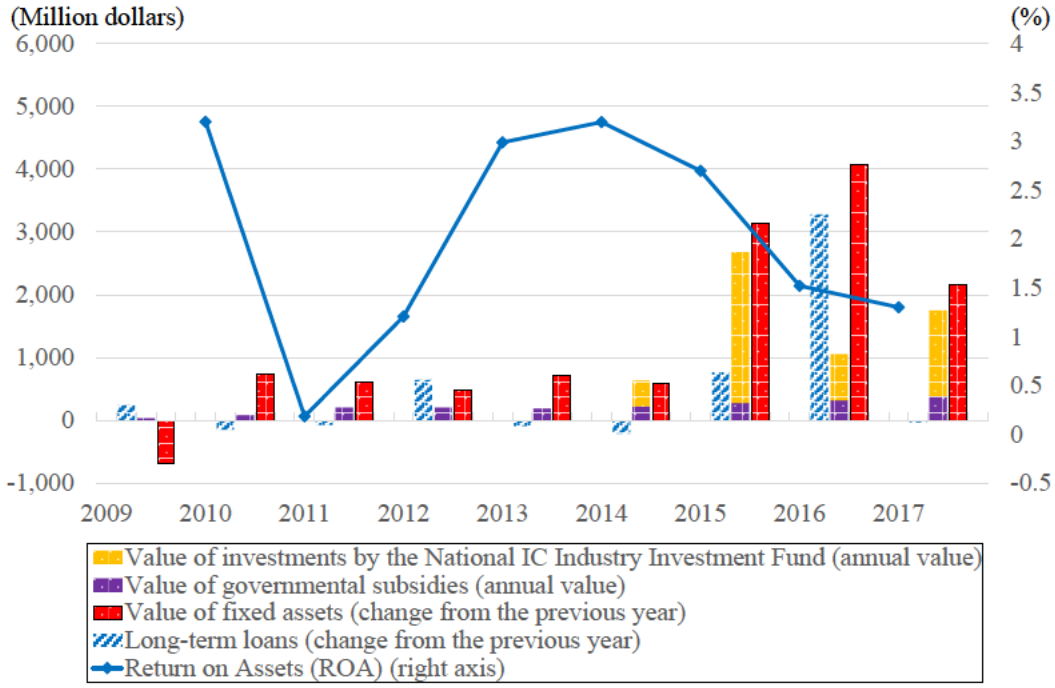
new energy vehicles, such as electric vehicles, and robotics as examples of industries facing the risk of an excess production capacity problem.

[56] In this section, 19 listed companies are analyzed.

Figure II-2-2-22 Trends concerning Chinese IC-related companies in the past nine years



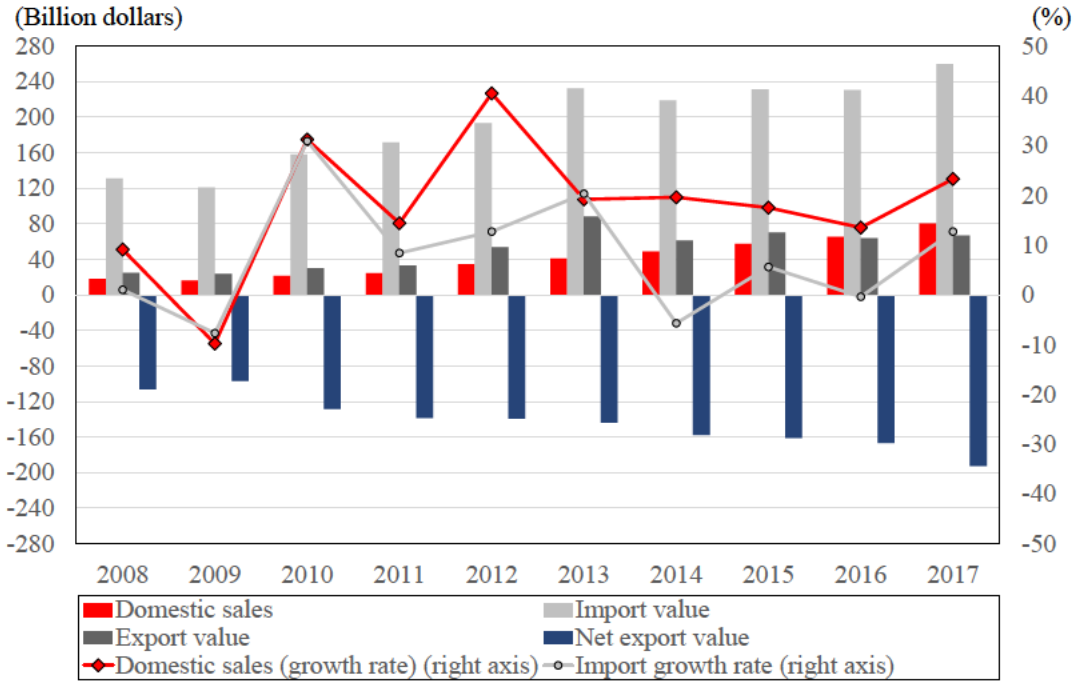
Notes: The values of ROA are the results of dividing the sum of operation profit of the top 19 IC-related Chinese listed companies in terms of market capitalization by the sum of total assets. It should be noted that the operation profit in 2017 includes the government subsidies due to an accounting standard change. Accordingly, the operation profit in 2017 is the result of deducting the government subsidies from the operation profit. The ROA in 2009 was -12.5%.

Source: *Fiscal Financial Reports* (top 19 IC-related Chinese listed companies in terms of market capitalization, *Securities Research Reports (证券研究报告)* (Zhongtai Securities Co., Ltd.).

Subsequently, the government of China adopted the ICT industry as one of the "strategic emerging industries" under the 12th Five-Year Plan that started in 2011 and issued the notice on "Several Policies for Further Encouraging the Development of the Software Industry and Integrated Circuits Industry"[57] as policies specially designed for the industry. The policies included fiscal support measures, mainly preferential tax measures, investment and loan measures to promote research and development, and import and export promotion measures. In 2011, the year when the policies were notified, the value of governmental subsidies provided was around twice higher than in 2010. Thereafter, the annual value of governmental subsidies continued to increase, and in 2015, the last year of the 12th Five-Year Plan, it was around 3.5 times higher than in 2010. Around that time, demand was robust (Figure II-2-2-23), as shown by the annual expansion of around 20% in the Chinese IC market in terms of sales and by the continued import increase. Against the backdrop of this robust demand, IC-related companies increased fixed assets. Their return on assets also improved, rising to 3.2% in 2014.

57 State Council (2011), "Notice of Several Policies for Further Encouraging the Development of the Software Industry and Integrated Circuits Industry (关于印发进一步鼓励软件产业和集成电路产业发展若干政策的通知)" (http://www.gov.cn/zwgk/2011-02/09/content_1800432.htm).

Figure II-2-2-23 Demand for integrated circuits in China



Source: Statistics Data (World Semiconductor Council of China), Global Trade Atlas.

On the other hand, it was difficult to continue to meet domestic demand with domestically manufactured products, so the government of China formulated the National IC Development Guidelines[58] in 2014 in order to further strengthen policy support. Under the guidelines, the government promoted loans by policy banks, such as the Export-Import Bank of China and the China Development Bank, and commercial banks (state-owned banks) and decided to establish a national investment fund specialized in support for the IC industry (National IC Industry Investment Fund). It also expressed support for the establishment of IC industry investment funds in regions. The National IC Industry Investment Fund, which was established in September 2014, invests around 4 billion dollars annually in IC-related companies. As a result, in addition to governmental subsidies and companies' borrowings, policy resources, including investments by investment funds, have expanded rapidly since 2014. In line with the expansion, the value of fixed assets rose steeply between 2015 and 2017. On the other hand, companies' return on assets continued to decline in the same period.

The trend in the Chinese IC industry as described above is similar to the situation of the Chinese steel industry in the period of net import in terms of production capacity expansion due to the excessive allocation of policy resources against the backdrop of robust domestic demand and expected demand growth. In the steel industry, the international market conditions deteriorated because of the supply of products manufactured by steel companies with low profitability that would normally have to be ousted from the market. In light of the results, there are concerns that an excess production capacity problem will arise in the IC industry as well in the future.

58 MIIT of the People's Republic of China (2014), "National ICG Guidelines (国家集成电路产业发展推进纲要)" (http://www.miit.gov.cn/n1146295/n1652858/n1652930/n3757021/c3758335/content.html).

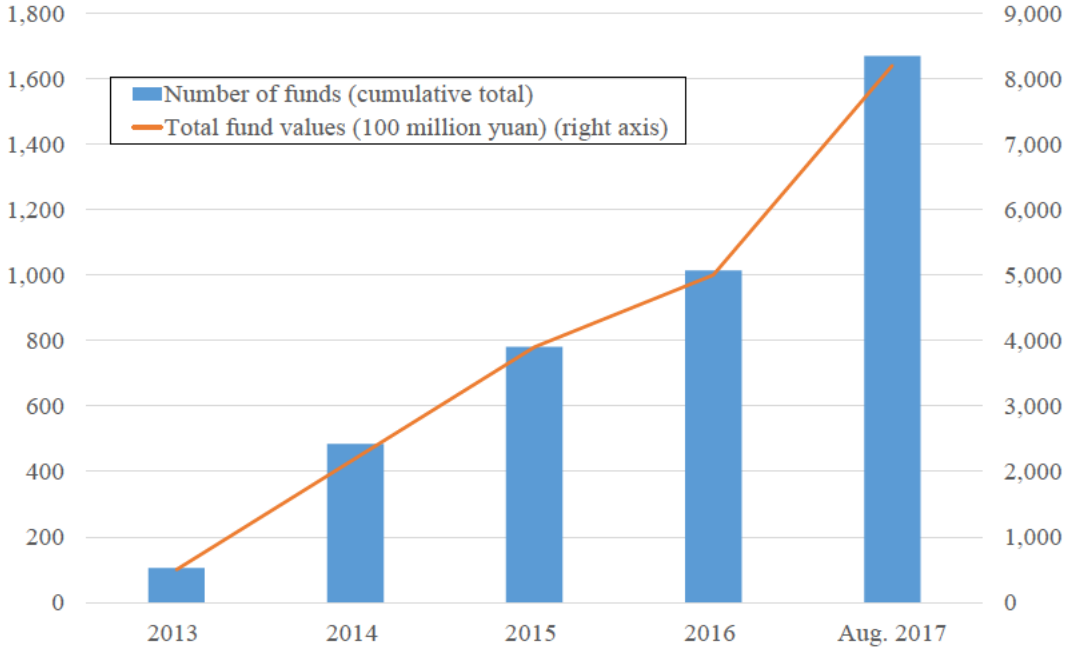
Against the backdrop of these problems, an agreement was reached on best practices and guidelines for improving the transparency of regional support programs, including industrial investment funds, and correcting the programs at a conference in November 2017 of the Government/Authorities Meeting on Semiconductors (GAMS).[59] As a concrete implementation measure, it was also agreed that GAMS members (Japan, the EU, the ROK, the United States, Taiwan and China) will exchange information concerning regional support programs. It is expected that through this and other meetings, the transparency of regional support programs will be maintained and the excessive allocation of policy resources in the IC industry will be prevented as a result.

(2) Industrial investment funds

In this section, we discussed concerns that an excess production capacity problem may arise in the Chinese IC industry in the future due to excessive allocation of policy resources. In recent years, industry investment funds such as the National IC Industry Development Fund have played a particularly significant role as policy fund sources.

Industrial investment funds collect funds from fund providers, including government organizations, financial institutions, companies, PE funds, venture capital funds, and public pension funds and invest in government projects and make investments intended to support the optimization of the industrial structure through fund procurement by companies and mergers. Since around 2014, the number and scale of industrial investment funds increased rapidly and their presence as a major policy fund source of the government has grown (Figure II-2-2-24).

Figure II-2-2-24 Changes in the number of industry investment funds and total fund values



Source: Private Equity Database (私募通) (Zero2IPO Group).

59 This meeting, which brings together government officials from semiconductor-manufacturing countries in order to exchange opinions on points of international debate related to semiconductors, started in 1999. Since then, it has been held every year, and discussions have been conducted on proposals from the World Semiconductor Council (WSC), which was established as a private-sector meeting of the industry.

For example, the scale of the China Integrated Circuit Industry Investment Fund, which is an industrial investment fund intended to support the IC industry, is 138.7 billion yuan (20.6 billion dollars), and the value of investments made in Chinese companies[60] is higher than the value of governmental subsidies (Figure II-2-2-22). Furthermore, local governments have established many funds intended to provide financial support to the IC industry, with budgets totaling around 333 billion yuan (49.4 billion dollars) in 2017.[61]

In addition, the Advanced Manufacturing Investment Fund (budget scale of 20 billion yuan (2.9 billion dollars)), which is intended to support the strategic emerging industries (see the column in Part II, Chapter 3) designated under the 13th Five-Year Plan and the Made in China 2025 project, was established in 2016.[62] It has also been reported that a new fund intended to support industries involved in the Made in China 2025 project will be established.[63] As a result, there are concerns that an excess production capacity problem may be caused by the allocation of policy resources in several industries in the future.

(3) Japan's industrial policy for the IC industry and the trends concerning companies at that time

In this section, we provided an overview of policy resource investments for fostering the IC industry and trends concerning IC-related companies in China. Here, we will provide an overview of trends in the Japanese IC industry in and around the period from 1976 to 1979, when the Super LSI Technology Research Association, which embodied a typical industrial promotion policy in Japan, was active.

The Super LSI Technology Research Association was a research association whereby the public and private sectors jointly conducted research and development on semiconductor micro-processing technology with a view to developing central processing units for computers and large-scale integrated circuits (LSIs). The association was comprised of seven companies--Fujitsu, Hitachi, Mitsubishi Electric, NEC, Toshiba, Computer Associated Laboratory (a joint venture of Fujitsu, Hitachi and Mitsubishi Electric) and NEC-Toshiba Information Systems (a joint venture of NEC and Toshiba)--and the total value of research and development expenditures for the project was around 73 billion yen (of which 29 billion yen was borne by the government). The system of project implementation was unique[64]: for example, research themes under the project were designated as non-competition fields,[65] and researchers who were attracted from multiple companies engaged in research at a directly controlled joint research center. This research association succeeded in developing the most advanced semiconductor micro-processing technology at that time. Consequently, Japan's share in the global

60 This refers to the investment achievements made by 19 Chinese listed companies, according to the *Securities Research Report (证券研究报告)* compiled by Zhongtai Securities Co. Ltd. See http://pg.jrj.com.cn/acc/Res/CN_RES/INDUS/2018/1/2/a2dbe851-a871-4505-8907-3a4c4f79bb43.pdf.

61 Liu Xiaobo (2018).

62 Ministry of Finance of the People's Republic of China (2016), "Press Release (July 15, 2016)" (http://www.mof.gov.cn/zhengwuxinxi/caizhengxinwen/201607/t20160715_2358336.htm).

63 China.org.cn (February 12, 2018), "Chinese New Material Industry Reaches its Production Volume to 10 Trillion Yuan in 2025 (中国の新素材産業、2025 年に生産高は 10 兆元へ)" (japanese.china.org.cn/business/txt/2018-02/12/content_50496646.htm).

64 This system served as a model for many joint research projects that would be implemented later around the world.

65 The Takeda Foundation (2005), "CHOUSA HOUKOKU SHO."

semiconductor market rose from 28% (1975) to 52% (1988). In addition, total sales of products using the results of the project over the five years from 1983 exceeded 2.2 trillion yen.

The value of governmental investments in the Super LSI Technology Research Association was 29 billion yen. In the period around the project implementation of the association (1973-1984), the value of governmental subsidies for the five participating companies and the research association, was equivalent to 0.3-0.5%[66] of sales at most, much smaller than the ratio for Chinese IC-related companies (1.3-4.1% between 2009 and 2017).[67] On the other hand, the return on assets (ROA) for the five participating companies after the project implementation by the Super LSI Technology Research Association stayed above 6%. This provides a contrast to the recent trend in the Chinese IC industry.

66 Estimated from the profit-loss statement in financial reports by the five participating companies. Under the Japanese accounting standards, there is no legal basis for requiring the statement of government subsidies. As government subsidies are customarily recorded in the miscellaneous income (other) sub-column under the non-operating income column, the value of miscellaneous income (other) divided by sales was used as a reference.

67 The average rate in 2009-2017 is 2.5%. While only governmental subsidies were taken into account, the companies actually received more government resources, including funds provided by industrial investment funds.