Section 2 Promotion of S&T and Contribution to Society

1 Efforts to Guide Science, Technology and Innovation

For Japan, in order to achieve the post-disaster reconstruction and to solve a variety of social problems, importance of the promotion of science, technology and innovation is growing further. In other countries, science, technology and innovation policy is positioned in the core of their national strategy, and they actively evolves the policy in coordination with industrial, economic and diplomatic policies.

In the USA, the government announced "A Strategy for American Innovation: Driving Towards Sustainable Growth and Quality Jobs" for the purpose of "Investment in Innovation is Necessary to Ensure High Quality of Life, National Development, High Salaries, and Employment for the Future," and the government aid and regulations for S&T are being steered in that direction. In addition, the reauthorization bill which acknowledges the extension of the "America COMPETES Act," which was established in 2007, was passed at the US Congress in December 2010, and backing for science education and basic research is to be expanded.

In the United Kingdom (U.K.), the government combined the Department of Business, Enterprise and Regulatory Reform (BERR) and the Department for Innovation, Universities and Skills (DIUS), and newly established the Department of Business, Innovation and Skills (BIS) in 2009. After the first change of government in 13 years in May 2010, the government started reductions with adjustments to each budget. The government, however, announced in December 2010 that 4.6 billion pound is going to be handled as a separate framework for science budget every year and maintained with a cash base for the following term (FY 2011-2014). The Higher Education Funding Council for England (HEFCE), which allocates aid for universities in England, also positioned the basic expenditure necessary for daily research activities in universities within the science budget and handles it as a separate framework.

In France, President Sarkozy announced the "Investment in the Future" strategy, with a budget of 35 billion Euros using government bonds in June 2010 in order to support the national priority areas such as higher education, research and development, and small and medium-sized enterprise expansion.

In March 2010, European Union announced "EUROPE 2020," the EU's growth strategy which sets economic and social goals for the coming 10 years. It listed 3 priorities that have to be tackled for growth, "Smart growth – developing an economy based on knowledge and innovation," "Sustainable growth - promoting a more resource efficient, greener and more competitive economy," and "Inclusive growth – fostering a high-employment economy delivering economic, social and territorial cohesion." It also set a goal of increasing the research and development investment from the current GDP ratio of 1.9% to 3% through the promotion of investment from industry.

The Organization for Economic Co-operation and Development (OECD) announced its "OECD Innovation Strategy" in May 2010, and is seeking to evoke the promotion of education to provide citizens of the member nations with innovation competency and business innovation.

Even in Japan, with facing many problems at home and abroad, the Japanese government needs to utilize S&T strategically to overcome them, and work to return its results to society.

The "Research and Development Capacity Strengthening Act[1]" established in 2008 specifies that through research and development system reform, from the government's allocation of research funding to the delivery of research findings, Japan's overall research and development powers, including national university corporations, public research institutions, independent administrative institutions, and private companies, will be strengthened, innovation creation will be increased, and global competitiveness should be enhanced. In addition, the government approved "The New Growth Strategy," a strategy for the realization of a "Strong Economy" at a Cabinet meeting in June 2010, and along with setting up the promotion of two innovations, green innovation and life innovation, as growth fields for harnessing strength, it positioned the "Science, Technology and IT-oriented National Strategy" as a "Platforms to Support Growth."

As for the direction of future S&T policies, innovation creation will be positioned as a central pillar in the policies, and social sciences and humanities perspectives will be incorporated. In addition to S&T policies, associated innovation policies will also be included. This integrated comprehensive approach is considered to be essential to promote. Even in the discussion on the settlement of the 4th Basic Plan, it is to be developed strongly as a "Science, Technology and Innovation Policy." With regard to specific promotion policies, we need to set in advance the challenges our country need to tackle, promote related S&T comprehensively to achieve them, and position green innovation and life innovation as approaches for dealing with urgent and important issues.

One main difference between the 4th Basic Plan and previous basic plans is the fact that the principles shifted widely from prioritization of research and development projects by the research fields to prioritizing measures by the importance of the issues to be solved. And accordingly, the government needs to know what important issues should be solved and accept requests from the society properly to a greater extent than ever before.

In the remainder of this section, as well as presenting the direction of work regarding green innovation and life innovation, we presented the status and problems of work related to infrastructure development for the creation of industry-academia-government collaborative innovations, the securing of intellectual property, and the status of the basic research that contributes to the creation of new values. In addition, we will introduce our work to prompt those people responsible for our country's future to move forward positively with their hopes and dreams into the world of science, technology, and innovation.

Furthermore, the government is examining the prioritization and promotion of measures for the improvement of safety from disasters, including reconstruction, recovery and risk management, along with the two major innovations, green and life in the follow-up review of the 4th Basic Plan by the CSTP.

2 Promotion of Green Innovation and Life Innovation

At the discussion for the development of the 4th Basic Plan, in order to achieve continuous growth and development to secure an important position in the world, and to realize a prosperous lifestyle for the Japanese public, following tasks such as 1) Responses to climate change and the realization of a low-carbon society and 2) Treatment, care and health responses to the problem of an aging population have been set as

1 "Act on Enhancement of Research and Development Capacity and Efficient Promotion, etc. of Research and Development, etc. by Advancement of Research and Development System Reform" (Legislation Number 63, June 11, 2008)

important issues that our country has to work on. With this perspective, green innovation and life innovation have been identified as approaches for overcoming the important challenges so that they could lead to economic growth.

"The FY 2011 Action Plan for the Implementation of Important Science and Technology Policy Measures" (July 8, 2010) covered here lists 7 ministries, the Ministry of Internal Affairs and Communications (MIC), the Ministry of Education, Culture, Sports, Science and Technology (MEXT), the Ministry of Health, Labour and Welfare (MHLW), the Ministry of Agriculture, Forestry and Fisheries (MAFF), the Ministry of Economy, Trade and Industry (METI), the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), and the Ministry of the Environment (MOE), as promotion related measures. At the planning level, a call for opinions took place (May 21-28, 2010) and they received 859 opinions, and made new amendments such as the setting of measures regarding issues like "Biomass[1]" and "Greenery Environment/Natural Circulation."

(1) Promotion of Green Innovation

We promote green innovation in order to achieve a sustainable low-carbon/natural symbiosis/recycle-based society.

We are going to disseminate and develop one of our country's strengths, which are environmental/energy technology, within our country and abroad. At the same time, we strategically promote the creation of innovation, including breakthrough creation based on problem solving oriented R&D and social systems/systemic reform. It is hoped that through the promotion of green innovation, in addition to the contribution to solve climate change problems, we will take on the role of engine in "The New Growth Strategy," as to create new industries at home and abroad, and generate new employment.

We aim to lead the world to create "Environmentally Advanced Nation Japan" as described above, which the Japanese public can realize a low-carbon/natural symbiosis/recycling-based society.

In FY 2010, with the future vision of "Environmentally advanced nation Japan leading the world and overcoming the global-scale issue of climate change," an agenda of "shift to renewable energy," "low carbon energy supply/use," "highly efficient and smart use of energy," and "greening of social infrastructure" was formed, and in the action plan, measures have been set for things such as "promotion of the shift to renewable energy," "efficient use of fossil resources," "lower carbon generation in transport sectors by promoting the commercialization / dissemination of next-generation vehicles," "lower carbon generation in consumer sectors (household and commercial)," "low-carbonization through the application of information and telecommunication technology," "formation of an abundant green environment and natural circulation," and "environmental advancement in housing, transport and community sectors," using photovoltaic generation and biomass.

On the other hand, in May 2011, in light of the Great East Japan Earthquake, with regard to green innovation focussing on energy science and technology, CSTP compiled the report "Managing the Immediate Science and Technology Policy," a summary by the Minister in charge of Science and Technology Policy and expert members of CSTP which indicates follow-up reviews being performed while the direction of the re-examination of energy policies including nuclear power is looked at in the

1 Renewable biological organic resources excluding fossil resources

government. In this report, there is a objective to clarify the concrete promotion plan to accelerate the steps from research and development to business and diffusion with regard to the low-carbonization of energy supply, and the high efficiency of energy use and the respective important issues of becoming energy smart[1] and greening the social infrastructure[2] based on the constraints in measures for global warming and the crunch of the predicted future electrical power supply and demand, and the understanding that the promotion of countermeasures for energy conservation and the security of a stable supply of electricity is important.

(2) Promotion of Life Innovation

Through the promotion of life innovation, the Japanese government is going to develop S&T that is useful in the realization of a vibrant society where people are healthy in mind and body, and elderly and disabled people can live by themselves ("will not become ill," "will be cured without suffering if they do become ill," "will be able to lead self-supported lives,") and realize the wish that is common to all humankind, "to live a long life, healthy in both mind and body."

In an era of a rapidly aging population combined with a diminishing number of children, the government is going to achieve the nurturing and growth of new industries and the expansion of employment through the realization of such a society, while making a contribution to accomplishing common global challenges.

The Japanese government aims to lead the world to construct this kind of "Healthy Global Power Japan," where citizens can be healthy and work and live actively.

In FY 2010, the action plan, with a future vision of "The Realization of a Dynamic Society of Healthy Minds and Bodies," set two targets: "reducing incidence through the promotion of preventive medicine," and "improving the cure rate through the development of innovative treatment and diagnostic methods", and decided to implement two measures: "1) Development of preventive methods by integrating genome cohort research and medical information" and "2) Development of technology, medication and equipment that enables early diagnosis and cure." Furthermore, the action plan, with another future vision of "The Realization of a Society Where Elderly/Disabled People Can Live By Themselves," set a target of "assisting elderly/disabled people to live an independent life with the help of science and technology," and decided to implement a measure for "3) Development of technology for assisting elderly and disabled people to live an independent life."

In FY 2011, we are taking the lead with the implementation of the following measures:

-Maintenance of genome cohort[3] research systems [related to Measure 1)]

-Epidemiological genome analysis [related to Measure 1)]

-Maintenance of medical information and information infrastructure [related to Measure 1)]

-Early diagnosis and treatment of pancreatic, lung and liver cancer [related to Measure 2)]

-Development of equipment to aid/compensate for the cognitive function/physical disability of elderly and disabled people [related to Measure 3)]

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1 Through using information technology, optimizing energy use in various situations. Specifically, this means using "Smart Grid", which automatically controls demand and supply of energy

2 Through promoting innovation of environmental technology and social systems, reconstructing new social infrastructure, which will support people and industries, while coexisting with nature by pursuing low energy and low consumption type in relation to water and plants, natural resources, land, housing, and transportation systems

3 Conducting a follow-up investigation regarding a subject over an extended period, and collecting information about the disease/cause of death, etc. and genome information

-Development of equipment to reduce the physical and emotional strain of carers substantially [related to Measure 3)]

-R&D of equipment and systems to improve the quality and efficiency of care at home through in-house monitoring/health information services [related to Measure 3)]

In addition, the Cabinet Secretariat established the "Medical Innovations Conference" in November 2010 as part of the work to extend life innovation. In order to promote this work specifically, it also established the "Medical Innovations Promotion Office" in January 2011. The Japanese government aims to trigger "medical innovations" that Japan can be proud of to show the world by producing globally-competitive, world-leading medical technology such as medication, medical equipment and regenerative medicine with various personnel assembled from business, academic and government areas, taking into consideration the global medical trends 10 to 20 years, and 50 years into the future.

3 Promotion of Industry-Academia Collaboration

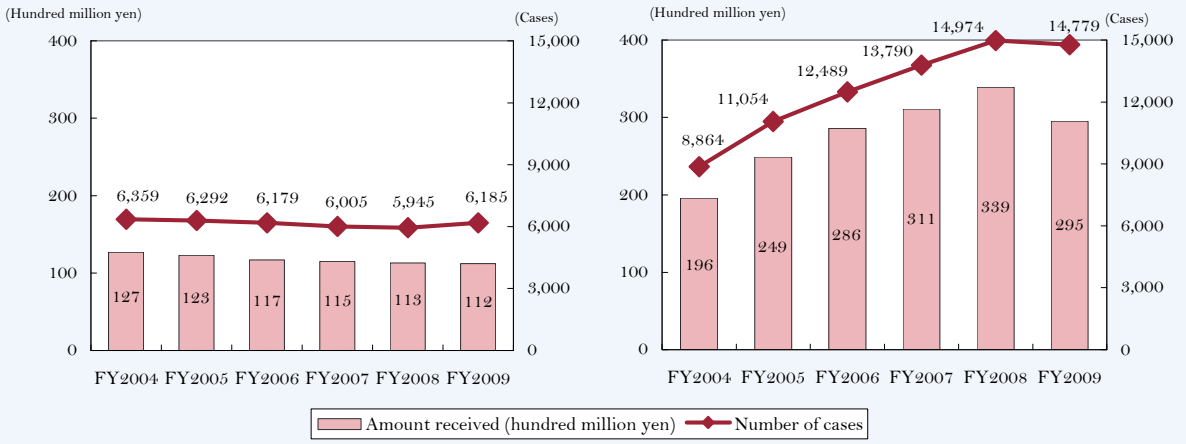
To bring the results of innovations at the hands of the Japanese public, in many cases, they are in the form of commercial products and services supplied by organizations such as businesses. For that reason, the promotion of collaboration with universities and organizations such as businesses, which are hoped to play the role of creating innovation sources, is important for to create a large number of sustainable innovations. Collaboration with universities and organizations such as businesses can be considered as one of the important scenes in the promotion of dialog and collaboration between S&T and society.

(1) Status of Japan's Industry-Academia-Government Collaboration Activities

1) Status of Commissioned Research and Joint Research in Research Institutions such as Universities

Although the number of cases of commissioned research with private businesses in research institutions such as universities in FY 2009 was 6,185, which is 240 more cases than in FY 2008, the amount of research funding received was approximately 11.2 billion yen, which is about 1 hundred million yen less than in FY 2008 (Figure 1-1-12). The number of cases of joint research was 14,779, which is 195 less cases than in FY 2008. The amount of research funding received in FY 2009 was approximately 29.5 billion yen, which is about 4.5 billion yen less than in FY 2008 (Figure 1-1-12).

Figure 1-1-12/Transition of Number of Cases and Amount Received for Joint/ Commissioned Research with Businesses in Research Institutions such as Universities

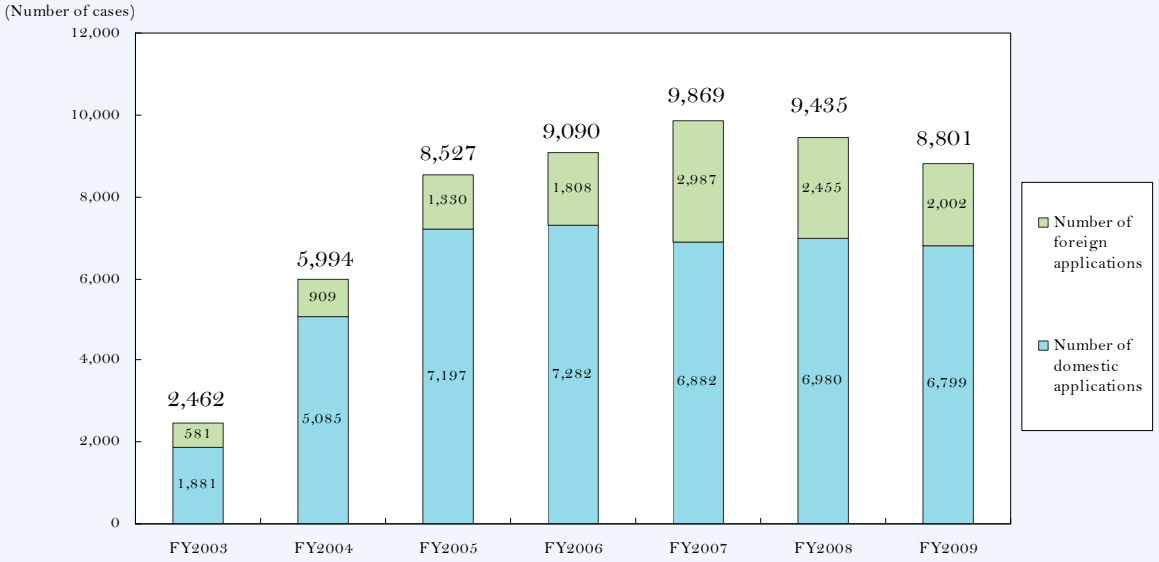


Source : MEXT "FY 2009 Implementation Status of Industry-Academic Collaboration in Research Institutions such as Universities" (2010)

2) Status of Invention in Research Institutions such as Universities

The number of patent applications by research institutions such as universities in FY 2009, including both domestic and foreign applications, was 8,801, which is 634 less cases than in FY 2008. In particular, the number of foreign applications decreased by 453 cases (Figure 1-1-13).

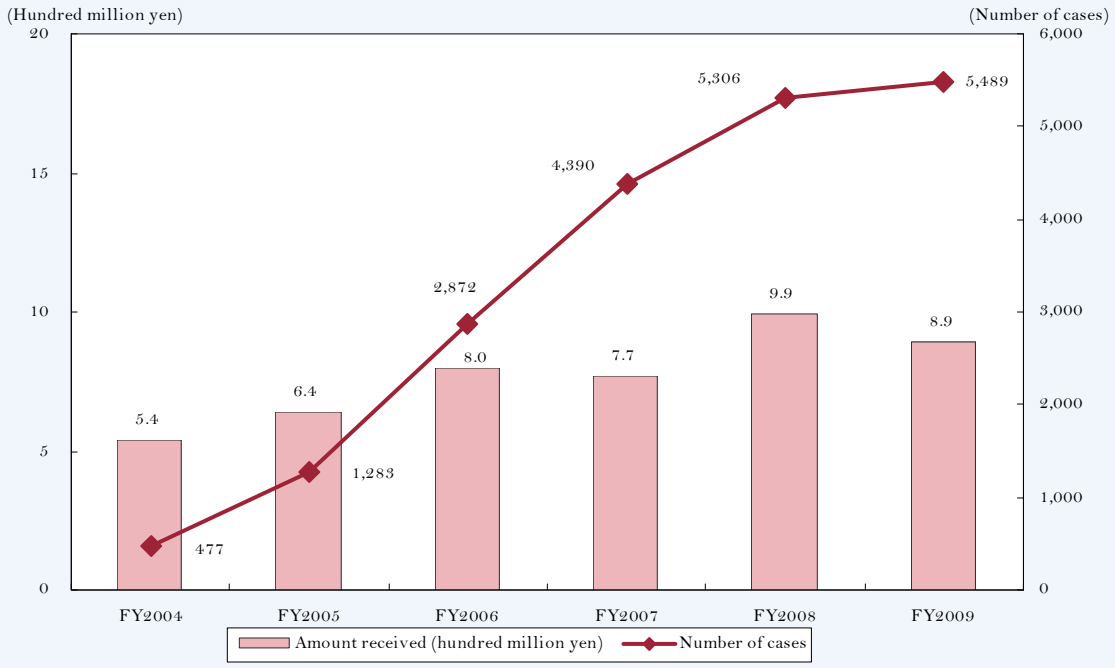
Figure 1-1-13/Transition of Number of Patent Applications in Research Institutions such as Universities



Source : MEXT "FY 2009 Implementation Status of Industry-Academic Collaboration in Research Institutions such as Universities b" (2010)

On the other hand, the number of cases of implementation of patent rights continues to increase year by year, and the revenue from patents shows an overall increase between FY 2004 and FY 2009 (Figure 1-1-14). However, the amount for FY 2009 was approximately 9 hundred million yen, which is considered small when compared to the USA. According to the AUTM[1] U.S. Licensing Activity Survey, the patent revenue of universities in USA in FY 2009 was 2.3 billion dollars (5,328 cases), making it more than 250 times greater that of Japanese research institutions including universities. Japanese research institutions such as universities need to create high-quality outcomes that lead to practical use.

Figure 1-1-14/Transition of Number of Cases of Patent Rights Implemented and Revenue in Research Institutions such as Universities



Source : MEXT "FY 2009 Implementation Status of Industry-Academic Collaboration in Research Institutions such as Universities" (2010)

3) Reduction in S&T Research Funding of Organizations such as Businesses

The drop in many industry-academia-government collaboration activities in FY 2009 is considered to be due to the effects of the global economic slump which began with the collapse of Lehman Brothers in 2008. The slump was severe enough to cause our country's diffusion index[2] to record its largest decline quotient ever in March 2009.

Japan's total research funding for FY 2009 was similarly affected, dropping 8.3% compared to FY 2008 to reach 17.2463 trillion yen.

Universities and other academic organizations increased research funding by 3.0% compared to FY 2008 to 3.5498 trillion yen, while commercial establishments such as businesses decreased their funding by a 12.1% to 11.9838 trillion yen, and non-profit organizations and public organizations decreased their

1 Association of University Technology Managers
2 Index created to contribute to an understanding of the current status and future forecast of the economic climate by consolidating the movement of the index which responds sensitively to the economic climate and is important in various economic activities such as production and employment

funding by 0.5% to 1.7127 trillion yen. This indicates a large decrease in business research funding caused a decrease in overall research funding (Table 1-1-15).

This kind of deterioration in the status of business leads to a reduction in Japan's overall research and development activity, therefore, it is getting more important to increase the support afforded by the continued strengthening of industry-academia-government collaborations.

Table 1-1-15/Research Funding According to Research Bodies

(Million yen)

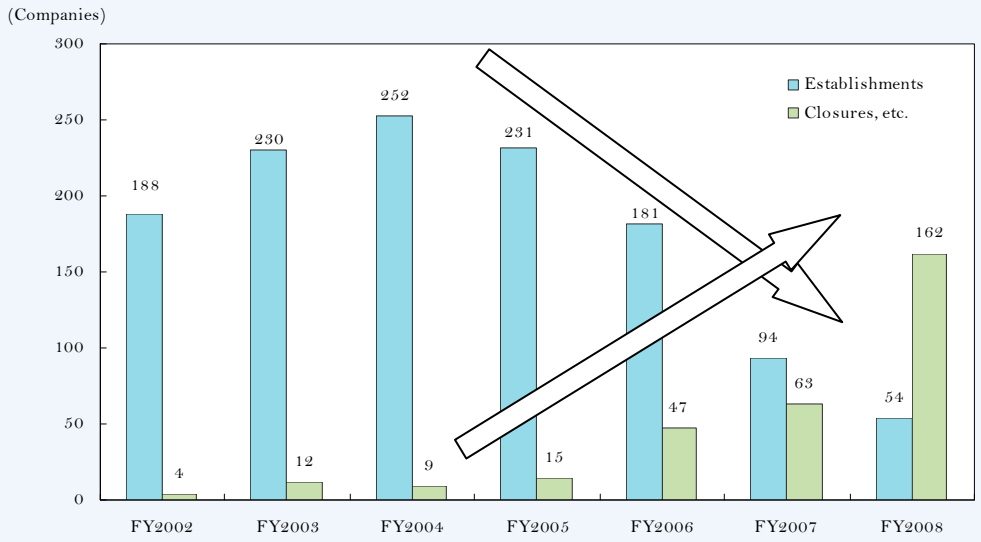
	FY 2008	FY 2009	Increase (%)	Composition ratio (%)
Total amount of research funding	18,800,063	17,246,300	-8.3	100.0
Businesses enterprises	13,634,478	11,983,844	-12.1	69.5
Non-profit organizations/Public agencies	1,720,593	1,712,676	-0.5	9.9
Non-profit organizations	273,229	255,138	-6.6	1.5
Public agencies	1,447,364	1,457,538	0.7	8.5
Government-run research organizations	277,668	238,868	-14	1.4
Publicly-owned research organizations	202,605	196,245	-3.1	1.1
Government-affiliated corporations and independent administrative agencies	967,091	1,022,425	5.7	5.9
Universities and higher educational organizations	3,444,992	3,549,780	3.0	20.6
National	1,433,965	1,550,974	8.2	9.0
Public	187,892	184,895	-1.6	1.1
Private	1,823,136	1,813,911	-0.5	10.5

Source : Bureau of Statistics, Ministry of International Affairs and Communications "FY 2010 Science and Technology Research Survey" (2010)

(2) Status of University-startups that Link University Outcomes to the Market

University- startups act as a bridge that links universities' intellectual properties including research outcomes to the market, and are considered to play an important role as instruments for innovation. According to METI's 2008 Survey on University- startups, Industry and Technology Research (FY 2009)," as of the end of FY 2008, there were 1,809 university-startups undertaking business activities. While the number of cumulative establishments of university-startups has been increasing year by year, there is a tendency for the numbers of university-startups established each year to decrease and closures to increase (Figure 1-1-16).

Figure 1-1-16/Transition of Establishments and Closures of University-startups According to Year



Note : Closures refers to companies that have merged with other companies and ceased to exist, or those that have gone bankrupt, gone into liquidation or ceased activity. The establishment and closure figures are the numbers of establishments and closures that could be grasped for the year, and do not necessarily match the exact number of establishments and closures for that year.
Source: METI, "2008 Industry and Technology Investigation Baseline Survey on University-startups (2009)" and the Venture Enterprise Center, "2009 Business Venture in Retrospect and Outlook (abridged version)"

The establishment of university-startups was found connected with the activity level of the industry-academia collaboration activities such as joint research and commissioned research. As indicated in Figure 1-1-17, there is a positive correlation between "the number of cases of joint/ commissioned research with businesses per teaching staff member" and "the number of university-startups per teaching staff member (university start-ups established by teaching staff, research staff or postdoctoral fellows.)" In particular, universities with special characteristics, such as science/engineering-focused universities and graduate universities, have a large number of establishments of start-ups and industry-academia collaboration activities.

It is believed that to strengthen the support for university-startups, challenges are the vitalization of this kind of basic industry-academia collaboration activity, including issues such as securing human resources and funds.