

## Science and Technology Trends

***2010 National R&D Budgets in East Asia*****CHINA**Yougui Wang<sup>1</sup> and Woo-Sung Jung<sup>2</sup>**1. 2010 R&D Budget Trend**

According to the Ministry of Finance, People's Republic of China, the R&D budget of the year 2010 increases to about 163 billion Yuan by 8.0% comparing with the year 2009, 151 billion Yuan, while the total budget increases by 6.3%.

The R&D budget in China steadily increases.

According to the statistics of the 2008 national investment in R&D, the expenditure was 461.6 billion Yuan, 1.54% of the GDP. The governments spent 108.89 billion Yuan and the enterprises 331.16 billion Yuan, accounting for 23.6% and 71.7% of the total R&D expenditure respectively. The expenditures in basic research, applied research, and pilot development as a ratio of the total were 4.8%, 12.5%, and 82.8% respectively. The R&D investment in 2008 increased by 90.58 billion Yuan, or 24.4%. The R&D expenditure as a proportion of GDP also was up by 0.1%. The per-capita expenditure on researchers and relevant personnel

Category	2009	2010	
R&D	151,202	163,285	8.0%
Education	198,139	215,990	9.0%
Social benefit and employment	329,666	358,225	8.7%
Health	127,714	138,918	8.8%
Environment	115,180	141,288	22.7%
Agriculture	350,124	350,124	7.9%
Defense	482,985	519,082	7.5%
Stockpile (grain and oil)	174,662	177,453	1.6%
Public safety	128,745	139,069	8.0%
Transportation	217,871	211,919	-2.7%
Public service	132,663	101,495	-23.5%
National bond	132,070	153,516	16.2%
Disaster recovery	96,999	78,001	-19.6%
Public administration	742,648	807,782	8.8%
Agrarian improvement	725,310	818,340	12.8%

Resource: Ministry of Finance, People's Republic of China

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was 235,000 Yuan, an increase of 21,000 Yuan over 2007.

## 2. The background of 2010 R&D Budget trend<sup>1)</sup>

The Five-Year Plans of China are a series of economic development initiatives. The eleventh five-year plan covers from 2006 to 2010. Among the main purposes of the Eleventh Five-Year Guideline are securing economic growth and economic structure, urbanizing the population, conserving energy and national resources, encouraging sound environmental practices, and improving education. During the eleventh period, the following are set to undertake as the major high-tech projects China.

- Integrated circuits and software: establishing integrated circuit research and development centers, industrializing the technology for 90-nanometer and smaller integrated circuits, and developing basic software, middleware, large key applied software and integrated systems.
- New-generation network: building next-general Internet demonstration projects, a nationwide digital TV network and mobile communication demonstration networks with independent property rights.
- Advanced computing: making breakthrough in technology for petaflop computer systems, building grid-based advanced computing platforms, and commercializing the production of teraflop computers.
- Biomedicine: Building a number of demonstration projects for commercial production of vaccines for major diseases and gene-modified medicines, improving the modern traditional Chinese medicine system, and enhancing the capability for new medicine invention and production.
- Civil airplane: developing planes for trunk and feeder lines, general-purpose planes and helicopters, as well as advanced engines.
- Satellite application: developing new meteorological, oceanographic, resource and telecommunication satellites, and poison- and pollution-free thrust augmented carrier rockets; building earth observation

and navigation positioning satellite systems and facilities and application demonstration projects for civil satellite ground systems.

- New materials: building demonstration projects for commercial production of high-performance new materials badly needed in information, biological and aerospace industries.

In particular, the Ministry of Science and Technology and the State Development and Reform Commission jointly published China's national S&T development plan for the 11th Five-year period (2006-2010). The Plan, designed to implement the National Outline for Medium and Long Term S&T Development Planning (2006-2020), will work on the following missions and tasks. Surrounding the general goals defined by the Planning Outline for S&T development in the future 15 years, efforts will be made to raise the proprietary innovation capacity in the following five areas in next five years: 1) strengthening key technology innovations in the areas of energy, resources, and environment, and enhancing the capability of addressing bottleneck restrictions, in line with major national economic needs; 2) strengthening the technical innovation part of industry, with focus on acquiring proprietary intellectual property, and noticeably enhancing the core competitiveness of major sectors, including agriculture, industry, and service industry; 3) strengthening technology integrations, and enhancing S&T service for public good sectors, including population, health, public security, urbanization, and urban development; 4) responding to the new needs of defense modernization and to nontraditional security concerns, and enhancing S&T support for national security; and 5) making deployments in the visionary areas of basic research and cutting-edge technology, and enhancing the capacity building of sustained S&T innovations.

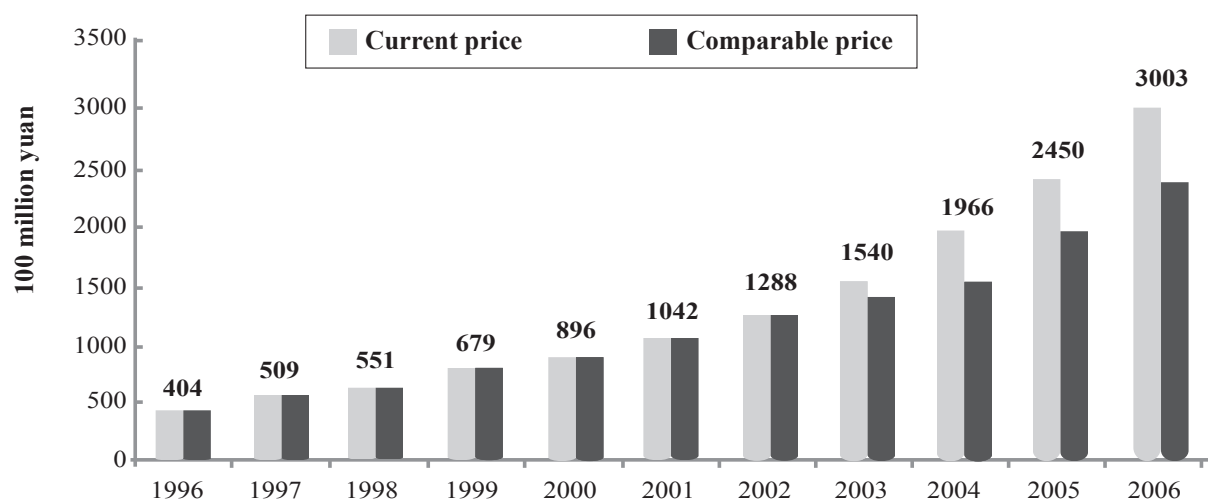
During the 11th Five-year plan period, step will be taken to establish a national innovation system, agreeable with the socialist market economy and the natural rhythm of S&T development, in an attempt to create a rational S&T development pattern, and strive for major breakthroughs and leaping development in the selected priority areas. The endeavor will raise China's R&D expenditure to 2% as a proportion of

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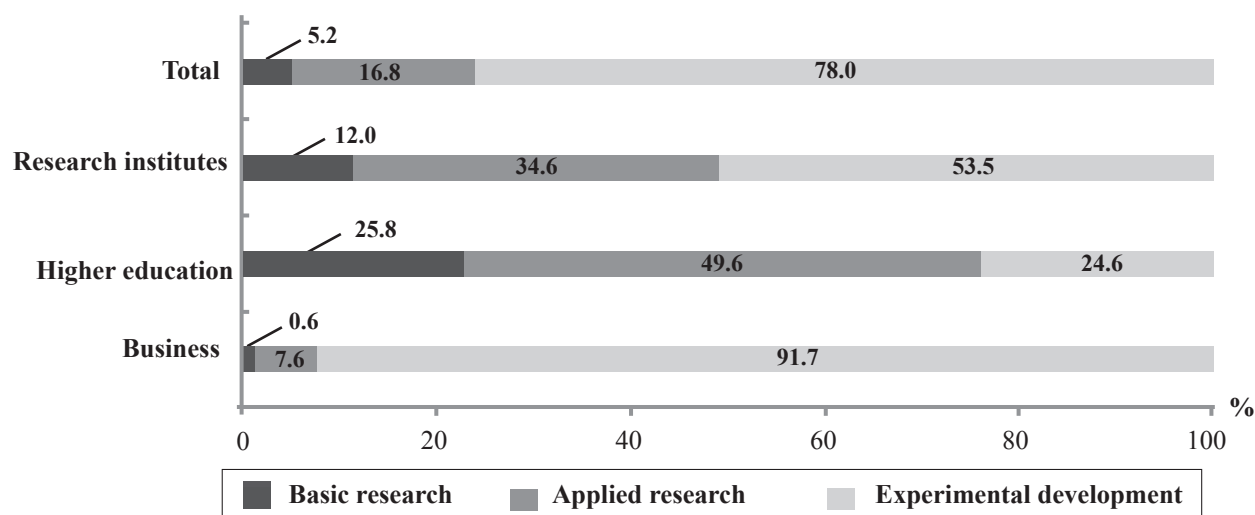
1) Resource: The Chinese Ministry of Science and Technology

	2001	2002	2003	2004	2005	2006
Gross Domestic Expenditure on R&D/GDP (%)	0.95	1.07	1.13	1.23	1.33	1.42
Share in total government expenditure (%)	3.7	3.7	3.8	3.8	3.9	4.2
S&T personnel (10,000 persons)	314.1	322.2	328.4	348.1	381.5	413.2
Overseas Chinese students (10,000 persons)	8.4	12.5	11.7	11.5	11.5	13.4
Returnees (10,000 persons)	1.2	1.8	2.0	2.5	3.5	4.2
Chinese S&T papers indexed by SCI	35685	40758	49788	57377	68226	71450

Resource: China S&T Statistics Data book 2007



**Figure 1** Gross domestic expenditure on R&D, Resource: China S&T Statistics Data book 2007



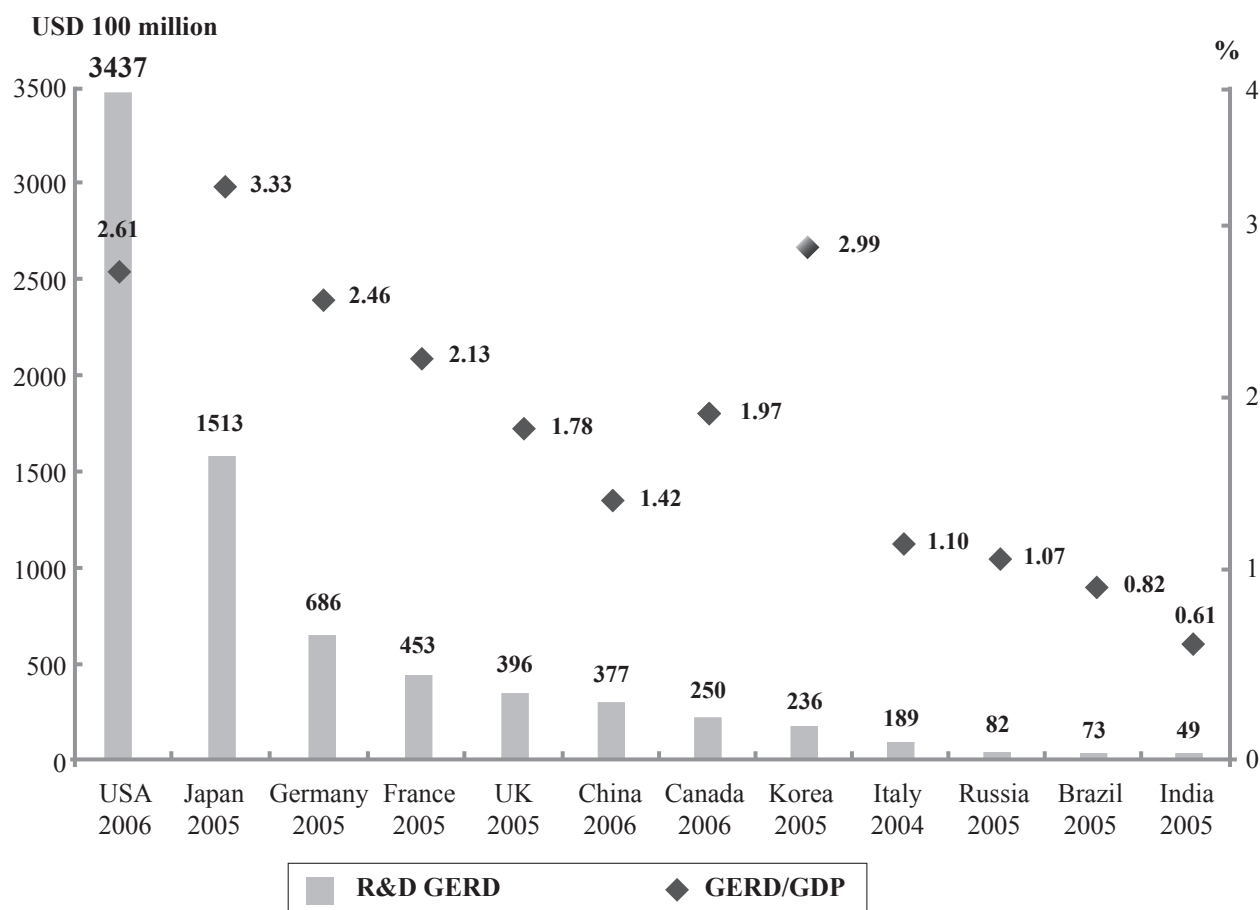
**Figure 2** GERD by type of activity, Resource: China S&T Statistics Data book 2007

GDP, allowing China to become an S&T power with strong proprietary innovation capacity, and laying a foundation for making China part of innovation economies in the world.

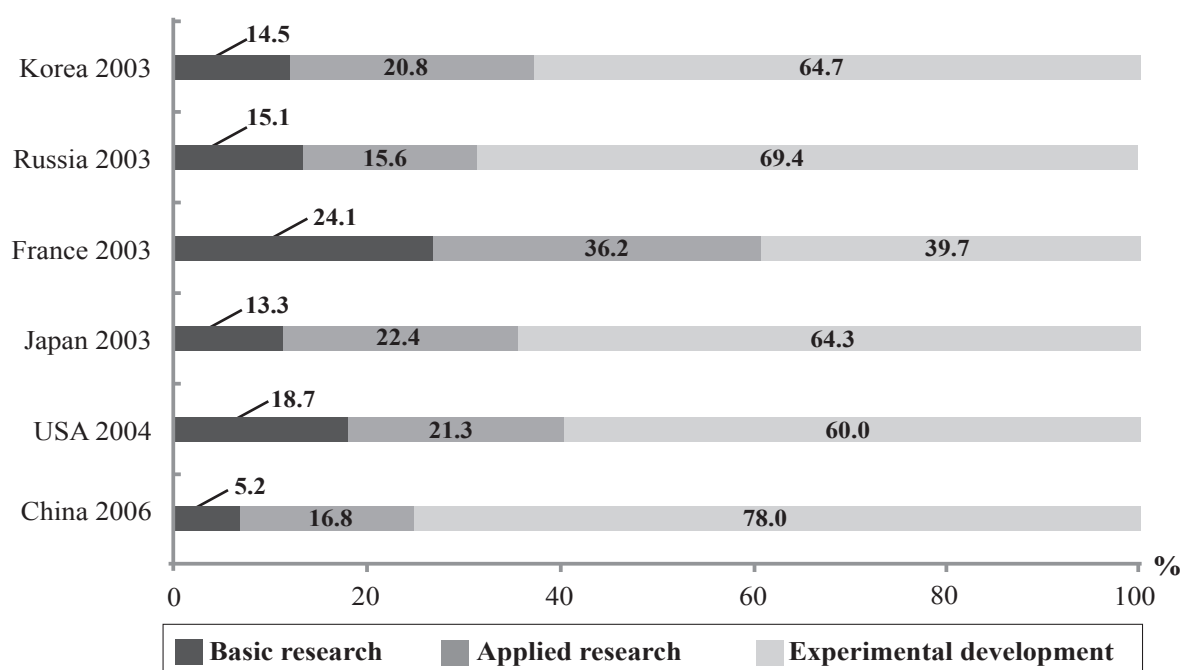
The Plan also puts forwards eight tasks for implementing the Planning Outline, including 1) pooling up forces to implement major special projects defined by the Planning Outline, with focus on strategic objectives; 2) strengthening efforts to address urgent concerns in the fields of energy, resources, environment, agriculture, information, and health; 3) grasping future development opportunities, and making deployments in the visionary areas of cutting-edge technology and basic research; 4) enhancing sharing mechanism, and establishing platforms for sharing S&T infrastructure facilities and conditions; 5) implementing the strategy of high caliber personnel, and strengthening the capacity building of S&T workforce; 6)

creating an environment agreeable with popular science activities and innovative cultures; 7) making industry a major player, and advancing the construction of a national innovation system of Chinese characteristics; 8) strengthening S&T innovation, and safeguarding defense security.

The Ministry of Science and Technology has more S&T Programs such as 863 Program and 973 Program. In 1986, to meet the global challenges of new technology revolution and competition, the National High-tech R&D Program (863 Program) was proposed. Objectives of this program are to boost innovation capacity in the high-tech sectors, particularly in strategic high-tech fields, in order to gain a foothold in the world arena; to strive to achieve breakthroughs in key technical fields that concern the national economic lifeline and national security; and to achieve “leap-frog” development in key high-tech fields in



**Figure 3** GERD in selected countries, Resource: China S&T Statistics Data book 2007



**Figure 4** GERD in selected countries by type of activity, Resource: China S&T Statistics Data book 2007

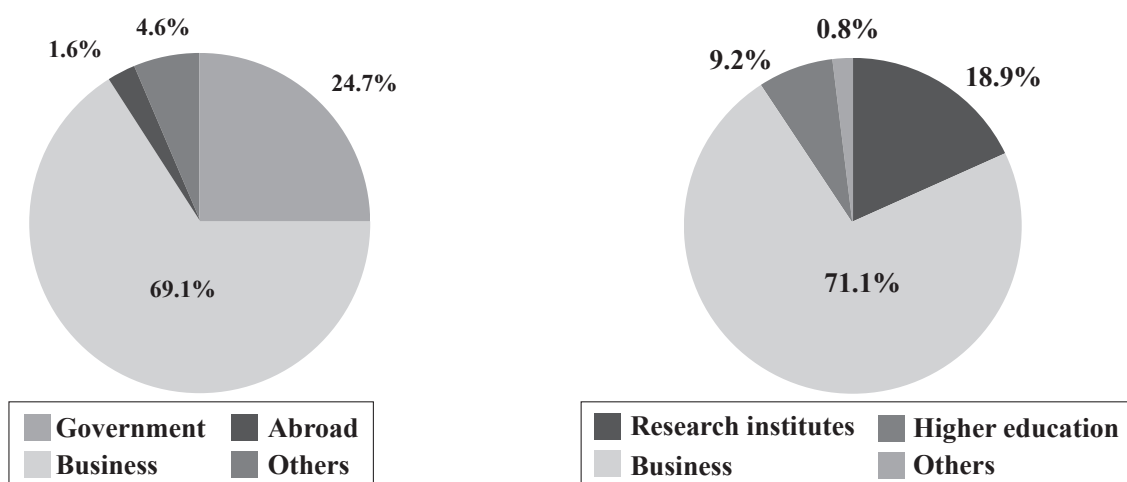
which China enjoys relative advantages or should take strategic positions in order to provide high-tech support to fulfill strategic objectives in the implementation of the third step of our modernization process. In line with national objectives and market demands, the program addresses a number of cutting-edge high-tech issues of strategic importance and foresight. They are: 1) Develop key technologies for the construction of China's information infrastructure. 2) Develop key biological, agricultural and pharmaceutical technologies to improve the welfare of the Chinese people. 3) Master key new materials and advanced manufacturing technologies to boost industrial competitiveness. 4) Achieve breakthroughs in key technologies for environmental protection, resources and energy development to serve the sustainable development of the society.

China recognizes that basic research is a driving force for the progress of human civilization, a source and backbone of S&T and economic development, a precursor of inventions and new technology, and a cradle of S&T talents. Continuous fast socio-economic growth imposes increasingly higher demands on basic research while many scientific issues press for solutions derived from in-depth basic research.

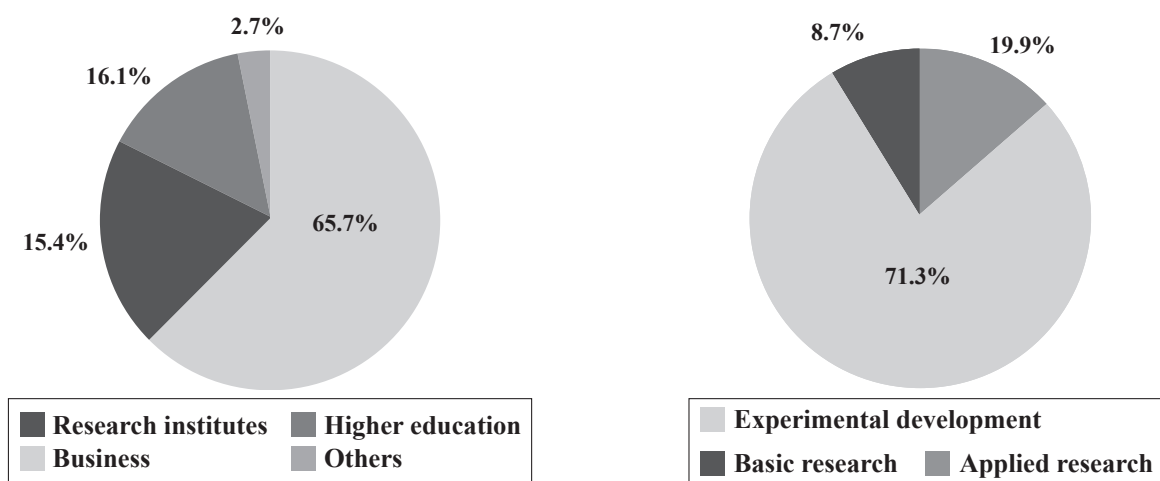
Significant breakthroughs from basic research often trigger remarkable changes in economic and social sectors. On June 4, 1997, the State Science and Education Steering Group decided to formulate "The National Plan on Key Basic Research and Development" and organize the implementation of the "National Program on Key Basic Research Project (973 Program)". The purpose of these two initiatives is to strengthen basic research in line with national strategic targets.

### 3. Implication

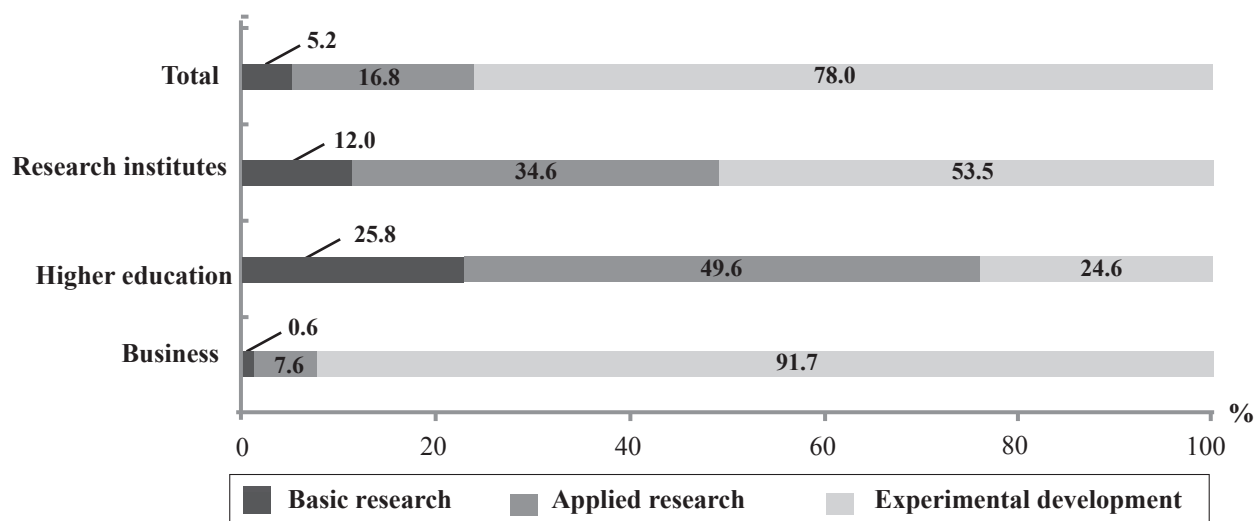
The R&D budget in China gradually increases recently. Interestingly, business sector, which occupies 69% of the total R&D budget, is the largest funding source. Business sector also accounts for 65.7% of the R&D personnel. In business sector, experimental development accounts for 96.1% with respect to GERD of business sector, while higher education focuses on basic research and applied research. China speeds up its industrialization through R&D, particularly, on industrial technology. However, it should be noted that basic science of China is also strong.



**Figure 5** GERD by source of funds and by sector of performance (2006), Resource: China S&T Statistics Data book 2007



**Figure 6** R&D personnel by source of funds and by sector of performance (2006), Resource: China S&T Statistics Data book 2007



**Figure 7** GERD by type of activity (2006), Resource: China S&T Statistics Data book 2007