KOREA

Investment Trends Analysis of National R&D Mega-Projects in Korea

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1. Introduction

The S&T (Science & Technology) R&D (Research & Development) of today is developing in the direction of satisfying the needs of the future society and thus maximizing the impact of investment. Technologically advanced countries recognize that the key to maintaining and expanding the current leading position in the future is to develop the capability of S&T and its innovation. Developing countries also recognize that the key to changing their current status is S&T. Whereas S&T once simply satisfied intellectual curiosities, it is now recognized as a means to advance a nation's future position. Due to a substantial rise in international competition, each nation's efforts are accelerating in order to discover, develop, and ensure the promise of S&T. . As a result, each nation shows a tendency to invest its available resources in future promising S&Ts whenever possible, and thus the proportion of so-called mega-projects is increasing.

The purpose of this study is to analyze the investment trends in mega-projects led by the Korean government from 2005 to 2008 based on the economic and social objectives, classification of science and technology standard, 6T classification, training subject, and technology life-cycle. The subjects of this analysis are the projects that received more than 30 billion Korean won of government funding for five years (which is 6 billion Korean won per year) and were registered in the National Technology Information System (NTIS). The criterion of 30 billion Korean won was chosen, for any projects receiving more than 30 billion Korean won are expected to undergo a feasibility study before being funded.

2. Overall Investment Trends in National R&D Mega-Projects

The R&D investment of the Korean government increased by an annual average of 12.4% from 2005 to 2009. This means that approximately 9.9 trillion won was invested in some 34,580 projects, which is an average of 286 million won per project. 293 projects, which is 0.85% of the total of 34,580, received more than 6 billion won per year. The number of super mega-projects receiving more than

Table 1 Status of R&D investments in Korea (2005-2009)

Year	2005	2006	2007	2008	2009
Number of projects	30,568	32,114	33,225	37,415	39,565
Total government subsidy (million won)	7,790,434	8,763,909	9,574,545	10,993,594	12,414,472
Average government subsidy (million won)	254.9	272.9	288.2	293.8	313.8

Table 2 Status of investments in mega-projects in Korea (2005-2009)

Year	2005	2006	2007	2008	2009
Number of projects over 30 billion won	14	15	10	20	26
Number of projects over 20 billion won	23	24	28	31	51
Number of projects over 10 billion won	54	70	66	82	103
Number of projects over 6 billion won	128	158	176	182	206

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100 billion won in five years (20 billion won in one year) is about 48 annually, which means the quantity of mega-projects has increased by 16.4% within recent two years.

In 2008, approximately 3557.2 billion won was invested in 182 mega-projects. By ministry, the funding was distributed as follows: Defense Acquisition Program Administration 35.5% (1261.4 billion won), Ministry of Education, Science and Technology 29.0% (1030.1 billion won), Ministry of Knowledge and Economy 18.3% (649.3 billion won), Ministry of Land, Transport and Maritime Affairs 7.1% (250.8 billion won), and Rural Development Administration 3.4% (120.8 billion won). In particular, Defense Acquisition Program Administration (35.5%), Ministry of Education, Science and Technology (29.0%), and Ministry of Knowledge and Economy (18.3%) represent 82.8% of the total national R&D mega-projects (Figure 1). The fluctuation of the investment in mega-projects in 2008 compared to 2007 was similar throughout each ministry with the exception of Korea Forest Service and Ministry of Environment which showed a decrease in the amount of investment. There is a significant imbalance in funding among ministries; however, considering the nature of the services each ministry provides, the imbalance is rather natural (Figure 2).

Investments in mega-projects from 2005 to 2008 on each economic and social objective have been concentrated on national defense, industrial production and technology, and space development and exploration (Figure 3). On the other hand, investments in mega-projects shows severe imbalance among areas of promotion of public health, social structure and relations, earth development and exploration, and environmental preservation. Investments in mega-projects with economic and social objectives have markedly increased from 2007 to 2008 in the planned use of subordinate structure and land by 204.39% (10.1769 trillion won) and earth development and exploration by 195.1% (368.66 billion won); however, the decrease of investments was significant in environmental

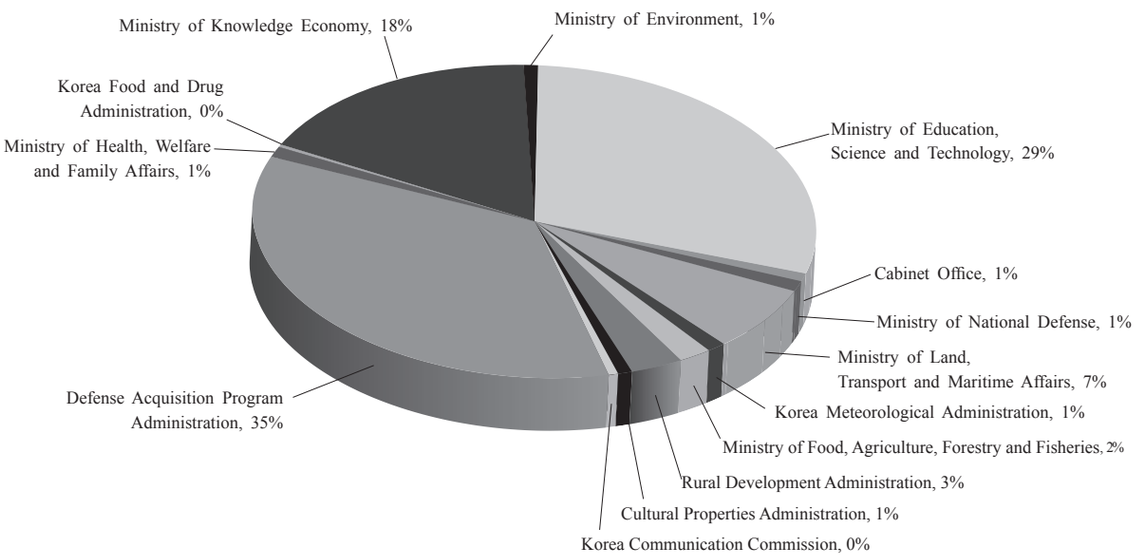

Figure. 1 Status of investments in mega-projects by each ministry in 2008

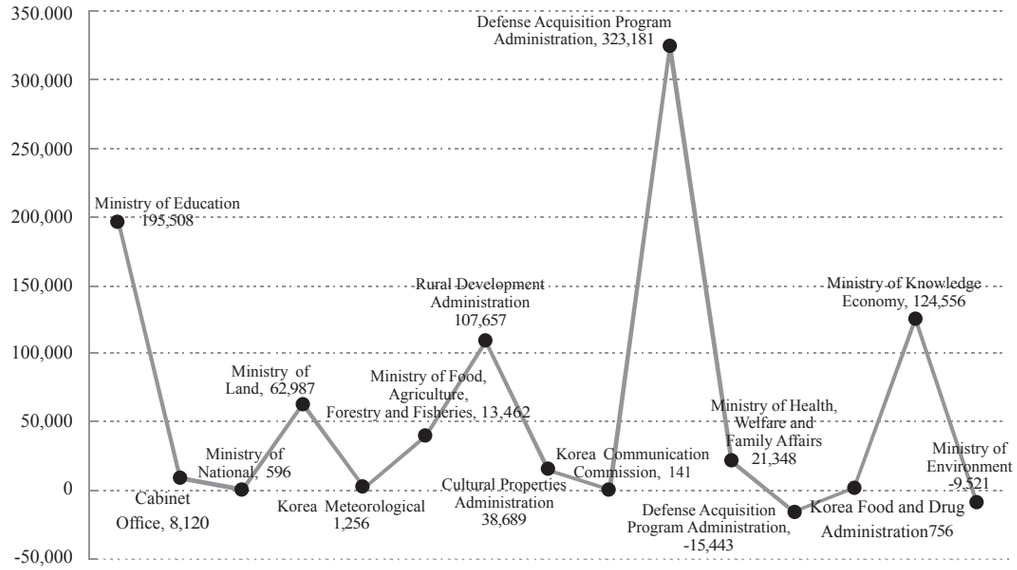

Figure. 2 Fluctuations of investments in mega-projects of each ministry (2007-2008)

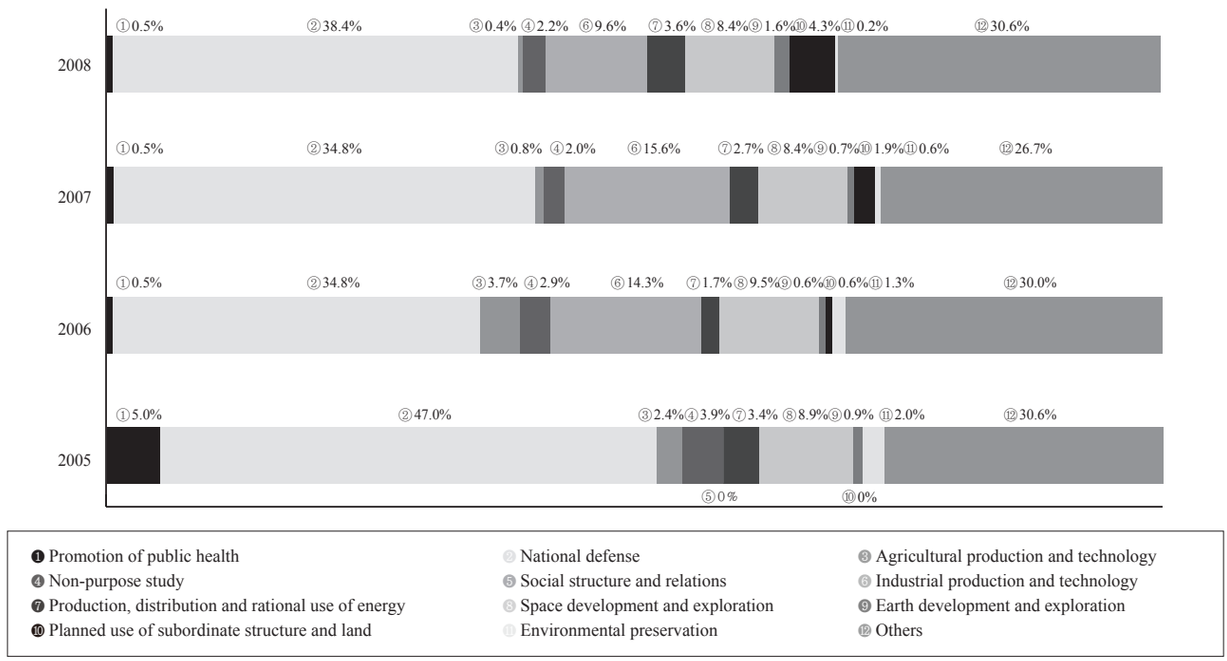

Figure. 3 Proportion of investments in mega-projects with each economic and social objective (2005-2008)

preservation (-62.4%) and the agricultural production and technology (-40.7%) (Figure 4).

Mega-project investments in each category of S&T from 2005 to 2008 were applied as follows: 17.2% to astronomy and ocean (4.79332 trillion won), 8.1% to information (2.16106 trillion won), 6.9% to electricity (1.67984 trillion won), and 6.5% to communication (1.60568 trillion won). On the other hand, mega-projects in the area of mathematics (0.0%), chemistry (0.6%), earth science (0.2%), and

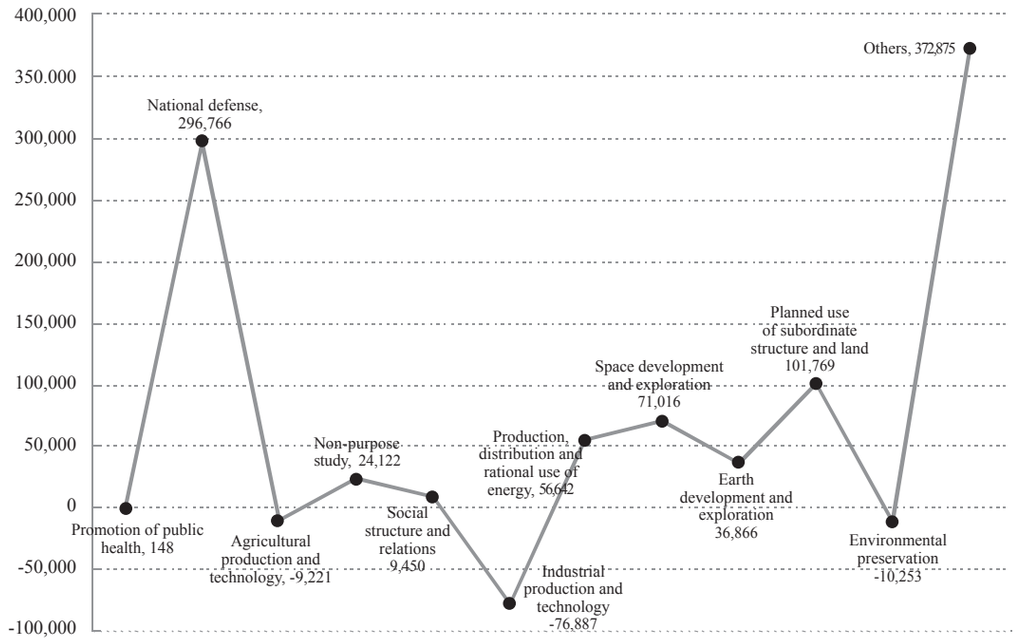

Figure. 4 Fluctuations in investments in mega-projects with each economic and social objective (2007-2008)

material science (0.8%) seldom received support (Figure 5). Typical Investments in each category of science and technology in 2008 compared to 2007 increased in the areas of life science (404.2%), construction and transportation (106.4%), energy resources (95.8%), physics (85.5%), nuclear energy (40.3%), and aerospace, astronomy and ocean(32.6%). However, areas that received private investments rather than government investments, such as electricity, information, and communication, experienced a large

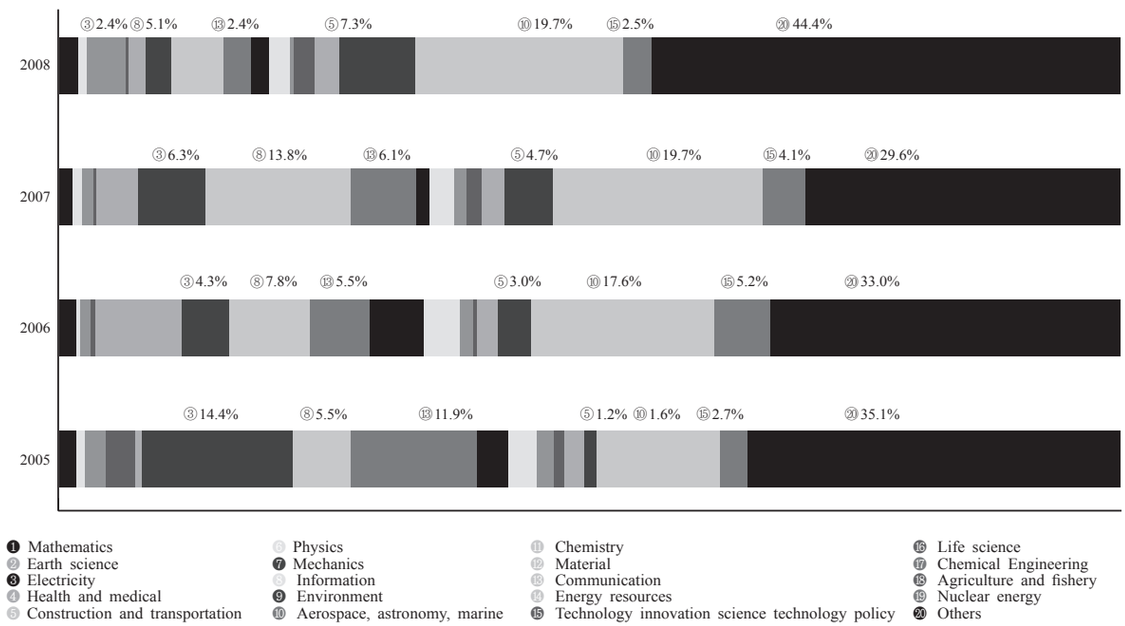

Figure. 5 Investment proportion in mega-projects in each category of science and technology (2005-2008)

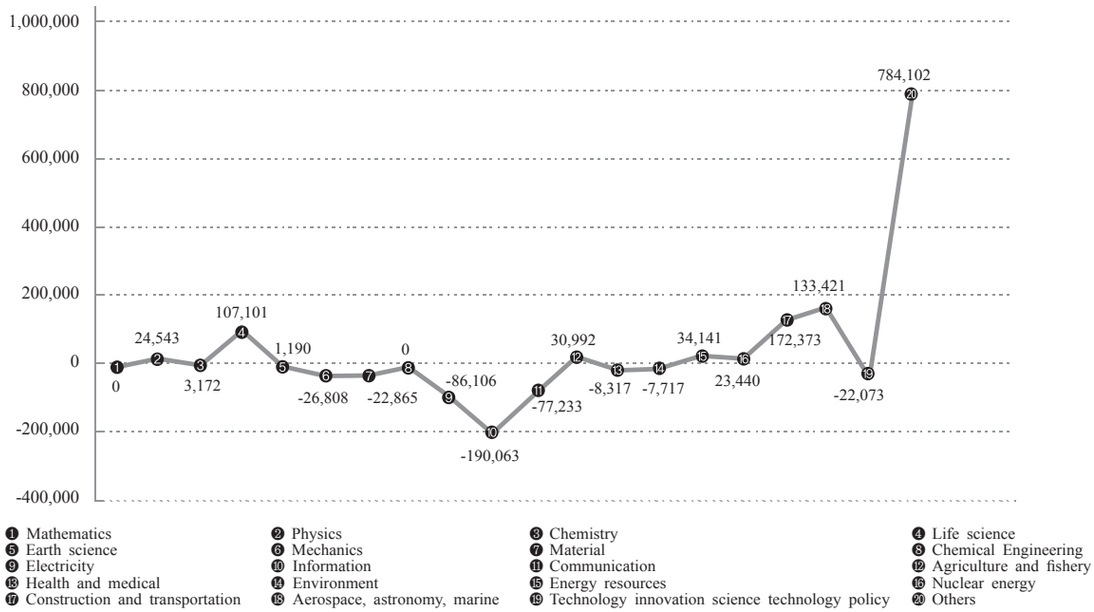

Figure. 6 Fluctuations in the investment in mega-projects in each category of science and technology (2007-2008)

investment decline (Figure 6).

Investments in the 6T mega-projects—information technology (IT), biological technology (BT), nano-technology (NT), environmental technology (ET), space technology (ST), and cultural technology (CT)—which are noted as future promising industries, are in descending order as follows: ST (18.5%), IT (14.2%), BT (4.3%), ET (3.4%), and NT (2.4%). On the other hand, hardly any mega-projects in CT were based on digital media such as broadcasting, film, animation, games, and music. However, investments in areas other than 6T mega-projects occupied about 57% of the total mega-project investments. Investments in 6T mega-projects in 2008 increased substantially as follows: BT (193.6%), ET (64.9%), and ST (35.2%), whereas investments in IT and NT decreased by -30.5% and -21.7% respectively (Figure 7).

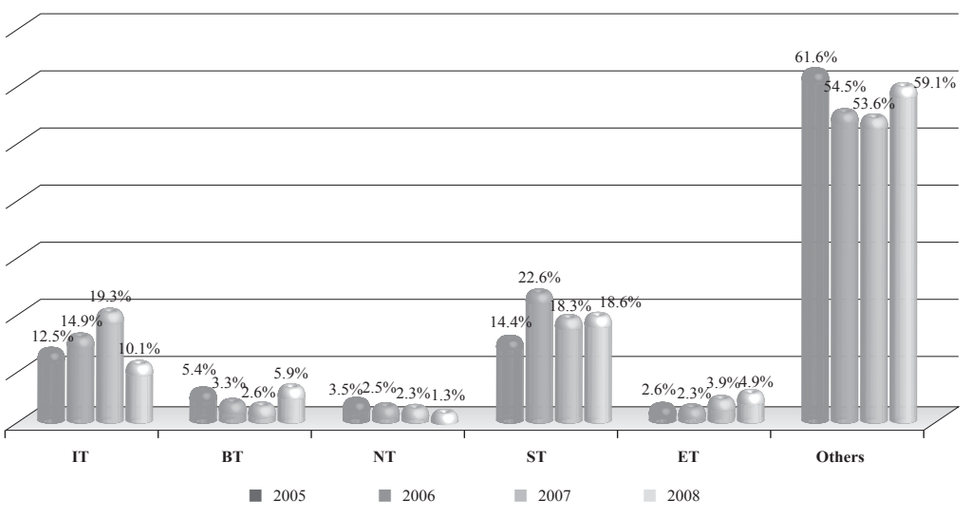

Figure. 7 Proportion of investments in the 6T mega-projects (2005-2008)

Investments in mega-projects based on the R&D stages of basic research, applied research, and development research were applied as follows: development research (35.1%), applied research (9.2%), and basic research (8.3%). The proportion of investments in the field of research and development is constantly increasing. However, investments in other areas which cannot be classified as R&D occupied about 47.4% of the total investments in mega-projects (Figure 8).

Research for mega-projects is conducted by government research institutions (59.4%), universities (11.6%), large-sized companies (5.2%), and national and public research institutions (4.6%), whereas medium-sized companies were engaged in only 0.4% of the projects. Interestingly, the proportion of research conducted by highly engaged institutions, such as government research institutions and universities, decreased gradually (Figure 9). However, the proportion of research contributed by large-sized

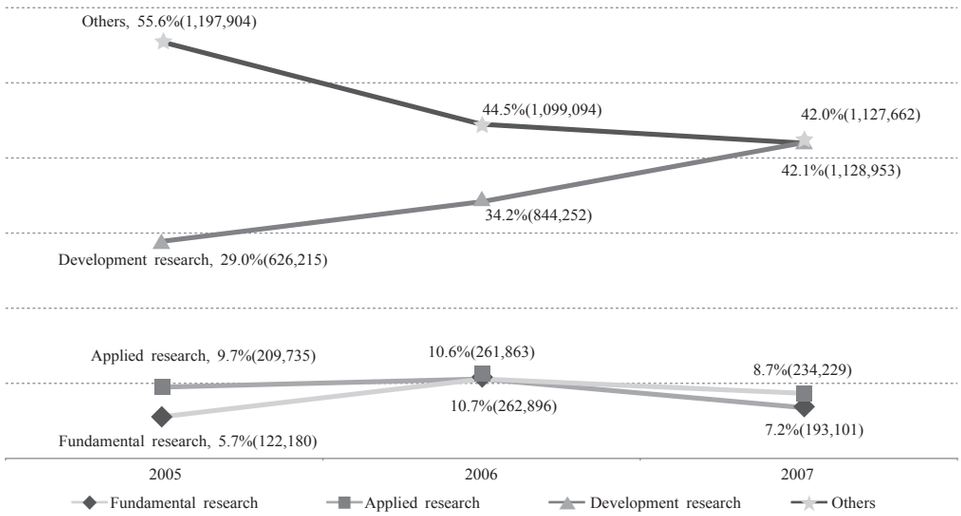

Figure. 8 Status of investments in mega-projects in each R&D stage (2005-2007)

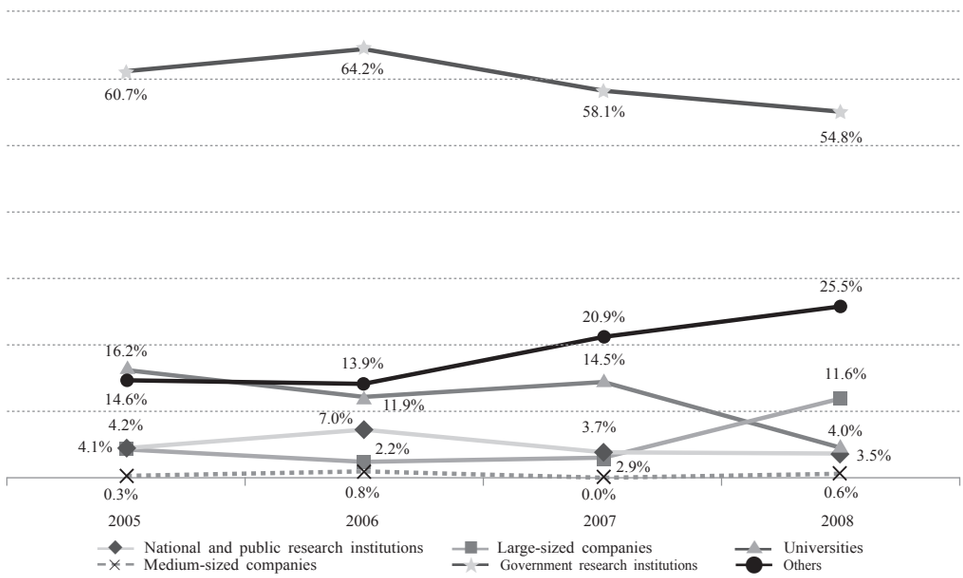

Figure. 9 Status of investments in mega-projects in each research subject (2005-2008)

companies and other institutions increased. In particular, the proportion of research conducted by large-sized companies showed a notable increase of 432.3% in 2008 compared to 2007 while research conducted by national and public research institutions and government research institutions showed a relatively smaller increase of 28.2% and 25.0% respectively. Mega-project research contributed by universities was decreased by -63.8% (Figure 10).

Investments in mega-projects according to the technology life-cycle, such as the emerging period, the developing period, and the maturing period, were contributed as follows: the developing period (30.0%), the emerging period (18.5%), and the maturing period (11.6%); however, investments in other areas from the category was almost 39.9% of the total investment (Figure 11).

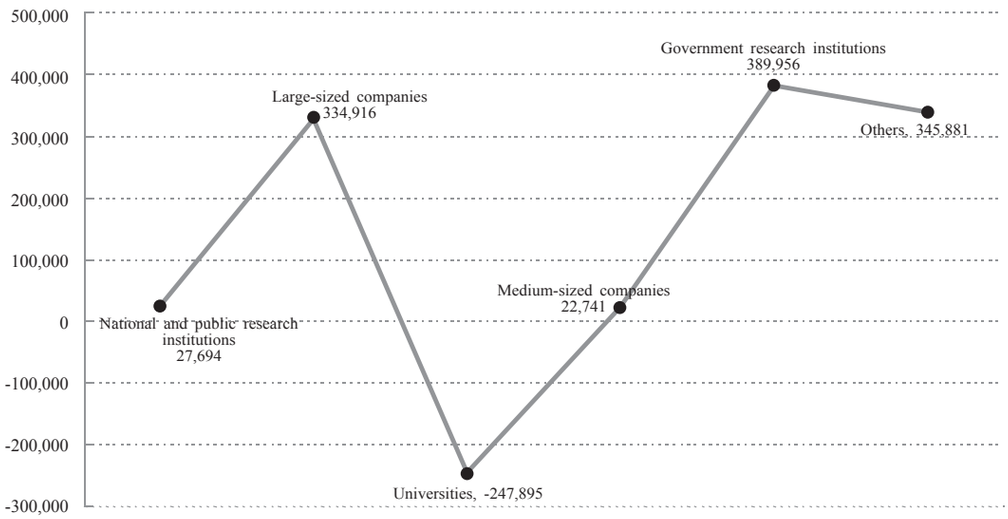

Figure. 10 Fluctuations in investments in mega-projects in each research subject (2007-2008)

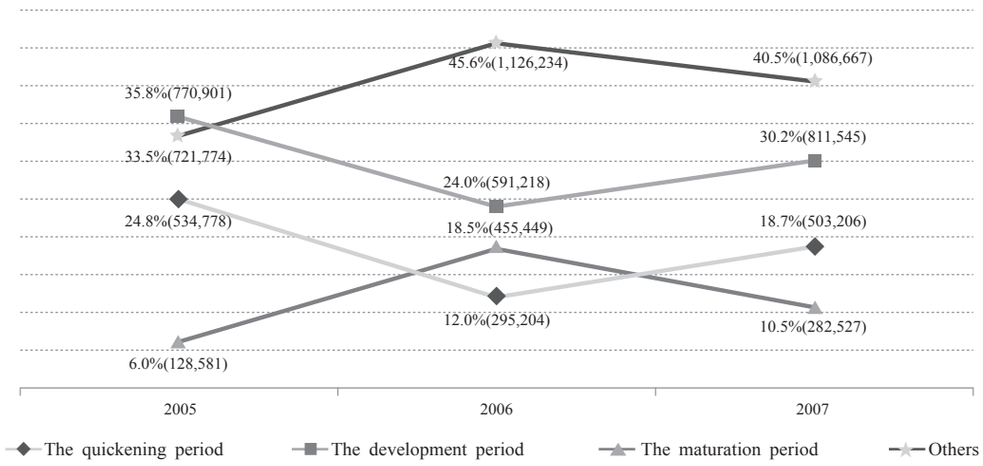

Figure. 11 Status of investments in mega-projects during each technology life-cycle (2005-2008)

3. Limitations and Implications

The subjects of the analysis are the projects that received more than 30 billion Korean won in government funding for five years (6 billion Korean won per year) and were registered in the National Technology Information System (NTIS). However, this study has limitations since it is only based on the government funding vaguely in the situation that there is no clear definition or concept on what the "mega-project" is in its nature. Considerable effort is needed in classifying the subjects more clearly and consistently with respect to those criteria adopted: economic and social objectives, science and technology standard classification, 6T classification, the subject of research, and the technology life-cycle. Therefore, more sophisticated categorization of mega-projects is necessary following a clear definition of mega-project. When it is analyzed in association with the reason for the fluctuation of budgets and political issues of each year, the flow of mega-projects, where colossal amount of tax is invested, will be understood in more detail. In particular, mega-projects which explore future values beyond those of science technology, such as significant social and economical values, are anticipated.