Promoting Commercialization of National R&D Projects in Korea

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Abstract: In Korea, the national R&D program supports technological innovation and research activities to enhance competitive advantage of companies in the global markets. In terms of investment volume and capacities, Korea is among the top R&D investors, but limitations remain such as a limited participation of the SMEs and a low rate of commercial use of R&D outcomes. Several missing elements are responsible for this: a strategic approach in the planning stage, financial aid to back up commercialization of project outcomes, follow-up support after the commercialization process, a centralized control tower for better coordination, and a proper legal/policy structure. To address these, it is essential to improve support for innovative SMEs and expand technology-based funding to meet investment needs. Specifically, it should be positively considered to use a part of national R&D budget to back up commercialization of R&D outcomes, based on an innovative system that will take into account commercial aspects of a project from the early planning stage. At the same time, it will be conceivable to strengthen the roles of policy financing institutions to engage in investment in addition to guarantees and loans to better support.

The Korean government supports national R&D projects to enhance global competitiveness of corporations by strengthening their core competitiveness based on technological innovation and research activities. To lessen risks and uncertainties associated with R&D investment, the government intervenes to allocate resources more efficiently, and facilitate investment for innovative SMEs. Specifically, the endeavors are led by the National Science & Technology Commission (NSTC) in accordance with the Basic Planning for Science Technology, assigning areas of research to relevant ministries, which in turn, hire research institutes to carry out R&D projects. The NSTC works as a planning tower as it sets basic plans, coordinates policies and budgets across the ministries, and evaluates the outcomes.

1) Combined together, some 30 ministries, universities, research institutes and companies engage in the national R&D program.

The NSTC identified five policy areas of priority in allocating R&D budget: a) cultivating future growth engines, b) fostering SMEs, c) educating creative workers, d) expanding local R&D investment, and e) promoting investment in basic science and technology. Some target to promote innovation of small businesses ((b) and (c)), while others focus on large corporations and large-sized innovation complexes ((a) and (e)). The support system is broadly divided into project management (high-level) and task management (low-level); the NSTC functions as the planning tower, and the Ministry of Strategy and Finance (MOSF) takes charge of budget allocation and performance evaluation. The task management system is run by relevant ministries and research institutes to deal with planning, evaluation and commercialization of project outcomes.

Current State of the Program

Under the incumbent government, the budget for the national R&D program has steadily climbed: KRW13.7 trillion (2010) → KRW14.9 trillion (2011) → KRW16.0 trillion (2012). With a goal to raise the share of R&D investment in GDP from 3% to 5% by 2012, the government has expanded the budget 1.5 times compared to 2008. It identified R&D investment as one of the core national agenda, and between 2008 and 2012, the budget increased by 10.7% on annual average; the total amount has accumulated to KRW68.4 trillion.

Nonetheless, the budget allocated for the SMEs remains at a relatively low level of 4% among the entire R&D budget (KRW0.5 trillion in 2010 → KRW0.6 trillion in 2011 → KRW0.7 trillion in 2012). While 65% of the budget, or KRW8.9 trillion, was used for basic science research by universities and research institutes, only 12.0%, or KRW1.6 trillion, was given to SMEs that have potentials to create jobs and enhance competitive edge of the industry.

1) Under the revised government organization, the NSTC will be abolished and its functions will be taken over by the newly organized Ministry of Creative Science for Future.
As of 2010, the Ministry of Knowledge Economy took the largest share of the R&D budget (32.4% or KRW4.44 trillion), followed by the Ministry of Education & Science Technology (32.1% or KRW4.39 trillion), the Defense Acquisition Program Administration (12.9% or KRW766.9 billion), the Ministry of Land, Transport and Maritime Affairs (4.2% or KRW575 billion), and the Small and Medium Business Administration (4.1% or KRW560.7 billion). In 2010, the total R&D investment, combining the public and private sector, recorded KRW43.9 trillion, growing 12.7% on annual average in the past five years. The volume of investment has expanded dramatically (7th largest in the world as of 2010), but investment has often been criticized as being inefficient. Currently, the rate of a technical success in R&D project is over 90%, but, when it comes to turning the research outcomes into business, the rate plummets to 20%. According to an analysis by the KISTEP (Korea Institute of Science & Technology Evaluation and Planning), the rate was even lower at 4.4% for R&D investment in colleges and research institutes, which takes up 65% of the entire R&D budget. By comparison, the rate of commercialization was 70.7% in the UK, 69.3% in the US, and 54.1% in Japan.

**Barriers to Commercializing R&D Outcomes**

There are several reasons why it is hard to turn the R&D outcomes into profitable business. First of all, a more strategic approach is required in the R&D planning stage. Currently, the support focuses on the actual research and development activities, without much consideration for the project planning. As a result, costly projects often have negligible effect in creating jobs or improving the economy. Moreover, a lack of participation from the business sector makes it hard to identify projects that can have solid demands in the market.

Second, as is often the case, commercialization of R&D project is relinquished due to a lack of follow-up support or guidance to refine and enhance technologies after they are transferred. Regarding technology transfer, in more than half of the cases, the recipients either put off (33.1%) or gave up (19.1%) commercialization of technology; in other cases, they used the new technology to boost sales (18%) or produce test products (9.9%) (Korea Research Council for Industrial Science & Technology, September 2012).

Next, budget is insufficient to support commercialization of technologies, which costs five to 10 times more than R&D activities. In 2010, only 1.3% of the national R&D budget was allocated to scale up and commercialize outcomes of research projects. By comparison, the US implemented a target budget policy to inject a certain portion of R&D budget—2.5% and 0.3% respectively—for the SBIR (Small Business Innovation Research) and STTR (Small Business Technology Transfer) programs.

Fourth, ministries select areas of focus and support them, without a centralized guidance or coordination. Accordingly, it is hard to broadly assess how the projects are distributed by regions, industries, and what kind of activities, innovations and performances have been yielded. Even though the government reviews efficiency of projects, it is often perfunctory due to a tight budget schedule.

Fifth, there is little supervision on whether the regulations on, for example, the establishment of a division in charge of technology transfer, or an incentive scheme, are observed. In 2009, 45.1% of research institutions failed to set up such division; and 38.1% of them did not fulfill obligations for technology transfer. Similarly, incentives were given to only 39.2% of public research institutes and 32.2% of researchers who generated royalty from technology transfer (Ministry of Knowledge Economy, Analysis of Commercialization of Technology Transfer, 2009).

**Basic Directions to Promote Commercialization of National R&D Projects**

Most likely, the newly elected government would give top priority to welfare and economic growth. To
achieve both goals, it is essential to strengthen the SMEs and enhance their competitive advantage; Amid economic slowdown and a threat of deflation, large corporations are hardly playing their roles. In the US, the share of large companies exceeds 10% by number, and they hire 45% of total employees, facilitating a virtuous circulation in the business ecology. However, in Korea, only 3,100 firms (0.1%) are classified as large-sized corporations out of 3.1 million businesses, and they hire merely 12.2% of total workers.

Developing R&D programs specifically designed for the SMEs and providing financial aid would encourage small businesses with a solid technology base to expand their research activities, and spur an industry-wide competition. Also, it will give incentives to hire skilled workers, stabilizing the labor market and possibly creating more jobs. However, a more voluminous budget would not suffice to commercialize outcomes of R&D projects. An innovative system should be put in place that fully considers business feasibility of projects from the beginning, and ensures a systematic process throughout the project cycle. Equally important is to closely assist and support the R&D efforts throughout a project, and reduce the risk of failure in turning R&D projects into business; it will attract more skilled, talented people to launch start-up businesses.

At this point, financial support for innovative SMEs mostly comes in the form of direct guarantee by policy financing institutions. That is, investment financing is quite rare whereby a potential investor makes loan or investment decisions based on the evaluation of technologies of portfolio companies. SMEs with innovative technologies lament that they must cross ‘a death valley’ to secure investment from venture capital or qualify for bank loans. Systematically supporting this process would be essential for sustainable growth. In many countries, venture capital and angel investment actively engage from an early stage of an R&D project, while the government usually provides indirect guarantee. By comparison, in Korea, such investments focus on businesses soon expecting an IPO to turn out quick profits, and banks heavily depend on collaterals to approve loans.

Moving forward, funding policy should focus on technology-based financing based on analysis and assessment of innovative businesses. Alternative financial institutions should be in place to deal with risky assets that banks generally avoid. Emulating best practices of public-private partnership (PPP) would be also conceivable, such as joint efforts of private financial firms and policy financing institutions to evaluate technologies and extend loans.

Tasks Ahead

Above all, policies and the legal framework should be improved to systematically commercialize outcomes of R&D projects and promote technology transfer, which will stimulate innovation of the SMEs and enhance efficiency of the government’s R&D investment. To do so, a conducive environment should be created with a part of R&D budget assigned for technology transfer and its commercialization. Possibly, 5% of R&D budgets allocated to universities and research institutes may be set aside for such purpose, and to cover a loss from risky investment. In 2012, the budget for the national R&D projects, not including national defense, humanities and social science, was KRW10.7 trillion. 5% of the budget would amount to KRW500 billion, or KRW2 trillion of funds at an operation multiple of four. Hypothetically, this fund may be managed by institutions that have supported innovative SMEs. The Korea Technology Finance Corporation (KIFCO) would be well qualified with extensive experiences in this regard.

Additionally, it will be advisable to establish a mid-to-long-term follow-up support system to provide continued support, and operate a Golden Bridge Program to coordinate R&D projects across the ministries, areas of research, and throughout the project stages. To this end, a joint survey and planning should be done among different ministries and projects, led by the NSTC, to efficiently design the project, divide roles and make
best use of the results. A certain portion of a project budget may be allocated to fund follow-up activities and commercialize new technologies to revitalize research on basic science core technology.

Last but not least, it is important to revise related laws and systems to encourage research institutes to utilize the outcomes of R&D projects and improve an access to technologies in public domain. For better coordination, the rights of ownership and operation may be centrally managed by a large R&D group. Also, efforts to facilitate technology transfer should be made such as allowing equity acquisition with technology royalty or expanding tax benefits for incentives given to successful R&D projects. Provisions on technology royalty will have to be modified as well to better respond to changing mechanisms of technology transfer (e.g. equity-partnership). Exempting responsibilities of joint liability would be another way of encouraging commercialization of R&D projects.