

The Spillover Effects of Research and Development Investment on Productivity

Up until the 1970s in Korea, R&D investment was insignificant as the nation was not capable of developing technology on its own and lacked an understanding of technological development. From the 1980s, however, R&D investment began to expand, with the growing necessity to sharpen the nation's technological competitiveness in response to widespread technology protectionism and catch-up effort by technological late starters. In consequence, the ratio of R&D investment to Korean nominal GDP has recently been approaching the 3% level, similar to the levels of major countries, including the United States and Japan. In addition, as the introduction of overseas technology has increased steadily, centering on technology difficult to secure domestically, the share of expenditure made for the import of overseas technology in total R&D investment, i.e. dependency on the import of overseas technology, has been maintained at 25-30% recently.

The expansion of R&D investment has contributed greatly to the improvement of productivity in Korea. In this respect, this paper views R&D stock as a production factor, sets the Cobb-Douglas production function and estimates the spillover effects of R&D investment on productivity. The analytical results of estimation demonstrate that R&D investment exerted a significant influence on the enhancement of labor productivity during

1980~2001. When R&D investment is divided into domestic R&D investment and technology import, domestic R&D investment was found to be more effective than technology import in improving productivity. Also, when domestic R&D investment is classified into basic and applied research*, the effects of basic research on productivity were shown to be less than applied research. (* Applied research includes development research.)

Furthermore, considering that the productivity of an industry is affected not only by its own R&D activities but also by those of other industries, the direct effects caused by its own R&D activities and the indirect effects caused by those of other industries were estimated separately. The results show that estimated coefficient of indirect effects was somewhat larger than that of direct effects. In other words, the productivity of an industry is greatly affected by the R&D activities of industries other than its own. Particularly, if the analysis period is divided into the 1980s and the 1990s, the effects of R&D investment on productivity became larger in the 1990s.

Based on these results, in order to further enhance the spillover effects of R&D investment on productivity, it is judged that policy efforts should be made as follows: First, domestic R&D investment, particularly basic research activities, which have great effect of externality, should be reinforced. To this end, efforts should be made to stimulate joint research activities among companies, centering around a field of research that each company is hard to carry out, and to reinforce the government's role in this. Second, it is desirable to develop human resources for R&D through qualitative improvement in higher education and preferential treatment for science and

engineering majors. Third, R&D resources should be utilized in an effective manner through enhancement of the linkages of R&D systems between industries, academia and research institutes; and a cooperative system needs to be established in which information on R&D achievement is exchanged smoothly. Lastly, imported technologies from abroad should be more highly advanced so that they can stimulate domestic R&D activities, and a system should be constructed that will allow its capacity to develop its own technology.