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The Analysis of Socio-economic Impact on Big Science R&D: Focusing on Fusion R&D Program in Korea

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This paper is focused on the analysis of socio-economic benefits of the ongoing R&D program on big science such as nuclear fusion in Korea. The spillover effects are understood here as positive externalities of publicly funded R&D activities that may be revealed at the companies' level in the form of newly created knowledge stock; development of innovative products/ processes with broader market applications; strengthening of R&D, manufacturing and marketing capabilities; etc. In addition, this study critically reviews the literature on the socio-economic benefits of publicly funded big science R&D. In that literature, two main methodological approaches have been adopted --surveys and case studies. These studies have also highlighted the importance of spillovers and the existence of localization effects in research. From the literature based on surveys and on case studies, it is clear that the benefits from public investment in big science R&D can take a variety of forms. We classify these into seven main categories, reviewing the evidence on the nature and extent of each type. The results demonstrate that fusion R&D programs have relatively outstanding performance in seven categories: (1) increasing the stock of useful knowledge; (2) training skilled graduates and researchers; (3) creating new scientific means and methodologies; (4) forming networks and stimulating social interactions; (5) reinforcing the capacity for scientific and technological problem-solving; (6) creating new firms; and (7) access to scientific facilities. In particular, those projects were observed to form an industrial ecosystem for nuclear fusion that extends to the accelerator sector, in the category of creating new firms, while making a significant contribution to training talented researchers and expanding social networks as well. We reconsider the rationale for government funding of big science R&D, arguing that the traditional 'market failure' justification needs to be extended to take account of these different forms of benefit from big science R&D. The article concludes by identifying some of the policy implications that follow from this review.

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No

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