From basic research to private innovation

What's the return on basic research spending? What can policy makers do to make basic research more valuable, beyond simply spending more taxpayer money? And what role will private innovation have?

Science generates new ideas. Ingenious firms exploit them to create new products and services. Examples are the new drugs to overcome the COVID crisis, new solutions to stop climate change, and the digital revolution.

Basic and Applied Research

Basic research generates new ideas with yet unknown applications. The results of basic research can be used by all without 'using them up'. Basic knowledge with yet unknown and diverse applications is also hardly patentable. For these reasons, basic research is a truly public good and a classic responsibility of government which can use tax-payer money to finance it.

True, some very large corporations engage in basic research as well. These are firms with hundreds of products and services. They can make use of the unspecific and unpredictable outcome of basic research. If not useful in one area, they can use the results elsewhere or set up entirely new product lines. Large corporations are also those who are most intensively cooperating with universities, thereby contributing third party funding. Yet, for the bulk of the private sector, own basic research is not profitable. They focus on industrial R&D with very specific applications, quality improvements and new products.

University-industry collaboration typically rests on applied research. Applied research is closer to specific applications and can help firms to develop quality improvements or entirely new products and services. Firms are willing to pay for inputs to their own R&D investments. They pay for patents and consulting services, and financially contribute to applied university research to get better access to new solutions. Altogether, third-party funding may become an important source of revenues to relax tight university budgets.

Incentives to push innovation

The distinction between basic and applied research can be fuzzy. In fact, many researchers pursue both basic and applied projects. In addition, a core mission of universities is teaching. Teaching absorbs time and effort of professors which subtracts from research time. Complementarities can relax the trade-off. Teaching in PhD programmes promises competent help by doctoral students in doing experiments, collecting data, and providing other tasks. The same holds for applied research. Students value the private sector relevance of teaching which helps their prospects with reputed employers. Firms obviously value skills that are close to their needs.

Time is limited and financial resources are scarce. Universities must thus strike a balance between basic research, applied research and teaching. To resolve this trade-off, they tend to specialise. Some universities are truly research-intensive with few students and little 'distraction' from consulting. Others are mainly engaged in high quality teaching, accepting lower rankings in academic research. The contribution of third-party funding varies across universities.

Universities respond to incentives created by funding rules, and by market prices such as student fees, patent prices and consulting fees for private sector cooperation. Budget rules can be linked to success in academic research such as publication frequency in top tier scientific journals, and quality and number of citations. They may be sensitive to student numbers and existence of third-party funding. Funding of basic research is subject to tight competition for research grants by national science funds or the Horizon Europe programme.

Intrinsic motivation through recognition and reputation are important. However, much like private firms respond to prices and profitability, universities and their professors respond to financial incentives. Incentives can be powerful. For example, Norway enacted in 2003 a reform that shifted two thirds of the ownership rights from patents and other third-party funding to universities, whereas professors had full rights before the reform. Hvide and Jones (2018) found that entrepreneurship and patenting rates declined by about 50% thereafter. Letting university researchers participate in their inventions affects the knowledge flow to the private sector.

A multiplier of private innovation

What is the role of universities in promoting private innovation? Basic research is still far away from commercial applications and might get stuck in the 'ivory tower'. It doesn't automatically become useful in private R&D. Applied university researchers can serve as 'intermediaries' between basic researchers and private sector firms. University patenting, research cooperation with industry, consulting, and academic entrepreneurship leading to spin-offs are examples. Universities can offer valuable inputs to industry R&D, depending on how they share revenues from patenting and third-party funding with their researchers.

Another channel is teaching. The success of industrial R&D rests on hiring research personnel endowed with state-of-the-art methods and know-how at the frontier of research. Private R&D is the most skill intensive activity in the economy and benefits the most when universities supply more high-skilled labour. Implementing new technology by setting up production of entirely new products and services is similarly skill intensive. Much of the knowledge transfer from universities to the private sector is embodied in well trained graduates. Altogether, universities need to strike a balance between basic research, applied research and high-quality teaching.

Policy

The social return on basic research and innovation is certainly larger than the private market return. However, the value of university funding is endogenous and can be increased by good policies: install a good incentive structure that leads to the right balance in basic and applied research and advanced teaching; facilitate the knowledge transfer to the private economy to make academic research productive for society; make sure that new ideas get financing from venture capital, private equity, and banks; and implement an efficient bankruptcy law and other policies that help labour and capital to flow more easily to the most rewarding uses. Beyond spending more money, governments can do a lot to make university funding even more profitable for society.

References

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