

Support to science-industry links

Strong linkages between science-industry are the core paths for technology transfer and commercialization and their development requires time and sustained public and private efforts. Science-industry links can exist before the commencement of technology transfer or/and can arise at any stage, from the conception of a new idea through its commercial development.

Industry-science linkages promote the cross-fertilization of ideas and synergies in research, avoiding wasteful duplication of R&D efforts in firms. More generally, industry-science collaboration can leverage technological spillovers through the stimulation of additional private R&D investment. Linkages with industry can have enriching effects for research institutions as well, although there is a substantial variation in the relevance of science for innovation across industries and the modes of interaction across scientific disciplines.

Linkages are developed through the exchange and sharing of knowledge and objectives; they can refer to a particular stage of the technology transfer process and can vary in duration and intensity in accordance to the channels of knowledge transfer available. Transfer channels operate often simultaneously and/or in a complementary fashion and facilitate the interaction between tacit and codified knowledge that flows in a multidirectional manner. Such complexity requires two ingredients:

First, the parties involved are capable and willing to participate in knowledge exchange and transfer. This means that firms need to be capable of delivering innovative products, processes and services to the market while universities and public research institutes serve the process by sharing knowledge, expertise, innovation skills, and technological applications. Exploiting university-industry linkages is an important means for innovative entrepreneurs to compensate possibly limited internal resources and infrastructure for conducting R&D and other costly innovation activities by exploiting knowledge spillovers arising from public research organizations. Certainly, the effect on firms' innovativeness is closely linked to the firms' own characteristics so homogeneity of results is not applicable.

Second, the conditions for the development of the essential linkages between them are in place, which is when the role of the government becomes critical. A number of schemes are directed at better linking science and industry in order to promote communication and knowledge diffusion and increase firms' ability to find and absorb technological information, and provide them with information about trends in R&D. Public support to endorse science-industry links includes:

- **Cluster policies:** offer a better pooling of physical, human and financial resources for innovation and exploit the benefits of proximity for the further development of knowledge spillovers and coordination between actors.
- **Grants for collaborative R&D:** include competitive research and development and partner matching grants the former aiming at near-to-market technology generation and the latter promoting research partnerships for the development of novel products or services.
- **Centres of excellence (CoEs):** aimed at stimulating creative and efficient research and training environments. Establishing concentrations of researchers and resources in CoEs is considered as a means to increase quality and relevance of public sector research at the international level.
- **Innovation vouchers:** small lines of credit provided by governments to SMEs for the purchase of services from public knowledge providers (universities, PRIs)
- **Technology platforms and fora:** industry-led stakeholder forums that aim to define research priorities and action plans in a broad range of strategic technological areas.

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- **Knowledge Transfer Partnerships:** a relationship formed between a company and an academic institution which enables the transfer of knowledge, technology and skills to the company partner which needs them.

Other factors that influence the formation and nature of science-industry interactions include:

- Greater autonomy granted to universities in many countries
- The adoption in many countries of Bayh—Dole type of legislative policies that grant universities ownership over IP created from publicly funded research and provide them with incentives to patent and license academic inventions
- The rising costs of scientific research and budgetary pressures on universities which encourage universities to seek new sources of revenue and engage in partnerships to share risks
- The rise of regional government efforts to foster economic development around knowledge-based clusters
- Increasing demand from the business sector to collaborate or to contract research to universities.

While some knowledge flows served through these linkages are difficult to measure due to their tacit nature (e.g. informal contacts, conferences, consulting, publications, and the movement of students), their role in the transfer of knowledge remains vital.

Thinking further in terms of policy planning, research policies that encourage greater openness and access to public research results may potentially allow for greater participation in public research and greater exploitation of the results, whether through commercial or other channels. The exploitation of research through new open science channels (e.g. open access databases) may also lead to downstream commercialization and innovation.

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