# Instruments to finance technology adoption and research–industry collaboration

This section discusses features of the technology adoption process and the instruments that can be used to finance it and explores the dynamics of research–industry collaboration. It emphasizes the role of grants and vouchers in fostering technology adoption and presents information about programs that have been employed in several countries to address this issue.

*Importance of technology adoption.* Businesses have much to gain by adopting innovations not developed in house. Technology adoption and knowledge absorption are particularly important priorities for developing countries, given that acquiring and using knowledge that already exists is less costly and less risky than creating new knowledge, while the rewards can be huge. Therefore, policies that facilitate access to global knowledge are critical.

In some cases, this knowledge resides within the research sector. There is also much knowledge in the public domain to which businesses can get access at little or no cost if they have sufficient absorptive capacity.

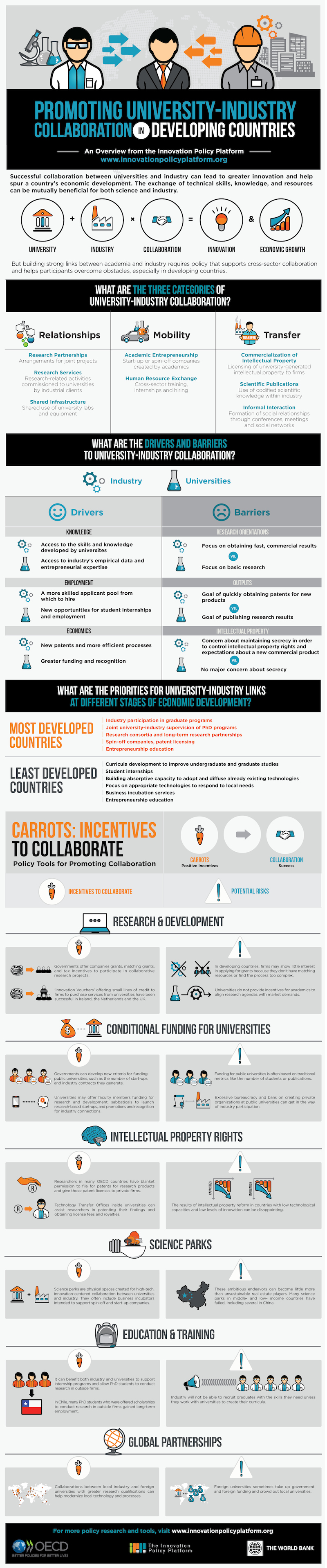
#### *Some features of the technology adoption and industry–research collaboration process.* Firms can adopt technologies developed elsewhere by several channels. One of the most common is by acquiring machinery and equipment and integrating it into existing businesses. The know-how embodied in new machinery, in business processes (like Six Sigma), or in the combination of both (such as the introduction of information technology and related business practices) that is developed externally and disseminated into existing firms is a significant element of business innovation around the world (Hall and Khan 2002).

The adoption of new technologies can be expensive, particularly when new production equipment must be purchased and experts hired to provide training. As a result, firms may not be willing to adopt them (if they don’t recognize their value) or may be unable to do so (if they cannot get access to sufficient finance to cover the cost of adopting them).

Several other barriers also hamper technology diffusion and collaboration, such as information asymmetries between producers and users, high costs of switching to new technologies, high entry costs (especially in areas with important network effects), and technological path dependencies. Some of these can lead to market failures, which governments may be able to help address.

Another potential source of new knowledge resides in the research sector, generally R&D. The types of collaboration and the challenges associated with them are in figure 1.

**Figure 1**. **University–Industry Collaboration**



Source: IPP.

#### *Policy interventions.* Policy instruments to aid new technology adoption generally target SMEs, which are typically less informed about new technologies and may also be quite reluctant to risk introducing potentially disruptive technologies. Similarly, SMEs may not understand how to work with research providers or business consultants who can help reduce the risks and costs of the adoption process. Finally, SMEs may not only be unable to see the rewards of adopting new technologies; they may also lack the resources to afford them.

In addition to advisory services, several types of subsidies can be provided to SMEs to reduce the upfront costs of technology and make its adoption more attractive. In some cases, advisory services are linked to funding to help implement change, but standalone funding initiatives also exist. Sometimes funding is directly provided to SMEs, while in other instances it supports the soft infrastructure and related services that help enable knowledge diffusion (for example, clusters, accelerators, innovation intermediaries, trade/industry associations that run technology dissemination events, and so forth).

Small grants to obtain expert advice on organizational or process innovation or to support the accreditation of International Organization for Standardization (ISO) certifications can be effective mechanisms to promote knowledge absorption and technology adoption. For instance, to drive energy-efficient practices, the Canadian government has a facility that provides up to C$40,000 to companies that decide to implement the ISO 50001 standard certification (Energy Management Systems Standard). In addition, the program provides industry networking opportunities, customized energy management workshops and toolkits, and technical information.

The UK Manufacturing Advisory Service provides advice to manufacturing SMEs to improve their business and production processes, as well as small grants for clients to bring in external experts to help implement this advice. This type of advisory service–grant package not only supports the direct infusion of new knowledge into the business, but, ideally, it can also help improve SMEs’ future capacity to find and implement external knowledge themselves by showing them how to go through the process. Singapore also provides support through a simple grant for capability development via external knowledge providers (see Box 2).

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| **Box 2. Singapore Innovation and Capability Voucher**  The Innovation & Capability Voucher (ICV) is a simple voucher valued at S$5,000 to encourage Singaporean SMEs to take their first step toward capability development. SMEs can use the voucher to upgrade and strengthen their core business operations by acquiring external consultancy services in the areas of innovation, productivity, human resources and financial management.  Apart from consultancy, ICV also supports SMEs in the adoption and implementation of simple solutions to improve business efficiency and productivity. SMEs can use the ICV to implement productivity solutions under the supportable cost categories of (i) equipment & hardware, (ii) technical solutions, (iii) professional services, and (iv) design & renovation  Each SME is entitled to a maximum of eight vouchers. Each ICV project must be completed before the submission of a new application. The duration for each project should not exceed six months.  Source: http://www.spring.gov.sg/Enterprise/ICV/Pages/innovation-capability-voucher.aspx. |

“Innovation vouchers” are another instrument used to encourage SMEs to seek access to new knowledge sources. Specifically, the government gives vouchers to SMEs to purchase services from knowledge providers, such as universities or research organizations (IPP 2014). The vouchers are intended to promote collaboration between the scientific community and the private sector, which is difficult for several reasons. Universities and research organizations usually have insufficient information about private sector needs, while company management might believe universities and research organizations do not understand company needs, or that knowledge services are overpriced. Small vouchers, usually granted for consulting services, are a simple instrument that can help support knowledge diffusion.

One disadvantage of vouchers is that while they create short-term alliances, they may be less effective for fostering cooperation in the long run. A variation on this approach is to encourage the placement of researchers or technical people within SMEs as another way to support knowledge absorption. For instance, the Australian government runs its Researchers in Business initiative, which supports the physical placement of researchers from universities or public research agencies into SMEs to work on improvement projects for them. Brokering support is also provided to address the complexities of contracts and IP and to ensure the right cultural fit between the researchers and the SMEs.

Given the cultural differences between the research sector and SMEs, vouchers work best when accompanied by some type of brokering, since a pure financial incentive does not address the information asymmetries. Both this type of initiative and vouchers could be categorized as variations on the R&D grant scheme model, but with an explicit added goal of inserting external capability into a business.

Table 4 provides a summary of observations regarding technology adoption and industry–research collaboration.

**Table 4. Design and implementation observations—technology adoption and industry–research collaboration**

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| **Instrument** | **Observations** |
| Technology adoption and industry–research collaboration | * A key market failure is often insufficient information (SMEs lack awareness and/or mistrust external consultants), so to be effective, instruments need to address this problem in addition to providing funding. * Vouchers are much more effective when brokering between the SME and a potential research provider is offered (in addition to funding) to reduce the substantial transaction costs faced by both parties. * This brokering usually involves skilled people who understand business and research, so they can communicate with both sides and work through potential contractual and IP issues. * Vouchers generally involve small amounts of funding to introduce new knowledge by subsidizing external advice. They are most effective when delivered as part of a structured improvement plan that has identified the core needs of the business to which the intervention is targeted. * Subsidizing the purchase of capital equipment can be expensive, so policymakers need to be careful to assess whether there are additionality and any spillovers beyond the recipient for such an approach. |