

## **Spin-off firm creation universities and PRIs**

Spin-offs established by individual researchers, university departments, or entire organizations aim at putting the results of their research to commercial value, and have a market medium for technology transfer and commercialization. Some policy breakthroughs have been particularly influential in promoting spin-off strategies (e.g. US Bayh-Dole Act). Conditions ensuring the contributions of spin-offs to innovation performance include: spin-offs' access to innovation finance, intellectual property rights regime, incentives to researchers for creating spin-offs rather than keeping their intellectual property off the market, effective technology transfer offices and university involvement.

### **What is spin-off firm creation by universities and PRIs?**

In the university and public research institute context, spin-offs are private firms (usually small- and medium-size enterprises) established by individual researchers, university departments, or entire organizations to put the results of their research to commercial value, and to have a market medium for technology transfer and commercialization. As an initial investment, spin-offs get intellectual property and limited financial contributions, with the prospect of rapid growth, according to the proposed business plan. As a rule, spin-offs continue to sustain links with their parent organization, and can serve as an important mediator and facilitator of knowledge and technology transfer from publicly funded research organizations.

Some policy breakthroughs have been particularly influential in promoting spin-off strategies around the world. For example, the US Bayh-Dole Act of 1980 is recognized as a critical milestone that institutionalized the intellectual property (IP) rights of American universities with regard to federally funded research. Although universities were engaged in patenting activity since the 1920s, the Act was the first legal framework that allowed them to own IP and exclusively license their inventions. The law provided a simplified and unified framework for government funding and university IP ownership. Universities were also required to establish patent policies for their employees to promote technology transfer and ensure a bigger economic impact from these institutions (Sampat, 2009). In the 1990s, many European and Asian countries followed suit and adopted similar legislation to promote knowledge transfer from publicly funded research organizations, and to increase commercialization rates and innovation outputs throughout the national economy (OECD, 2003).

### **How does spin-off firm creation by universities and PRIs contribute to innovation performance?**

Most contemporary policies aim to sustain effective science-industry linkages to facilitate technology transfer from basic science and applied research, to the commercialization and production of actual innovative goods, processes and services. Spin-offs are a natural vehicle for fostering such links, since they combine the features of university labs and private enterprises by mixing both the research and entrepreneurial skills needed for successful innovation processes. Moreover, they may have close links with special facilities, such as technology transfer offices (TTOs), to help them translate university research into commercial applications.

Some empirical evidence also shows that spin-off strategy produces a bigger average return for universities in the long run, compared to returns from average licensing (Lockett et al., 2003). This is especially true when publicly funded research organizations and private firms jointly own spin-offs, since this permits risk sharing, and investment in a broad mix of innovation skills and financial resources.

### **Conditions ensuring the contribution of spin-offs to innovation performance**

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- As mentioned, spin-offs usually get only limited financial investment at the start of their operation and hence require good mechanisms for accessing innovation finance in the form of angel investment, venture capital, and other types of finance.
- Exit options are particularly important for fragile SMEs, including spin-offs, as they bear a high risk of failure before they reach a mature stage of growth. Acquisition, flotation and bankruptcy regulations should be in tune with the needs of these enterprises.
- Growth factors of spin-offs are rather diverse and depend significantly on the institutional, legal and cultural environment where they operate. Certain leverages helping them to survive and grow, such as links with large customers and partners, are often important for these firms to be viable.
- The characteristics of intellectual property rights regime are important factors in promoting or impeding the growth of spin-offs. Such legal environments as the US Bayh-Dole Act and the like construct favorable conditions for universities and PRIs to transfer knowledge and technologies to newly created firms. In this context, university intellectual property strategies, such as equity investment, are also crucial drivers for a growing number of spin-offs.
- Broader legal and regulatory frameworks are also important to ensure that universities are stimulated to establish new spin-offs as outputs of publicly funded research projects, rather than keep their intellectual property off the market. For example, OECD (2008) mentions that 19 countries worldwide allow researchers to return to academia after a period in the private sector, and to establish spin-off companies where they can apply both their research skills and business experience.
- Effective institutional arrangements, such as technology transfer offices, have been generally shown to have a good effect on the growth of spin-offs. O'Shea et al. (2005) also found that the business and entrepreneurial skills and experience of TTO staff and university researchers have had a large positive impact on the success of spin-offs.
- In a study of the US biotechnology sector, Zucker and Darby (2001) found that the link between "star" scientists and spin-off researchers improves the quality of innovation in new firms and stimulates their growth.
- Scientific community norms and research career incentives are two other major drivers of spin-off success: the community must stimulate knowledge transfer and the desire to commercialize, while researchers must have good financial and career incentives to pursue such behavior.
- Finally, reasonable university involvement has been found to be generally beneficial for spin-off growth, although excessive control may lead to overdependence on university decisions (Rigby and Ramlogan, 2012).

### Measurement

Data on the number of spin-offs are not collected systematically across countries, so that international comparisons are particularly difficult (see Table 1 for data on US, Canada, and the UK). Indicators on the performance of small firms and their survival are not ideal, since spin-offs represent only a small share of the total number of firms. It is also worth noting that high death rates for spin-offs are not necessarily economically undesirable, as many new risky ideas might not be suitable for markets and, therefore, will not survive market competition. It is relevant to examine whether this is a healthy cleansing process, or whether successful products sometimes fail due to market failures that policy could have addressed.

Universities and PRIs may serve as a good source of data on the number and growth of spin-offs, since they usually continue to keep accounts and control such firms, given their continuous affiliation. The Association of University Technology Managers is known to be collecting related metrics.

Collecting specific micro firm-level data and conducting case studies are also often considered suitable ways of assessing spin-offs and their performance.

**Table 1. Number of spin-offs established in Canada, USA, and the UK in 2003-2009.**

Spin-offs established	2003	2004	2005	2006	2007	2008	2009
Canada	57	45	36	31	48	39	48
US	352	436	437	534	544	584	585
UK	167	148	187	226	219	191	

Sources: adapted from WIPO (2011) and Geuna and Rossi (2011).

## What policies relate to spin-off firm creation by universities and PRIs?

### Policy rationales

Rationales for public intervention to support spin-offs are very similar to those policies supporting R&D collaboration with firms, since both mechanisms have the common function of promoting science-industry links and knowledge transfer from universities and PRIs to private firms.

Thus, market failure phenomena, such as information asymmetries and risk aversion, are addressed by the spin-off strategy, since these firms usually permit shared risk between universities and private enterprises, and create effective communication channels for knowledge exchange and long-term innovation growth.

If co-owned by universities and private firms, spin-offs also create economies of scope and scale by concentrating resources and capabilities in important technological areas.

From the system failure perspective, spin-offs improve knowledge flows and the productivity of innovation networks by creating a direct link between basic science, applied research and commercialization. They also contribute to the resolution of capability failures by directing innovation skills into particular areas. Often formally affiliated with universities and PRIs, spin-offs also have access to R&D infrastructure, which helps resolve infrastructure failures.

### Policy objectives

Policy objectives regarding spin-off firm creation by universities and PRIs include:

- improving knowledge transfer mechanisms between science and industry by promoting spin-off strategies that serve as enablers and facilitators of effective links between academia and business
- providing financial support to spin-offs
- supporting a network of technology transfer offices to allow for better spin-off and start-up activity at universities and PRIs
- providing supporting infrastructure for spin-off strategies: multi-user facilities, S&T parks, incubators, etc.

- adopting a proper legal and regulatory framework to stimulate individual researchers and property to them.

### Policy instruments

Policy instruments in support of spin-off firm creation by universities and PRIs include:

- Supporting incubators and S&T parks to create favorable environments for sustainable links between universities and spin-offs, and firm growth
- Establishing legal and regulatory frameworks to address the issue of which spin-off strategies collaboration with firms, since spin-off strategies can have better control on the results of publicly funded research projects at the university level
- Creating proper incentive programmes to stimulate the transfer of knowledge and technologies to business entities by researchers
- Supporting technology transfer offices to provide professional advice and guidance for spin-off strategies at universities and public research institutes.

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