

## Policy rationales and objectives for technology transfer and Commercialisation

The benefits stemming from the transfer of technology to different users and its commercialisation justify the policy makers' interest in planning supporting instruments aimed at mitigating institutional gaps, mismatches and barriers. Public intervention on this area has followed different yet complementary rationales summarized in tackling misalignments in agents' objectives, dealing with incomplete markets for technology and IP transfer and addressing system failures.

### Target misalignment - science, technology and the private sector

The multi-actor nature of the process implies a wide representation of interests, incentives and expected outcomes. While such variety is an indispensable and valuable attribute of technology transfer, its significance is often overshadowed by the misalignment of organizational targets and orientation.

Interests and motivations often differ radically between actors and such differentiation can hinder or discourage technology transfer. In general, science oriented organizations focus on creating new, freely distributed knowledge regardless of its potential commercial use and plan their activities over long time periods. Instead, private commercial organizations plan their activities around short term financial criteria and product development time cycles, which are also the ones used for valuing research outputs, but which may not align with those of science oriented organizations.

Policy intervention is then drawn around the objective of aligning the targets and decreasing the distance between the two types of organizations: namely, introducing the entrepreneurial culture to universities and incentivizing businesses to become able and willing to find practical applications for the results of basic research and create new commercial technologies. Such objective requires a set of policy instruments that support and strengthen the links between science and industry, guarantee the provision of education relevant to entrepreneurship and set up an adequate regulatory framework.

### Incomplete Markets

Public intervention in technology transfer and commercialisation has traditionally been justified on the grounds of market failures contained in the idea that private agents will invest less in entrepreneurial and innovative activities than the socially desirable level (Nelson, 1959; Arrow, 1962). The main reasons why this might occur include:

- **Imperfect appropriability** of knowledge creation due to positive externalities. The uncertainty regarding the value potential of scientific discoveries inhibits private investments due to the fact that, typically, inventions developed by universities and research institutions are often embryonic and need further investment for development. Such investment involves high risk, since neither the practicality of the inventions nor their market utility has been proven while the lack of a clear legal framework regarding the creation and exploitation of IPR increases the uncertainty on return appropriation. As a result, many potentially valuable inventions remain idle without the development necessary to make them attractive as business opportunities.
- **Information asymmetries** and the lack of mechanisms facilitating matching of supply and demand, and reflecting the inherent difficulties of under-developed technology markets. Information asymmetries may discourage transactions in general, while they become more prominent with investments in innovation due to the reasons explained in the previous point. Certain institutions, such as the patent system, may help to mitigate this asymmetry by

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providing some guarantee to suppliers of knowledge that disclosing the knowledge will not undermine their ability to consent to the transfer or sharing of the knowledge.

- **Other market failures** such as lack of access to finance for innovation or a lack of a suitable support infrastructure can hinder technology transfer. Small firms are likely than larger ones to be more exposed to such barriers, and the high level costs required to overcome these shortcomings requires collective intervention to avoid associated co-ordination failures.

In principle, well-functioning “markets for ideas and technologies” constitute an appealing mechanism in which inventors, researchers and scientists supply their inventions, and firms, entrepreneurs, and investors demand them, with a price that clears the market. However if such markets exist, they remain incomplete due to their inherent characteristics and factors such as:

- Rapid change towards more complex technologies
- Frequent new product introductions and enhancements
- Evolving industry standards
- Changes in customer requirements towards more sophisticated technologies
- Continued shortening of product life cycles

Such challenges call for policy measures that tackle the uncertainty in market forecasting and difficulties in estimating future revenues, seek to balance risk aversion and foster the routes to exploitation of new technologies.

### System Failures

Policy intervention is also required for dealing with gaps relevant to the links between key actors, their interactions and the coordination of policy action at a system level in a way that the supply and demand of knowledge flows is ensured. Failures at system level include:

- **Network failures:** problems in the interaction among actors (such as poor communications between system actors, lock-in/path dependency failures, transition failures).
- **Institutional failures:** inadequate configuration of public institutions so that they work effectively within the innovation system. Awareness of the substantial economic benefits from public research, have changed the rationales for supporting PRIs and universities in particular, but the ability of research institutions to engage in technology transfer activities is often limited. While public research continues to be considered central to advancing scientific training and supporting social needs, generating knowledge to support innovation, it is no longer considered independently from commercialisation purposes (OECD, 2013).
- **Framework failures:** deficiencies in regulatory frameworks (e.g. IPR), and in other background conditions (e.g. entrepreneurial culture and research orientation) which can have a negative effect on innovation and economic performance.

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## Policy considerations

As the technology transfer and commercialisation process is embedded in the wider economic and institutional setup, new policy rationales – notably increased university autonomy and a changing global and local environment – this results in actions and initiatives taken by the core organizations themselves. Hence, in addition to publicly induced measures, PRIs and Universities seek to reform and experiment with alternate initiatives that better reflect each institution's legislative, financial and cultural context (OECD, 2013).

As the results of technology transfer require sufficient time to materialize, policy sustainability and evaluation is critical. Notwithstanding the variety and source of rationales and for policy intervention and the accompanying policy instruments, the need for long-term policy planning and the sustainability of policy objectives forms a common attribute of public action and private initiative.

## References

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