Public policies for the diffusion of technology

Public policies play a key role in helping technological advances to emerge and spread throughout the economy. In this article we address the dissemination of technology and the role of public policies in this process.

The difficulties in disseminating technology

If it were easy to copy the technology of our neighbours or competitors, there would be little technological difference between countries, or between regions within a country... let alone between companies within the same country and region! Yet, in reality, only a few countries and companies develop new technologies. In addition to these differences in creation, the ability of third countries to adopt new technologies is also highly uneven (see first chart).

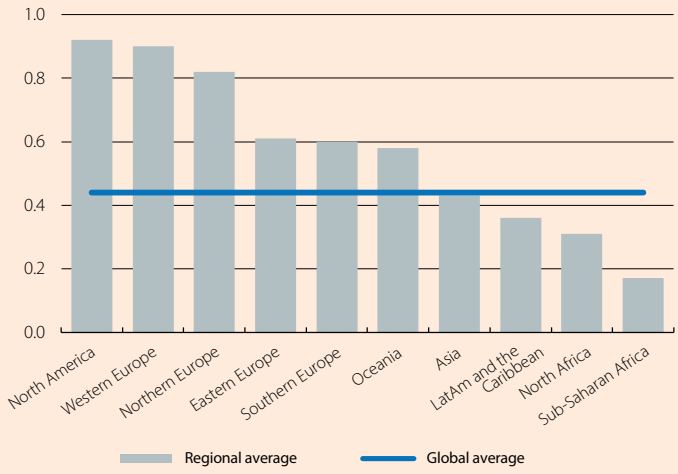
The spread of technology is by no means simple, neither between countries nor within countries themselves. According to Ricardo Hausmann, director of the Center for International Development at Harvard University, technology is composed of three types of knowledge: that of the tools and materials; the codes, manuals and instructions; and the tacit or practical knowledge (know-how) possessed by the professionals who have developed or who use the technology itself. This last element is the main stumbling block for the spread of technology.

As Hausmann explains, the tools and materials that make up a technology can be acquired; the codes can be understood with a sufficient educational base (through what is defined as explicit knowledge); but know-how can only be obtained through repeated face-to-face interaction with the technology itself (learning by doing) and this, inevitably, means it takes time.

Moreover, in modern societies this know-how is on such a vast scale that it cannot be covered by a single individual, nor by a handful of individuals, hence it is dispersed among large groups which are organised in an interconnected, modular way. Acquiring a new technology thus also requires a particular organisational fabric (an added hurdle for its dissemination).

Readiness for frontier technologies index

*(Points) **



Note: ** Index ranging from 0 (minimum) to 1 (maximum).*
Source: *CaixaBank Research, based on data from UNCTAD.*

How public policies can help... and what we find in Spain's Recovery and Resilience Plan (RRP)

In the development and dissemination of future technologies, it is firstly necessary to have adequate digital infrastructures (these would be the aforementioned «tools» or «materials»). In this sphere, Spain is in a relatively strong position compared to the EU average: it has one of the widest deployments of very high capacity networks, covering 89% of households in 2019, compared to 44% across the EU on average and 45% in 2015 in Spain.[1]

Despite this good starting point, the RRP emphasises the use of such digital tools by SMEs, whose small size often makes it difficult for them to adopt digital technologies. After all, having the tools available is not the same as making good use of them. The SME Support Plan (Component 13 of the RRP), with a significant investment planned (4,894 million euros), will play an essential role in facilitating this adoption. This component aims to promote the use of digital solutions in these smaller companies through grants, the creation of innovative digital hubs and training.

This latter element (training) is necessary to improve explicit knowledge on new technologies (the second defining component of technology according to Hausmann). In fact, in addition to this digital training focused on SMEs, the Spanish Plan will also invest in digital training for Spanish society as a whole, through the National Digital Skills Plan (Component 19 of the RRP). In other words, these are investments that will educate us on how to read and understand the «manuals» associated with new technologies.

1. See the article «Spain in the digital race» in the Dossier of the MR03/2021 for more details, as well as the article «NGEU: an international comparison of the recovery plans and their investments in new technologies» in this same Dossier.

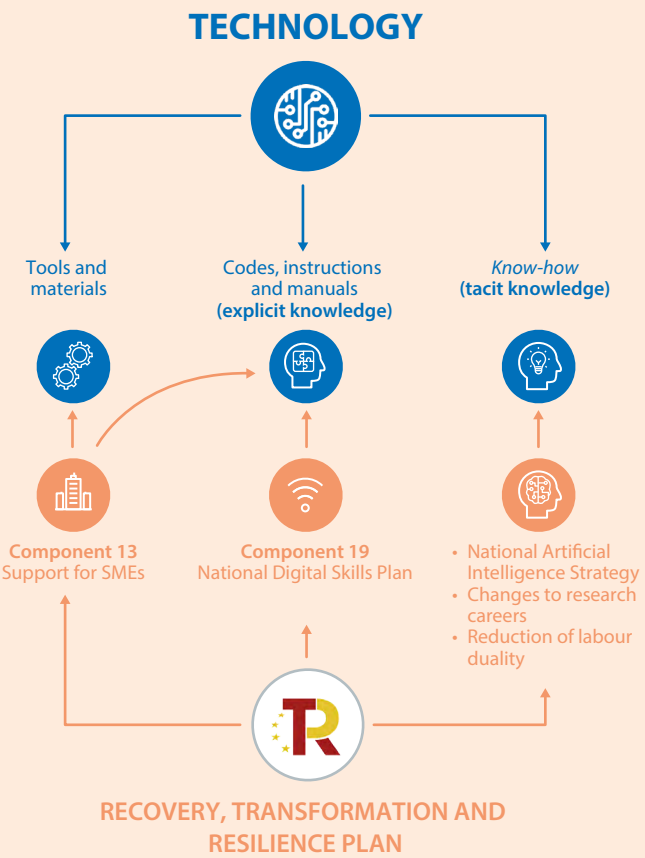
Up to this point, however, we have only talked about policies and investments that affect the first two defining components of technologies (tools and explicit knowledge), but not the third (know-how), which is precisely the one that makes the dissemination of technology more difficult.

Attracting talent, combined with the mobility of this talent within societies, are essential ways for encouraging the flow of know-how and, therefore, the flow of new technologies. As Ricardo Hausmann often stresses, it is easier and quicker to move brains with know-how than it is to fill them with this know-how.

Promoting innovative projects is certainly one way to attract talent from around the world. In this regard, the National Artificial Intelligence Strategy, which is Component 16 of the Plan, provides a clear path for attracting talent. However, as argued by EsadeEcPol,[2] it would be important to complement these efforts in order to achieve the establishment within Spain of different European research sites such as the European Centre for Industrial Competition or Cybersecurity, or to go further with the proposed changes to research careers in order to give new hires with external assessments (tenure track) greater stability and career opportunities.

More generally, attracting talent is aided by certain labour market policies and institutions. The economic progress of countries depends heavily on the evolution of a small group of companies that grow at rates far above the average (referred to as gazelles). Labour policies, among others, can make it difficult to reallocate know-how between companies. Thus, for example, the duality that exists in Spain's labour market, as a consequence of various of these policies, means that the most senior workers with a high degree of know-how are more likely to remain in jobs in low-growth companies rather than take the leap to join companies which have an enormous growth potential but are just taking off. Similarly, many of these workers are entrepreneurs with the potential to found firms that could well become the country's gazelles of the future, but again, they do not take the leap to found them. On the other hand, the most entrepreneurial companies also suffer this duality, as they would prefer a more flexible labour market in the face of the risk of their project not living up to expectations. In this regard, reforms that help to reduce this duality, as proposed in the RRP, are clearly a positive development. Furthermore, establishing individual workers' funds which can be used in the event of dismissal or a change of company (like the Austrian backpack) would help to prevent talent (linked to know-how) from being retained in low-growth companies for fear of losing the rights acquired after a long employment relationship.

Technology and policies for its dissemination



Source: *CaixaBank Research, based on articles by Ricardo Hausmann and information from the Spanish Recovery and Resilience Plan.*

Finally, the dissemination of technology is easier when similar or related technologies exist in the country that wants to adopt the new technology in question. This is especially true in the case of complex technologies, since they often require high doses of know-how and particular organisational structures (the idea of knowledge collectivity is key in such cases). The presence of related technologies will mean that there are many workers with know-how of elements similar to the new technology. Moreover, the organisation of the related technology could often be easily converted to meet the new technological needs. In this regard, it is important that public institutions, in their task of distributing and coordinating NGEU funds, make a good diagnosis of the productive structure and technological status of Spain's various sectors in order to help drive the most suitable technological leaps.

Clàudia Canals and Oriol Carreras

2. For a critical analysis of some of the elements of the Plan, see EsadeEcPol Brief #9 (April 2021) «Reformas, gobernanza y capital humano: las grandes debilidades del plan de recuperación» (article available in Spanish).