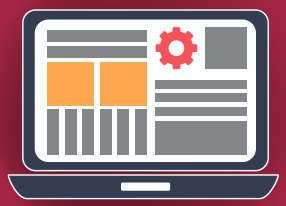
CDTI MONITORING REPORT

EXECUTIVE SUMMARY

RESEARCH AND DEVELOPMENT PROJECTS AT THE COMMERCIALISATION STAGE

Instruments managed through open calls

2018



Departamento
de Estudios
y Comunicación
CDTI E.P.E

CUADERNO 15

MINISTERIO DE CIENCIA, INNOVACIÓN Y UNIVERSIDADES
CDTI Centro para el Desarrollo Tecnológico Industrial
@CDTIoficial

Published by: Centro para el Desarrollo Tecnológico Industrial (CDTI-E.P.E.)
C/ Cid, 4 28001 Madrid (Spain)

Edited by: Studies and Communication Department

Legal deposit: M-21355-2018

June 2018

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NTRODUCTION

At the present time, technology appears, from many perspectives, to be an essential channel for tackling social and economic challenges that are decisive for the human race. In order to fulfil these expectations, the design of public policies intended to promote technology research and development should be based on extensive knowledge of the results and impacts of programmes currently in force and those that have already concluded. This is the only way to propose solutions and instruments that succeed in generating the desired changes in the business sector and in society as a whole.

Ex-post evaluation serves to access this knowledge and to offer public decision-makers and managers a unique opportunity to learn how and to what extent their participation is contributing to solving the problems or shortcomings that brought it about.

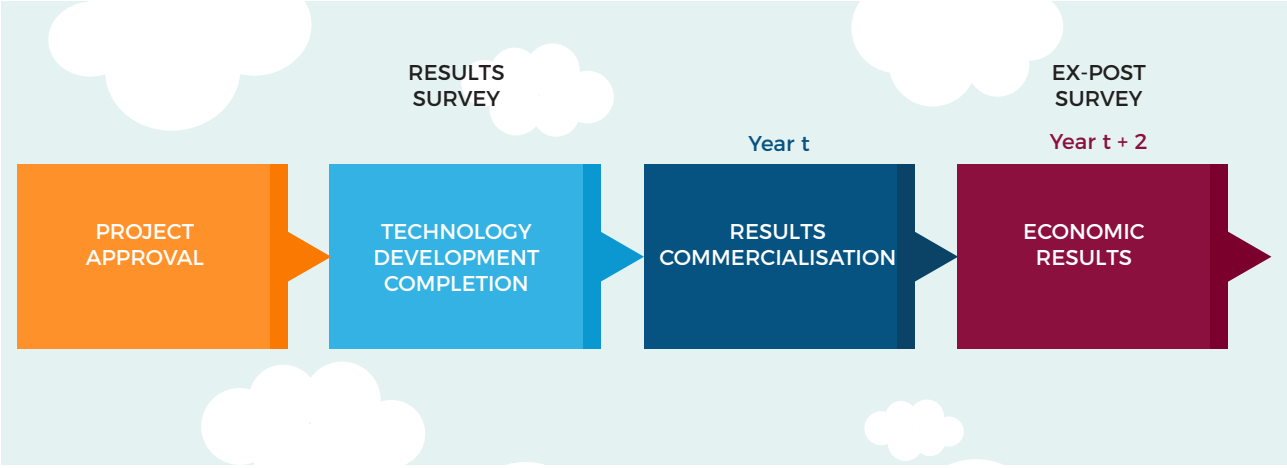
Aware of the growing interest shown by economic, political and social agents in our country, the CDTI promotes the ex-post evaluation of its instruments, by analysing how they have contributed to stimulating and enhancing R&D and innovation activities in the Spanish production system through two types of complementary actions: impact evaluation and monitoring. The ultimate objective is to use this knowledge to design new supporting instruments and to improve those already in place.

On the one hand, the impact evaluation aims to discover the cause-effect relationship between the funding granted and the changes undergone in the recipient companies[1], by using the most appropriate quantitative and qualitative methodologies. And, on the other, the continuous monitoring of the results from the projects financed by the CDTI offers extremely valuable information for the business innovation stakeholders, although it does not serve to establish cause-effect relationships.

The CDTI results monitoring system

In 2011, the CDTI began implementing this system, based on two surveys linked to each individual project's cycle and targeted at companies on two different occasions. The first of them, called the Results Survey, conducted upon completion of the project technology development stage, gives a comprehensive picture of the strategies adopted by the companies when they come to execute their technology developments. The second of them, the Ex-post Survey, carried out two years after commercialisation of the results obtained, focuses on commercialisation-related decisions and also collects information on the continuation of changes in the companies' behaviour and in their decisions to execute new R&D projects.

1 The impact evaluation studies prepared by the CDTI are published in the CDTI Work Documents series, available at **www.cdti.es**, Publications section.



In this way, the system meets the CDTI's information requirements relating to its priority objective: ensuring that the Spanish business sector generates and turns scientific-technical knowledge into sustainable and globally competitive growth.

The analysis of this information is published in "Cuadernos CDTI" series[2], in accordance with a calendar that alternates publication of the conclusions based on the Results Survey (technology development completion stage) and the Ex-Post Survey (commercialisation stage). It describe from a dynamic perspective how the financed projects are impacting companies in these two stages of the innovation process.

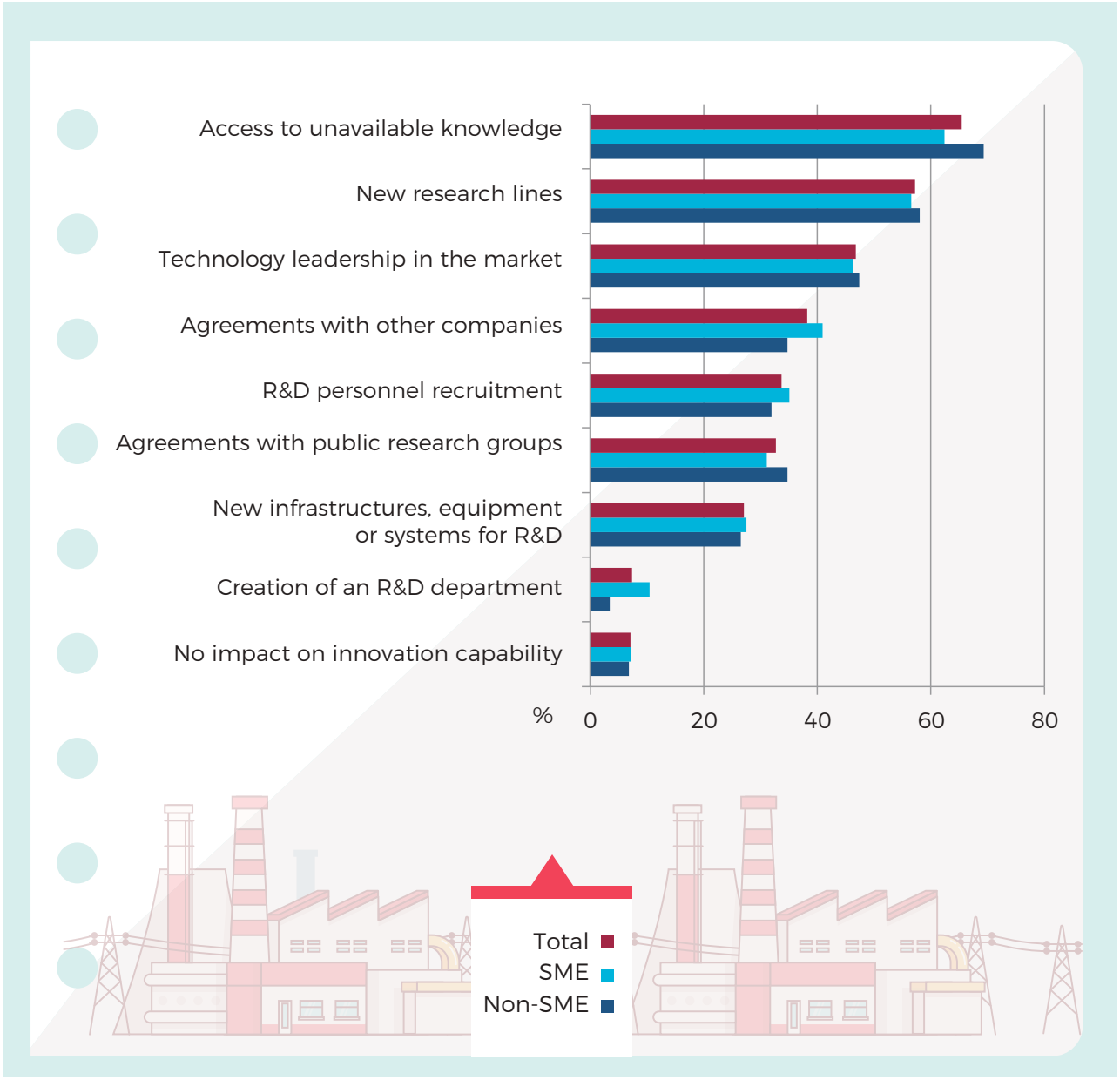
This report analyses the results generated by a total of 1,131 R&D projects financed by the CDTI and whose commercialisation is expected between 2011 and 2013. The sample used is representative of the region and of the size, the age and the industry of the companies that make up the population.

2 The "Cuadernos CDTI" series is available on the **www.cdti.es** website.

1 MAIN RESULTS GENERATED BY PROJECTS IN THE COMMERCIALISATION STAGE

Companies' **innovation capability** increases in over 60% of cases, specially with respect to access to new knowledge and the launch of new research lines. CDTI projects contribute to the transformation of 47% of companies into technology **leaders** in their market niche, specially in the capital goods and IT and electronics industries.

The provision of resources for R&D also receives a decisive stimulus, through the incorporation of staff (34% of projects) and of new infrastructures and equipment (27%). Out of the small-and medium-sized companies, 10% even created a specific **R&D department**, as a consequence of the project financed by the CDTI.



The impact of CDTI projects on corporate innovation capability (% projects)

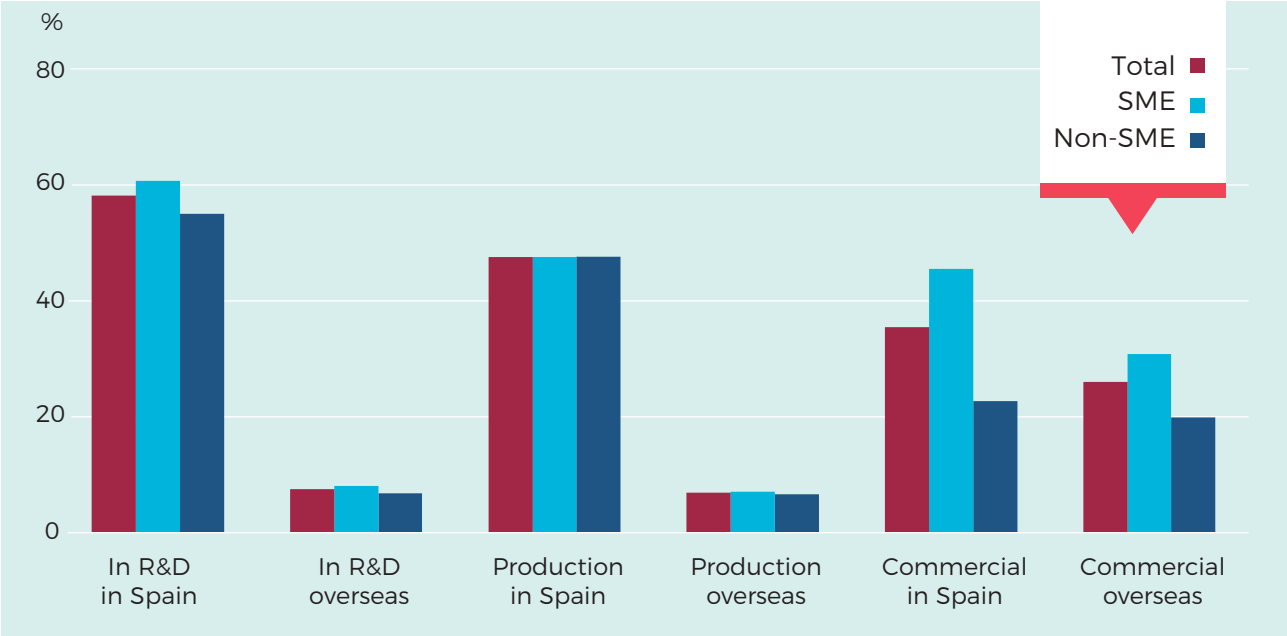
The new **knowledge generated is protected** by patents in 14% of cases, with a higher percentage in large enterprises (17%) than in SMEs (12%).

Economic impacts are shown in **sale and export** turnover. Two years after their commercialisation, approximately 9% of these figures are a direct result of the project. This percentage stands at 11-12% in the case of SMEs.

Weight of sales and exports generated by CDTI projects (% of total company sales and exports)

One out of every two projects enables companies to make **inroads in new markets**. This commercial expansion basically takes place towards European countries (30% of projects), although is also significant in Ibero-America (17%), the United States (10%) and, to a lesser extent, other Asian countries. Altogether, 15% of projects allow companies to increase their **international market share** by over 5%.

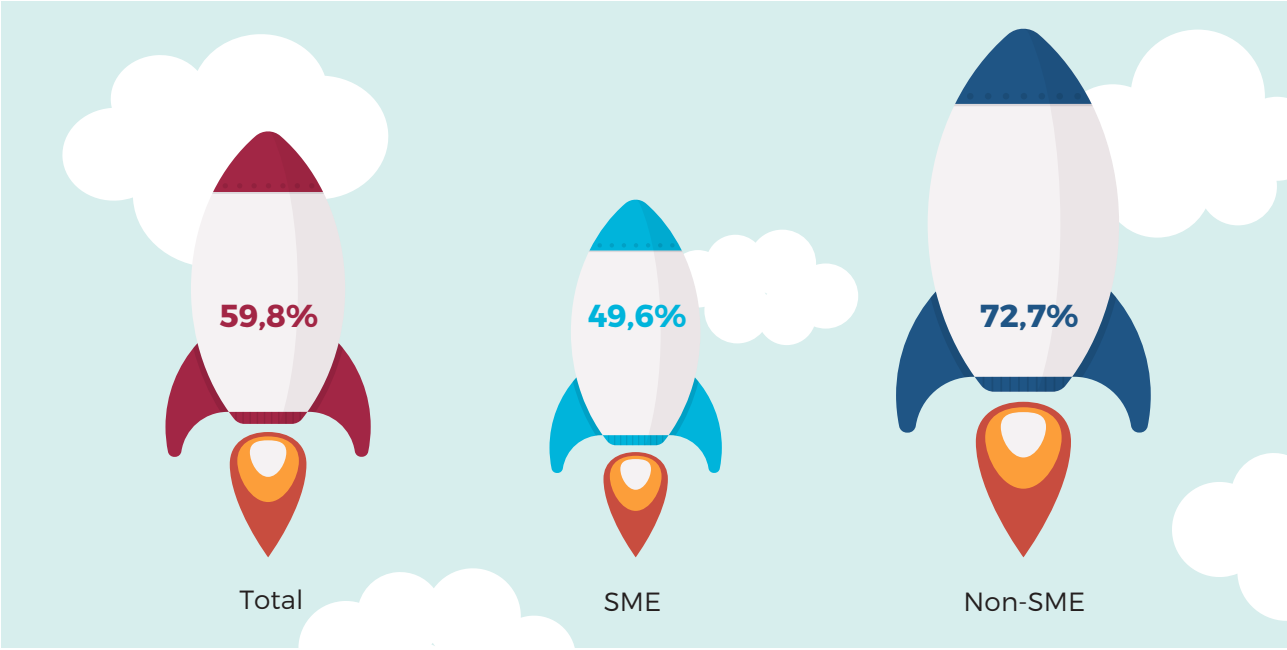
There seems to be a clear commitment by companies to innovation, materializing in new **R&D investments** in 60% of projects. The percentage of companies that make **additional investments in their production systems** stands at 50%. There do not appear to be any notable differences between SMEs and large enterprises when it comes to investing in these two areas. Nevertheless, **SMEs invest more frequently in commercial networks**, both in Spain and overseas.



New investments made resulting from CDTI projects (% projects)

Out of the projects, 16% participate or are open to do so in **international cooperation programmes**, such as the EU Framework Programme for Research and Development (Horizon 2020) or other multilateral or bilateral cooperation programmes.

Furthermore, **continuation** when it comes to carrying out R&D activities on the national level is very significant: in 60% of cases, the companies received CDTI support for developing follow-up projects. This percentage is higher in large enterprises (73%) than in SMEs (50%). The reasons why companies do not access this financing once again are strategy related, as 20% of SMEs then self-finance R&D, whereas 13% do not develop any further projects of this kind.



Persistence in R&D: CDTI projects developed at a later date

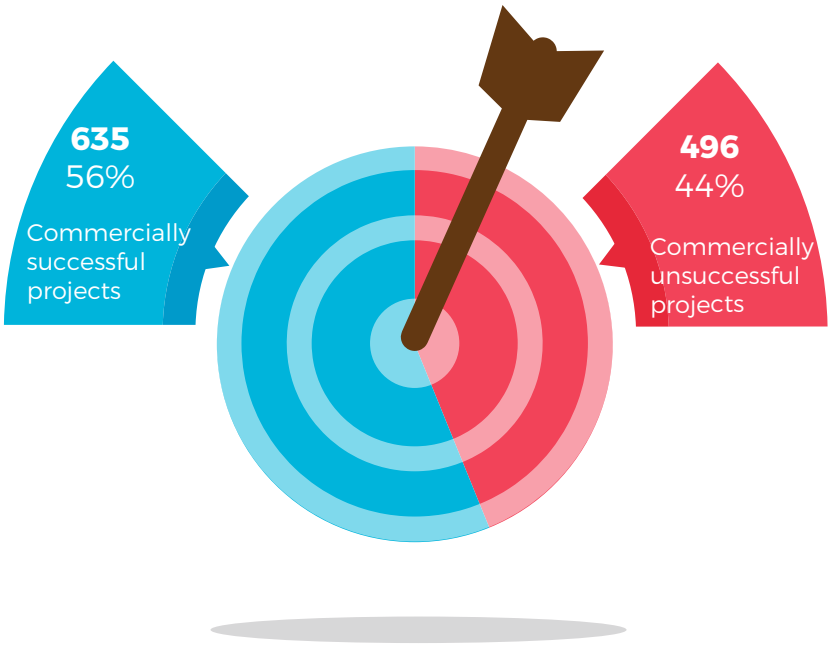
2 COMMERCIAL SUCCESS-RELATED ASPECTS OF CDTI PROJECTS

The definition used of commercial success is subjective, as it is the company itself that states whether the results of a project have been successful and, if not, the reasons explaining its failure to fulfil commercial expectations. Compared to other more objective definitions, which might be based on sales or exports, for example, this approach has been chosen to better understand the company's vision on its commercial success. In this respect, the notion of success used might respond to the company's expectations or commercial objectives.

Two years after their market launch, 56% of the projects analysed were considered a commercial success by their developers.

With respect to the remaining 44%, the companies say that failure to fulfil their commercial expectations is mainly due to market-related factors (an unfavourable demand trend or innovation not accepted as expected) or the need to make further developments not initially foreseen. These results are similar to those obtained by other public business R&D support programmes in Europe[3].

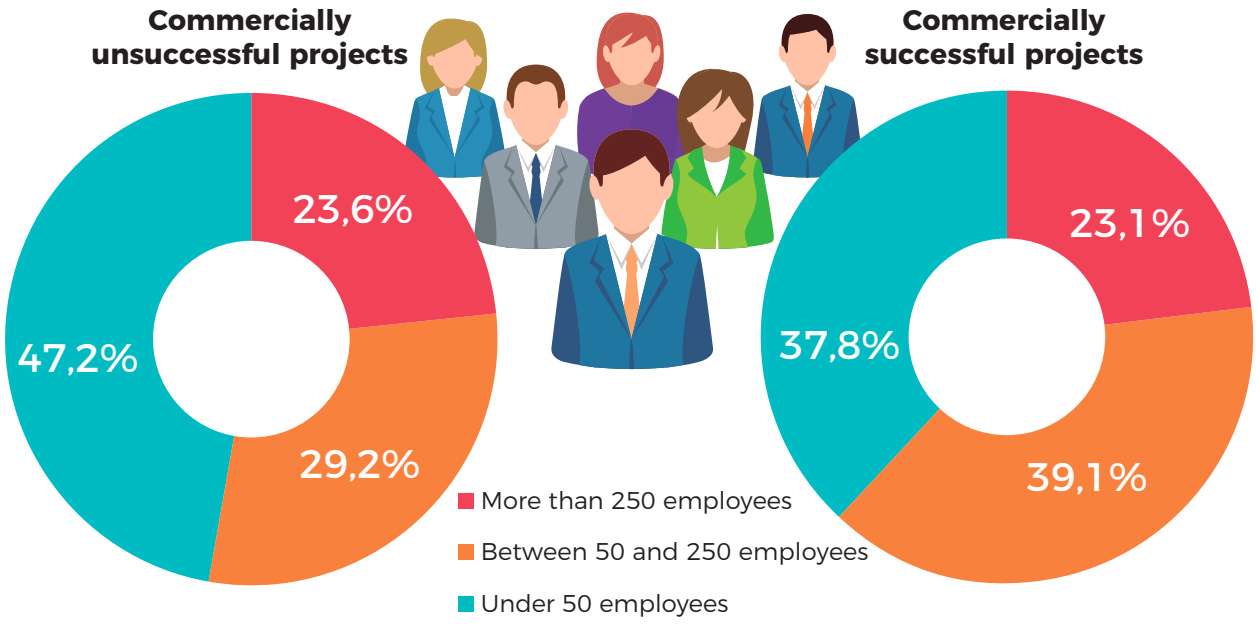
[3] Austrian Research Promotion Agency (FFG). **https://www.ffg.at/content/wirkung-der-ffg-foerderung**



Fulfilment of commercial expectations (number of projects and %)

Characteristics of the company and commercial success

Companies with **workforces comprising between 50 and 250** employees are seen to be the best placed to attain commercial success. They are companies with in-house capability to commercialise their innovations and organisational flexibility to adapt to market conditions.



Company size

In the same way, pertaining to industries regarded as **high tech** is more frequent among successful projects. This trend is more apparent in some fields, such as electronic products or telecommunications. On the contrary, R&D services are more frequent in the group of projects that are unsuccessful, probably because these companies believe that other companies are responsible for launching the innovations attained onto the market.

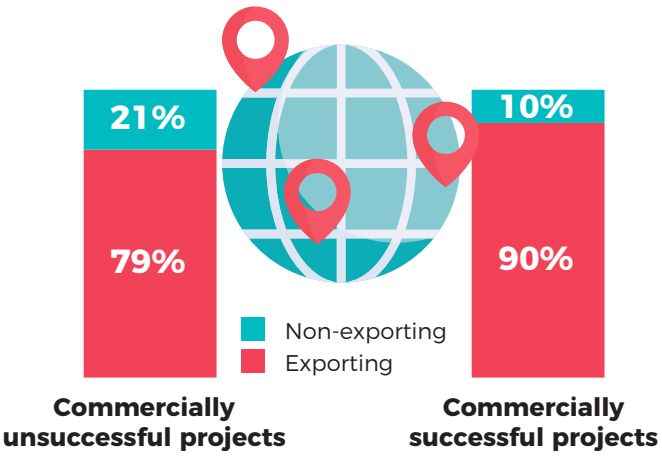
Furthermore, unsuccessful projects more frequently include those developed by companies **operating in convergence regions** according to the European Union designation, which would confirm the existence of geographical location-related barriers when it comes to market launches, as occurs with innovation.

With respect to indicators relating to company experience, age and previous R&D activity, they do not appear to be related to project success. Nevertheless, **experience in international markets** is clearly more frequent among successful companies.

The **investment strategies** that appear to be connected to commercial success are those focussed on R&D and **production systems**. On the contrary, investing in commercial networks does not appear, by itself, to be a factor related to success probability.

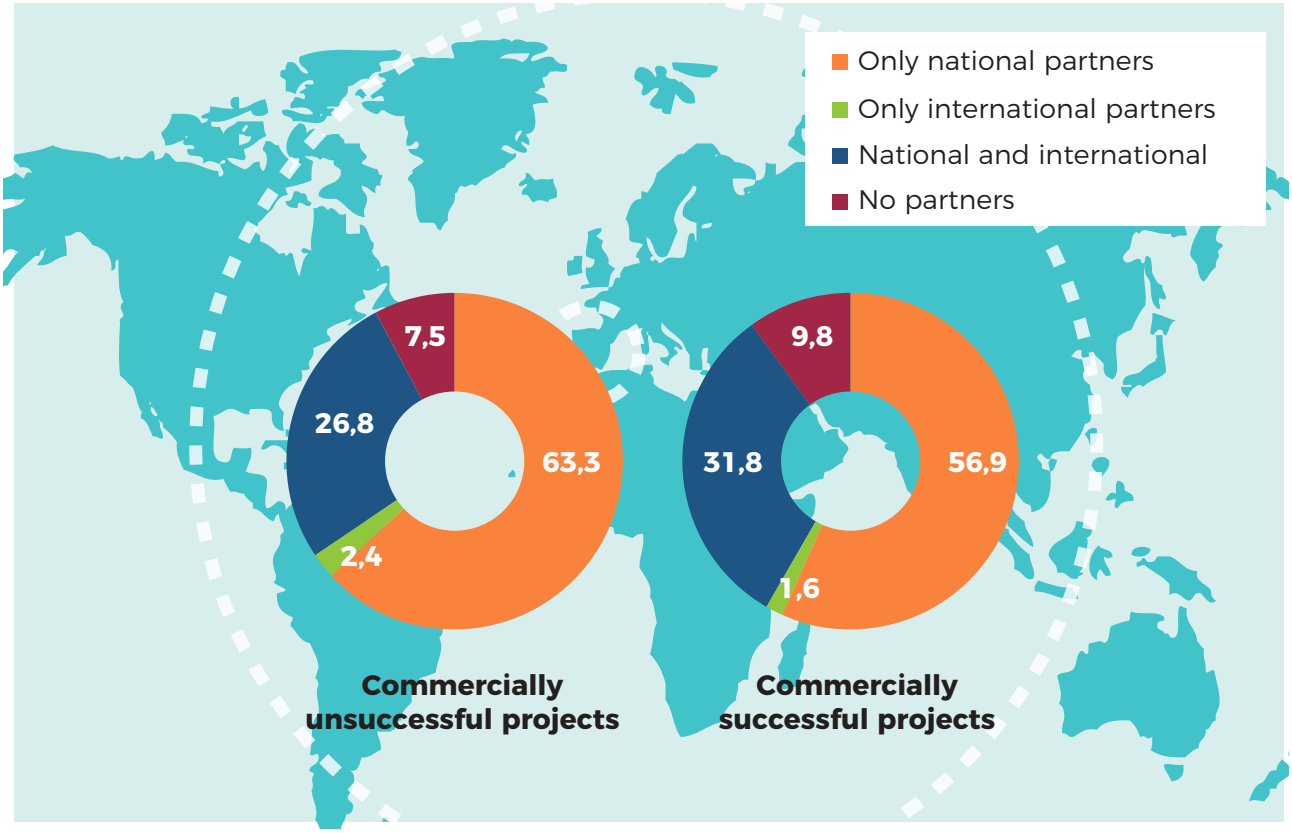
Project characteristics and commercial success

The differences when it comes to attaining commercial success in the expected time may be related to greater or lesser market proximity, which allows generating realistic forecasts. In this way, data show that projects in which the weight of **the research activities is over 50% of the project's total budget** (and, therefore, they surpass technology development-centred tasks) are more frequent among those that do not manage to fulfil their market-related expectations. On the contrary, to a greater extent, these types of projects tend to **strengthen the company's innovation capability**, opening up new research lines and consolidating agreements with public agencies.



Export activity

Irrespective of whether or not market success is achieved, collaboration with other entities is very frequent in all CDTI-financed projects. Nevertheless, a positive connection can be seen between **cooperation with international partners** and commercial success.

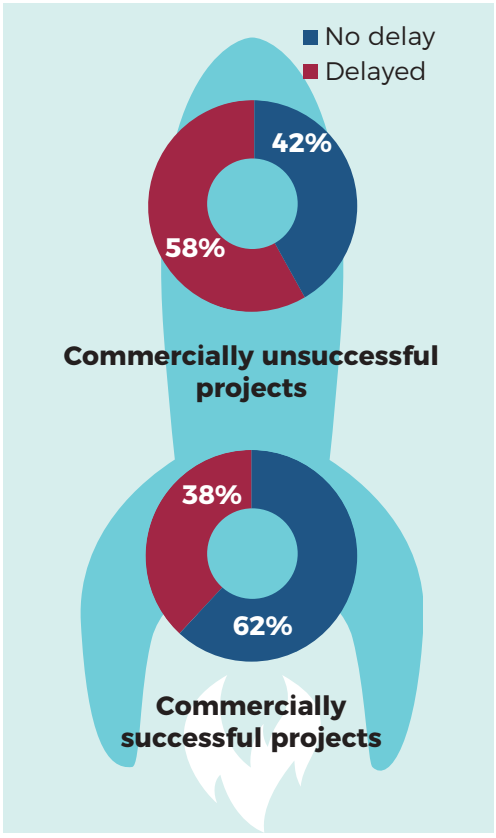


Participation of national and international partners

With respect to the type of innovation resulting from projects, **simultaneous product and process innovations** are significantly more frequent among those that were successful. The same thing occurs with projects that have enabled companies to position themselves at the **forefront of technology**, with advancements that their competitors did not have or improvements in their production systems.

Innovation type (I)

The time factor is directly related to project's commercial success and this is reflected in two indicators: project duration (shorter timeframes seem to stimulate success) and **market launch delay** (which is related to less probability of the company attaining its commercial goals).



Market launch delay

3 WHICH FACTORS INFLUENCE THE COMMERCIAL SUCCESS OF AN R&D PROJECT?

Based on an analysis of the differences existing between projects that become commercially successful and those that do not, conclusions can be drawn with respect to the factors relating to this success. These conclusions reflect an average profile, in other words, the most probable situation, which does not mean that there are not any cases of successful projects outside of this profile.

The probability of achieving commercial success is higher for medium-sized companies, with workforces of between 50 and 250 employees, with experience in international markets and high-export intensity. When a project leads to simultaneous product and process innovations and generates production investments, the probability of success also increases. In the same way, a favourable impact can be seen when R&D expenditure per employee increases.

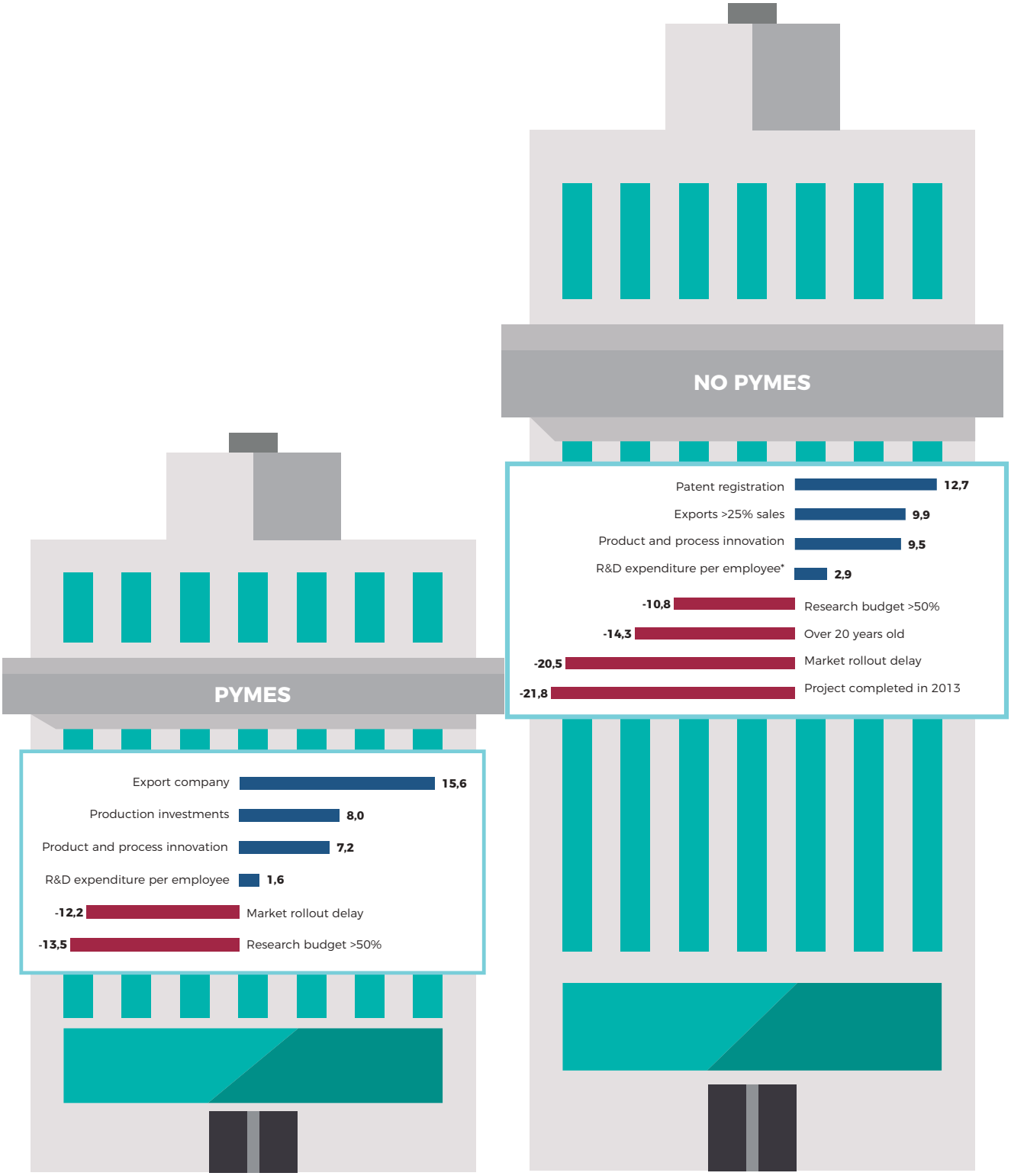
The economic context, represented by the project completion year, can be seen as a significant factor, which, in this case, hinders commercial success. To be specific, any projects that ended in 2013 are less likely to be successful than those that did so two years earlier. This **penalty caused by the economic climate** is similar to the one resulting from failure by the company to adhere to its in-house planning and from **delayed market rollout of the innovation**. As expected, when a project is **research intense** (more than 50% of the budget), the probability of fulfilling commercial expectations decreases, due to the greater uncertainty to make realistic forecasts about economic returns.

Some differences can be seen for SME and non-SME groups. In this respect, the execution of **production investments** seems to be more closely related to success in SMEs, whereas **patent registration** appears to be linked to the successful projects of large enterprises. It is important to point out that the adverse circumstances of the economic context of 2013 seem to have penalised large enterprises more than innovating SMEs supported by the CDTI.

In conclusion, the commercial success of R&D projects is benefitted when the company is medium size, has in-house R&D capability and sufficient capacity to position itself in the market with an innovation-related business strategy, supported by additional investments and with a clear export focus.

Although companies' commitment to R&D is necessary to guarantee the success of their innovations in the market, other factors are in place that may have a noteworthy influence on achieving this success. Some of these factors, such as activity in overseas markets or fixed capital investments, are part of the business strategy. This shows that, in order to be successful, innovation must receive strong support and match the company's corporate strategy.

Factors with a significant impact on the probability of commercial expectation fulfilment (% of change in probability)



Note: Results based on an estimate of commercial success probability using a Probit discrete choice model. Only marginal effects significant at 10%, 5% and 1% level are shown. The marginal effects denote an increase in probability of achieving success when the project or the company developing it fulfils the characteristic indicated by each variable. All of the variables are dichotomous except for R&D expenditure per employee. In the latter case, the coefficient shows the percentage by which the probability of success increases if expenditure on R&D per employee does so by 1%. Comprehensive data can be consulted in the original version of this report.

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