

SMEs's potentials of Research and Development and the European Union Prospective.

A Literature Review

Loreta Isaraj, PhD Candidate
Applied Social Sciences,
Sapienza University of Rome, Italy

Abstract

SME-s role in the economic development and economic structure is changing drastically, as it is gaining new dimensions the role they have as social agents. This becomes particularly present in the paradigm shift of the EU funding schema and priorities, for member and candidate states, indicating that from catalysts of development they are now considered as important and active agents of Innovation by their R&D potential.

The article provides a comprehensive literature review on different aspects of R&D processes in SMEs under the support of the funding programs of European Union collected from the reputed publications. The purpose is to provide an outline on the structure and dynamics of R&D in SMEs to highlight its role in the performance of these businesses in particular and in national and regional economies at the macro level. This paper aims to contribute to current discussions within the field of innovation by further exploring how EU R&D funding policies work in practice.

Keywords: small and medium enterprises; research and development; funding policies; European Union.

Introduction

It's a fact that Europe's 25 million small and medium enterprises (SMEs) are the backbone of the EU economy that employ around 100 million people, are a significant part Europe's GDP and have a key role in added value in every sector of the economy. "Small is beautiful", said Joseph Schumpeters, an Austrian political economist.

Economic development had long been in the minds of some of leaders of opinion, though under different labels, "modernization" or "westernization" or quite often "industrialization." The problem of the underdeveloped countries is not just growth, but development. Development is growth plus change, whereas change is social, cultural, economic, qualitative and quantitative at the same time (H. W. Arndt, 2015). Although a country can grow rapidly, still may have low results of literacy, health, life expectancy and nutrition. The environmental costs of growth are insufficiently recognized. Economic growth does not necessarily make people happier or satisfied. Social scientists have stated that development should not be viewed in terms of

economics only but also considering family structures, attitudes and mentalities, cultural changes, demographic developments, political changes and nation building, the transformation of rural societies and processes of urbanization (Szirmai, 2015). As mentioned in the book of (David Jaffee, 1998) socioeconomic development refers to the ability to produce an adequate and growing supply of goods and services productively and efficiently, to accumulate capital, and to distribute the outputs of production in a relatively equitable manner. Sociological studies have emphasized the tradition-to-modern transition as part of the larger process of social change. In another look, economists, tend to view development in terms of economic growth. Each of these perspectives provides us with the contemporary definition of socio-economic development. SMEs are the promoters of economic development. Their performance strongly affect the wealth of nations and economic growth. In many developed and developing countries, SMEs help buffer the shocks that come with the boom and bust of economic cycles (Ebrahim et al., 2010). The disaggregation of industries by firm size may be based on the standard definition of small and medium-sized enterprises (SMEs) in the EU as presented in the European Commission's User guide to the SME definition.¹ The definition of Small and Medium-sized Enterprises (SMEs) is found in the EU recommendation 2003/361.² Three categories of SMEs are micro-enterprises, small enterprises and medium-sized enterprises. In the table below is shown the official definition of SMEs which are categorized according to three different factors (level of employment, level of turnover, and size of the balance sheet).

Enterprise Category	Employees	Turnover	Balance sheet total
Micro SME	0 to < 10	< €2 million	< €2 million
Small SME	10 to < 50	< €10 million	< €10 million
Medium sized SME	50 to < 250	< €50 million	< €43 million

Table 1: The categories of SMEs

SMEs serve two key purposes:

Firstly, they play a dynamic role in economic development, by stimulating innovation, increasing competition, boosting wages and creating a middle class of small businesses;

Secondly, SMEs perform an indirect yet crucial political function in generating the demand for essential public goods, such as reduced corruption, the universal application of the law, improved infrastructure, public services, and good governance in general.

¹ Policy Brief: The SME policy of the European Union, 2016

² Commission Recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises (notified under document number C(2003) 1422) (Text with EEA relevance) (2003/361/EC)

In European Union, SMEs as it shown in Annual Reports on European SMEs for the period of 2015-2018, occupy 99.8% of the market for the number of enterprises, nearly 57 % of added value and nearly 67 % of employment. SMEs also play a more dynamic role in economic development, due to their role in stimulating innovation. In this respect, the SME sector: (a) acts as a incubator for the larger firms of the future; (b) is the next step up for expanding micro-enterprises; (c) contributes to boosting aggregate savings and investment; and (d), through the Schumpeterian process of “creative destruction”³, helps to move successful firms closer to the technological frontier. In this way the activity of SMEs is now considered a sine qua non for the development of knowledge-based economies, no matter what the development level of the economy, with SMEs often proving to be more flexible and innovative (Aston University, 2021).

Like most of the scholars we have referred to the definition of R&D by the Organization for Economic Cooperation and Development (OECD). According to OECD “Research and development is creative process undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications.” This R&D definition covers three activities: basic research, applied research, and experimental development. R&D are categorize into two main groups: product R&D and process R&D. Product R&D allows firms to produce better products, process R&D reduces the marginal cost of production.

Innovation activities that make up a broader picture and that include R&D, include also other activities such as the acquisition of machinery, equipment, buildings, software, and licenses; engineering and development work, feasibility studies, design, training and marketing when they are specifically undertaken to develop and/or implement a product or process innovation. This includes also all types of R&D that consist of research and development activities to create new knowledge or solve scientific or technical problems.⁴

The definition of R&D encompasses the four categories of R&D activities specific to services, as follows (Lee at. al., 2020):

- Basic research in the Applied Social Sciences and Humanities
- Organizations research about the behavior of economic agents
- Research about organizational engineering
- Composite R&D projects

³ The process of creative destruction, in both Schumpeter's original, and in the more recent account, is a process in which technological advance is the main source of economic growth and improvements in the quality of life (Diamond Jr at. al., 2006)

⁴ The Community Innovation Survey 2014 Version 13 of 23 July 2014

According to (Czarnitzki, 2006), establishing an R&D program involves significant sunk costs because a lot of significant R&D spending is wages of R&D staff.

Innovation serves as a lever for SMEs to be competitive nationally and internationally, but it is also very difficult to be well managed by them. R&D capability and innovation performance play an important role in driving firm success. Firms' R&D activity may not only generate new information, but also can improve the firm's ability to assimilate and exploit existing information. Many papers in this field suggests that R&D spending influences a firm's innovation. R&D and Innovation activities in turn have been shown to play an important role in explaining a firm's decision to export and import volumes (Ren, S. at al., 2014).

European Union Initiatives for R&D of SMEs

To respond to the increasing global competition, mainly from Asian and U.S. markets, Europe's policy makers are concerned with improving the quality of management in the SME sector (Gray, 2004). Increasing R&D investment is an issue of major concern for long-term European policy strategy. We find this materialized in "Lisbon Agenda 2000"⁵, which aims to make Europe the most dynamic knowledge economy in the world by 2010, and behind the more specific "Barcelona target"⁶ which on March 2002, committed that there must be a significant boost of the overall R&D and innovation effort in the Union in order to reach the objective of an R&D/Gross Domestic Product level of 3% by 2010, two-thirds of which is to be accounted for by the private sector.

In order to investigate the level of innovativeness of a company and thus how R&D activities may affect it, two mechanisms are commonly assumed: (1) the direct mechanism, R&D activities may lead straight to the development of a new product and/or production process (2) the indirect mechanism, raising the company's knowledge base and absorptive capacity together with the technological awareness of the employees, and so possibly leveraging the firm's innovative performance. This dualism is usually called the "Dual Nature of R&D" or the "Two faces of R&D". Since innovativeness is linked to productivity, and this in turn is vital for economic development, any policy measure supporting it, such as providing support for in-house corporate R&D, facilitating spillovers and innovative networks, or improving innovative management practices, could be justifiable (Ortega-Argile's at al., 2009).

⁵ The Lisbon Strategy was born as a European commitment to overcome the differences in growth and productivity between the EU and its leading global competitors of the time, USA and Japan. Europe's deficit in terms of technological capacity and innovation became the symbol of the ground needing to be made up to assure EU competitiveness; this was at the heart of the emphasis laid on advancing towards a "knowledge society", which became the strategy's best-known slogan.

⁶ Presidency conclusions, Barcelona European Council 15 and 16 March 2002: The European Council met in Barcelona on 15 and 16 March for its second Annual Spring Meeting on the economic, social and environmental situation in the Union.

For the nowadays challenges of Europe like climate change, resource efficiency and social cohesion, SMEs existence helps spread this innovation throughout Europe's regions. They are essential for the transitions of European market to a sustainable and digital economy. Because of their social and economic impact, they are essential to Europe's competitiveness and prosperity, economic and technological sovereignty, and resilience to external shocks.

The European strategy puts forward actions based on the following three pillars:⁷

- *Capacity-building and support for the transition to sustainability and digitalization*: 25 % of EU SMEs work on green products or services, 17% of SMEs have successfully integrated digital technologies, compared to 54% of large companies.
- *Reducing regulatory burden and improving market access*: While 80% of exporting SMEs sell their products and services on the Single Market, certain sectors like services face more obstacles. And only 600,000 SMEs export goods outside of the EU. Only 11% of businesses in Europe consider equity as a viable financing option while only 1% have used it. Venture capital investments in Europe are many times smaller than in the US, with three times fewer scale-ups. Only 40% of businesses in the EU are paid on time. This is the cause of ¼ of SME bankruptcies. 78% of SMEs cite complex administrative procedures as the biggest obstacle to operating in the Single Market.
- *Improving access to financing*: Only 10% of European SMEs' external financing is from capital markets. Only 11% of businesses in Europe consider equity as a viable financing option while only 1% have used it. Venture capital investments in Europe are many times smaller than in the US, with three times fewer scale-ups.

The strategy builds on the very strong foundations of the EU's existing SME policy framework and support programs, notably the 2008 Small Business Act⁸, the 2016 Start-up and Scale-up Initiative⁹, the Competitiveness for Small and Medium Enterprises (COSME) Program¹⁰ as well as SME support actions funded under the Horizon 2020 program and the European Structural Investment Funds.

⁷ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, an SME Strategy for a sustainable and digital Europe, March 2020 and Unleashing the full potential of European SMEs, 2020.

⁸ SBA is the framework and the basis for the EU policy on SMEs. It consist of a set of 10 principles to guide the conception and implementation of policies both at EU and Member State level. These principles are essential to bring added value at EU level, create a level playing field for SMEs and improve the legal and administrative environment throughout the EU, a set of new legislative proposals which are guided by the "Think Small First" principle and a set of new policy measures which implement these 10 principles according to the needs of SMEs both at Community and at Member State level.

⁹ This initiative addresses three issues: barriers; the shortage of partners and opportunities; and difficulties as regards finance

¹⁰ Established for the period from 1 January 2014 to 31 December 2020 has two generale objectives: (a) strengthening the competitiveness and sustainability of the Union's enterprises, particularly SMEs; (b) encouraging entrepreneurial culture and promoting the creation and growth of SMEs.

The Horizon 2020 dedicated SMEs financial support instrument is exactly targeting SMEs' ability to produce and commercialize breakthrough innovations to enable the EU economy to advance and better cope with world competitors. To limit market failure in access to finance, they particularly need a "helping hand" from public funds such as the EU R&D programs, which could serve as an impetus for growth of innovation activities in such enterprises. Public funding (at national or EU level) plays a significant role in funding new technologies (such as ICT and others). Innovation is also important for developing solutions to growing economic and social challenges such as climate change, aging population, rising poverty and inequality, energy efficiency, and others (Čučković & Vučković, 2018).

SMEs face a major finance gap in Europe of EUR 20-35 billion despite substantial support programs at EU and national level since in some Member States, access to finance remains one of the key problems they face. In 2019, 18% of SMEs in the EU did not obtain the full bank loan they had planned for. This puts SMEs at a disadvantage as bank-based finance accounts for roughly 90% of their financing needs.

The Enterprise Europe Network SMEs operates mainly at national level. Only few SMEs are engaged in cross-border cooperation within the EU. The Enterprise Europe Network helps SMEs in European and international level to make the most out of business opportunities in the EU market and beyond. It is a one-stop-shop for all business needs. With 600 partner organisations in more than 60 countries, the Enterprise Europe Network is the world's largest support network for SMEs, by combining international business expertise with local knowledge to help entrepreneurs take their innovation into European and international markets, overcome legal obstacles and identify potential business partners across Europe.¹¹

R&D and Innovation of SMEs

The academic literature largely acknowledges RD&I as a key factor in technological progress and thus the engine of economic growth. This is why RD&I has been placed at the heart of the 'Europe 2020' strategy, the EU's agenda for 'smart, sustainable and inclusive growth'.¹²

After economic crisis of 2008, the need to use R&D and innovation as important sources of productivity increased, especially at the level of SMEs.

The same line also followed by EU 2020 strategy relying more on SMEs to increase innovative products, services, and processes, but also to create new jobs through fast-growing SMEs. The culmination point of involvement of SMEs in future R&I

¹¹ Policy Brief: The SME policy of the European Union, 2016

¹² Annual Report on European SMEs 2018/2019 Research & Development and Innovation by SMEs, European Commission, November 2019.

programs in the EU was the presentation of the Horizon 2020 program that was launched to overcome the fragmentation of previous EU R&D funding programs.

Innovative and creative activity of SMEs is made possible through their cooperation with large enterprises, higher education institutions such as universities and research organizations. SMEs contribute greatly to innovation activities and output by introducing new or significantly improved products and services, processes, organizational methods, and/or marketing techniques. This is Eurostat's definition of enterprise innovation which is widely used.

While *product innovation* is seen as the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses, *process innovation* is defined as the implementation of a new or significantly improved production or delivery method, which includes significant changes in techniques, equipment, and/or software by enhancing total factor productivity, while product innovations modify the quality of products.

Although the share of SMEs in total innovation output is still much smaller than the share of large enterprises, which account for nearly four-fifths of total innovation output measured by patent applications, the growth trend of the SME share is promising. However, the data for the SME share in EU patents are still not easily available, and analysts rely mainly on the survey conducted for Eurostat. The first step in obtaining reliable indicators of the SME share of EU corporate patenting consists of matching firms' patent data to financial data (Čučković & Vučković, 2018).

European industrial relations are not about to become identical with supranational industrial relations. European-wide harmonization and centralization of industrial relations are blocked by the same factors that inhibit supranational state formation, as well as by the delay of the latter of such. Any attempt of harmonization faces the problem of wide, historically grown diversity of national institutions, having asymmetrical consequences in different countries.

European institutions of industrial relations will for all practical purposes always coexist with national institutions and perform their functions, even if that interaction will differ from country to country. European industrial relations have developed into a multi-level system that matches and complements the multi-level institutions that have come to govern most of public policy-making in Europe (Wolfgang, 1998).

SMEs have disadvantages in R&D and innovation when compared to larger firms which operate in the form of constraints of internal business resources and constraints in accessibility to external resources. To overcome these gaps, various public policies have been implemented to include financial, networking, and IPR (Intellectual Property Rights) support programs (Okamuro et al., 2019).

Due to a number of factors such as lack of financial resources, insufficiency to absorb funds, absence of economies of scale, etc., it should be virtually impossible for SMEs to engage in expensive R&D and innovation activities. The data extracted from the research of (Ortega-Argile's, at. al., 2009) show that SMEs may be less likely to conduct formal R&D than larger firms, their efficiency as R&D agents seems to be higher than that of larger firms, because they tend to produce more patents and more innovations than larger firms by unit of input invested in R&D. Referring to this study SMEs are important sources of employment growth, and innovation in the high-tech sectors, both through existing firms and "New Technology Based Firms".

Analysis of R&D of SMEs in EU through Safe Surveys

We have used the data of the European Commission monitors developments in SMEs' access to finance through the joint European Commission/European Central Bank Survey on the access to finance of enterprises (SAFE) for the last 5 years including the period 2015-2020 for the member states of EU. Based on the literature used in this paper as a reference for the concepts addressed, we have selected 7 following questions of this survey which are directly related to research and development dynamics.

What is currently the most important problem your firm is facing?

As we mentioned during this paper, access to finance is one of the three main objectives of EU programs of funds for enterprises. The data of 5 years SAFE show that European countries still have high levels of concern about external sources of funding. SMEs face more difficulties than large enterprises, but even the latter do not report very low figures as might be expected.

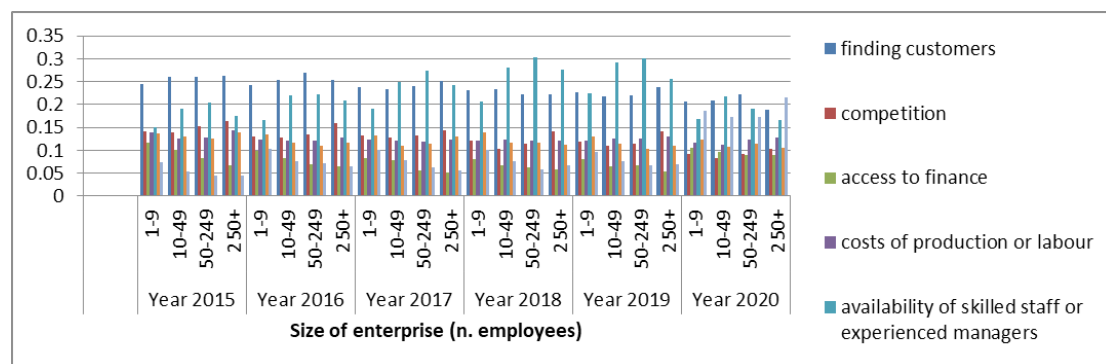


Chart n. 1. Source: SAFE 2015-2020

It is a conditional trend by limited financial resources and insufficient managerial infrastructure that SMEs unlike large firms rely less on costly research and development

(R&D) investment for innovation activities (Wang at al., 2009). Most previous studies are conditional on R&D-performing firms and neglect the circumstance that a large share of smaller firms do not conduct any R&D activities because of the lack of financial resources (Czarnitzki, 2006).

Hiring and training of employees- For what purpose was external financing used by your enterprise during the past 6 months?

In the beginning of R&D activities SMEs always face capital shortage and need technological assistance (Ebrahim at al., 2010) which is provided by the expertise of professionals in the field of artificial intelligence who serve as trainers for other employees to orient them to use hardware and software. Low percentages evidenced in the chart below are expected for companies with 1-9 employees which spend little or no on employee training.

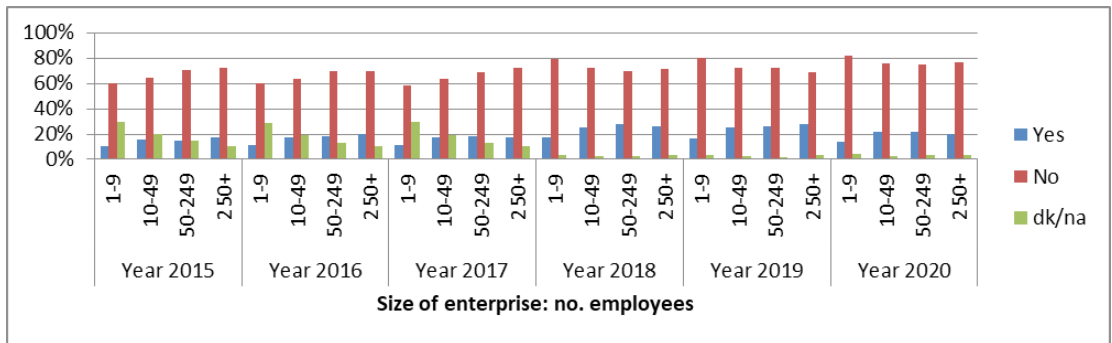


Chart n. 2. Source: SAFE 2015-2020

Developing and launching of new products or services - For what purpose was external financing used by your enterprise during the past 6 months?

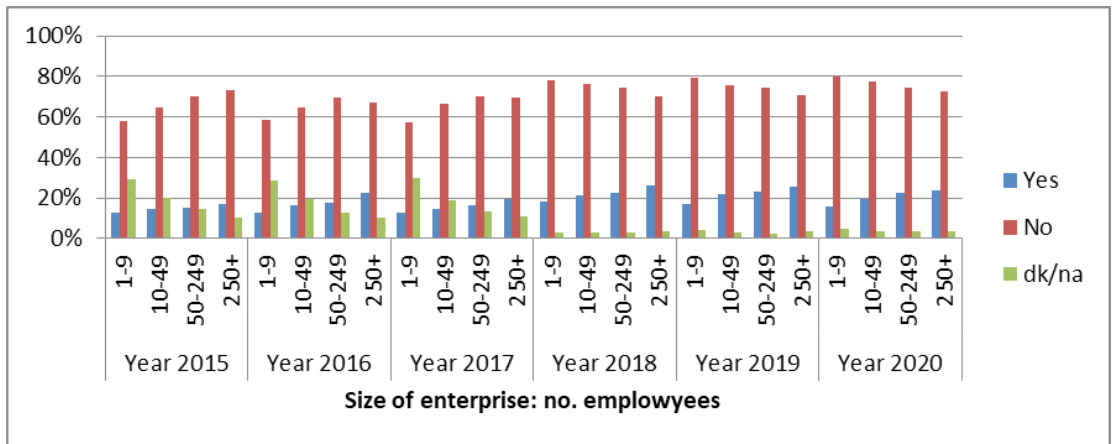


Chart n. 3. Source: SAFE 2015-2020

In their study (Heikkilä & Bowman 2018), find important to emphasize that many SMEs engage in BM (Business Model) Innovation while not being aware that they do so. Their survey indicates that 37% of European SMEs are innovating their BM. More than 60% of them offer a new product or service, or focuses on a new group of customers. They see also a rising percentage of SMEs incorporating IT for business purposes. Contrary to general belief that only start-up companies and recently established SMEs engage in BMI, they found that also older SMEs are innovating their BMs. However, still 15% of SMEs involved in BMI are less than 10 years old.

Because the attention from academia is a recent development, the concept of R&D in the service industry is more obscure than in the manufacturing industry, though industry management has little confidence in its ability to improve performance (Lee et al., 2020).

During the past 12 months have you introduced... a new or significantly improved product or service to the market?

Data shown on chart 4 with an average of about 30% of enterprises that have introduced a new product or service can be compared with the data of chart 5 below with an average of about 20-25% of enterprises that have introduced a new production methods. This can be explained by the fact that enterprises are more focused on R&D outputs than in R&D inputs.

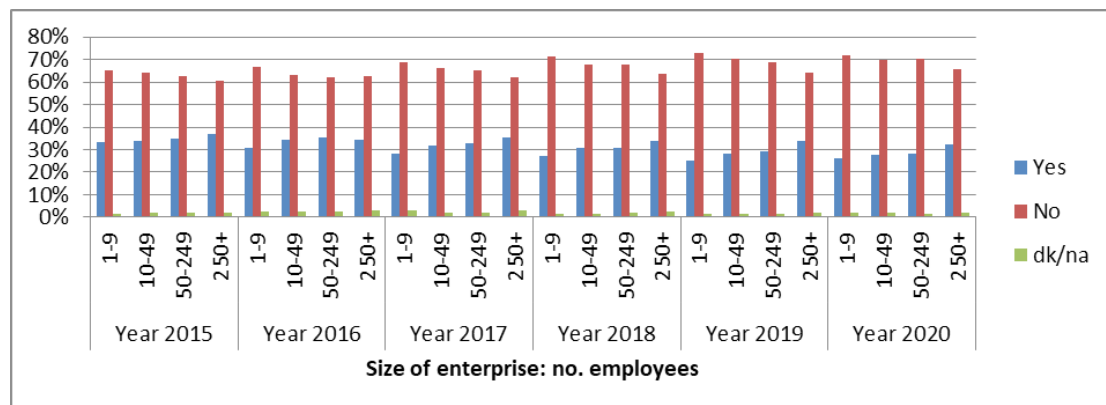


Chart n. 4. Source: SAFE 2015-2020

During the past 12 months have you introduced... a new or significantly improved production process or method?

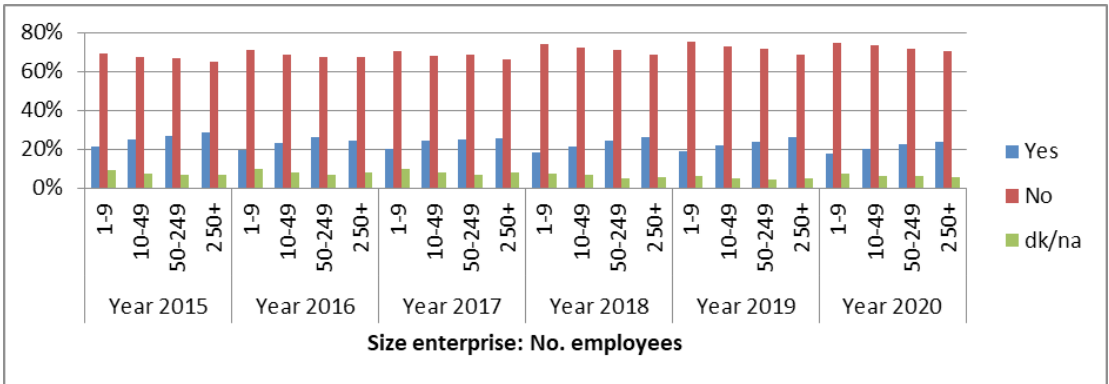
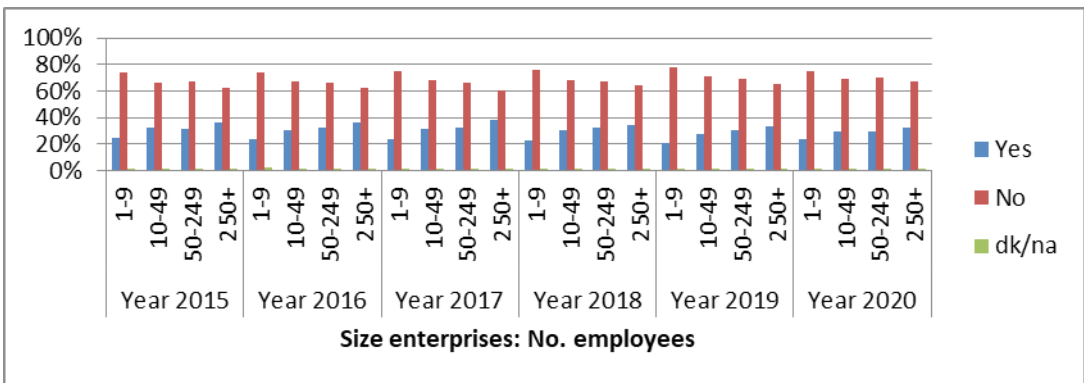


Chart n. 5. Source: SAFE 2015-2020

During the past 12 months have you introduced... a new organisation of management?

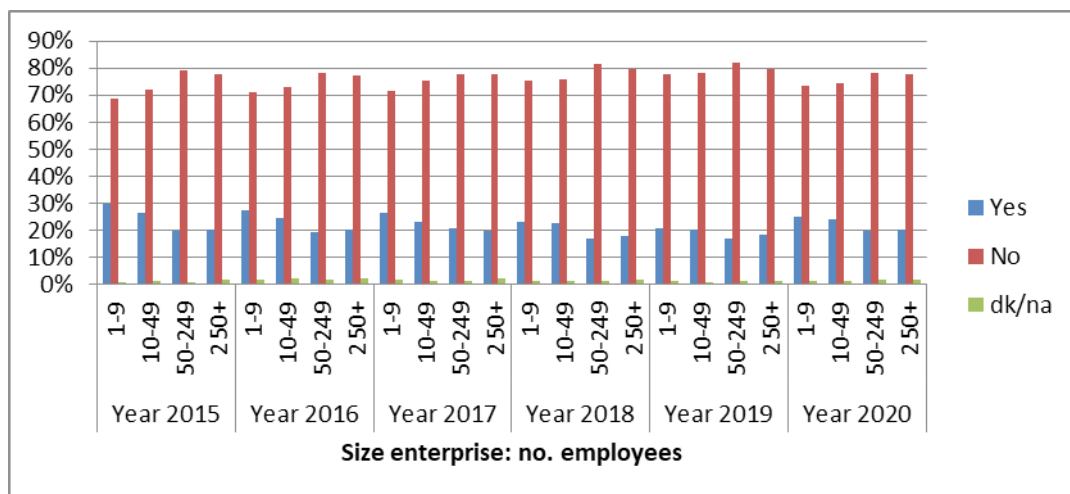


Chat n. 6. Source: SAFE 2015-2020

SMEs management is mainly focused on the decisions of the sole proprietor. Referring to the study of (Wang at. al., 2009) including data from 49 Taiwanese companies showed that aside from R&D investment, the depth and the breadth of an owner’s prior technical experience contributed significantly to an SME’s knowledge absorptive capacity.

During the past 12 months have you introduced... a new way of selling your goods or services?

Unlike other questions, here is a skewed report, where the companies with the largest number of employees have declared a lower percentage of introduction of a new way of selling goods or services during the last year. It seems the trend that smaller companies have experimented more in this area. Larger companies may have consolidated this aspect, so they have not invested much in this area of research and development.



Source: SAFE 2015-2020

The most interesting finding of the study of (Ren, S., et al. 2014) was that marketing capability has significant interaction effects on the innovation performance of SMEs. That is, SMEs' marketing capability not only positively strengthens the effect of R&D investment on innovation performance, but also positively strengthens the effect of internationalization on innovation performance.

Results

SMEs in all sectors that obtained EU funds recorded better results in product and process innovation, innovation expenditures, and share of turnover from product innovations that were new to the market. EU funds proved to be more efficient than national funds, although the latter had a positive impact on SME innovation performance, except in the category of process innovation where the estimated coefficient is not statistically significant. Based on CIS 2014 data, SMEs that received EU funds perform better than they would have done if they had not received EU funds. They also have a higher probability of receiving additional funding from other sources, including private investment (Čučković & Valentina Vučković, 2021).

As results in the study of (Czarnitzki, 2006) for SMEs in East Germany, subsidies are a positive stimulus of innovation activity. However, it remains to be investigated whether the high level of public R&D funding leads to a corresponding innovation success in terms of market shares and sales of new products in many of publicly funded firms.

The research conducted based on an integrated model (Lee et al., 2020), allowed to investigate whether R&D efforts influence the financial (sales growth, production cost saving, process improvement, market share extension) and non-financial business

performance of SMEs in South Korea. The results supported their hypotheses that managers in ICT SMEs perceive a positive impact of three categories of service R&D on overall business performance. Three mentioned categories are research about organizations and the behavior of economic agents, research about the design and development of technology, and multidisciplinary R&D projects. But, in contrast to their expectations, what is very interesting is that managers in ICT SMEs have identified two categories of service R&D such as research about the social sciences and humanities and R&D management as unnecessary and even disadvantageous in the context of the firm's performance.

This theoretical research confirms at the same time the paradigm shift in funding policies put in place by dedicated programs of the European Union toward SMEs, as a reflection of the new role they are gaining as agents of Innovation by their R&D potential. The need arises to conduct further empirical research to investigate the factors influencing the R&D activities of SMEs, their absorption capacity to benefit from EU funds, and especially to explain the impact of these developments in performance at the enterprise level, at the national and regional socio-economic level. The geographical region which will serve as a choice for future research on this topic is the Mediterranean. Unfortunately, SME activity across the Mediterranean is in general underdeveloped and the need for further research can help to better orient the development policies of all stakeholders influencing the performance of SMEs.

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