

Article

Comparison of the Profile of Portuguese Companies That Receive Public Support for Innovation: National Support vs. European Support

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Abstract: Innovation has emerged as the key driver of economic growth, technological advancement, and societal well-being. Recognizing the significance of fostering innovation, governments and policymakers worldwide have increasingly emphasized the need for public support to bolster the innovation ecosystem. This article explores the crucial importance of public support for innovation and delves into the characteristics of companies that receive such support. Based on the Community Innovation Survey of 2014, 2016, and 2018, information was compiled from 1857 companies. Of these companies, common to these 6 years of information, 755 received national support for innovation and 490 received European support. Based on these data, the main objective was to identify and distinguish the characteristics of Portuguese companies that receive European support and national support for innovation. To achieve this objective, logit models were estimated using Stata software. The results suggest that national support favors companies that belong to sectors with greater technological development, which develop new products and processes. Companies that establish cooperation agreements and that belong to groups of companies are also preferred for national support. In turn, of the companies that received European support, it appears that there is less differentiation in preference for the level of technological development. Companies that invest internally in R&D and that establish cooperation agreements for innovation are more likely to obtain European support, as are companies that have a higher proportion of workers with higher education. Finally, both national and European support favor companies with a greater volume of business from foreign markets.

Keywords: CIS; European support; innovation; logit model; national support; public support



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1. Introduction

Innovation lies at the heart of progress, enabling societies to tackle pressing challenges, create new opportunities, and drive economic growth. However, the realization of innovative ideas requires a supportive environment that fosters creativity, encourages risk-taking, and provides the necessary resources and infrastructure [1,2]. In recognition of these requirements, governments across the globe have increasingly recognized the value of public support for innovation, aiming to cultivate a fertile ground for groundbreaking discoveries and technological breakthroughs [3,4].

Public support for companies is essential to boost research and development (R&D) initiatives and promote innovation on a corporate, national, and global scale. This support allows companies to expand their knowledge base, with governments often providing financial assistance through grants, subsidies, and tax investments. Such assistance empowers companies to embark on ventures that involve high risks but promise substantial rewards, thus catalyzing innovation that might otherwise remain unrealized [5,6].

At the basis of this support is the creation of collaborative networks that link universities, industry, and government. These networks foster knowledge exchange, interdisciplinary research, and partnership building, cultivating an environment conducive to innovation. By facilitating access to a diverse array of skills, talents, and technological resources, such networks enhance companies' capacity to innovate significantly [6,7].

Furthermore, public support addresses market failures, where private investments alone prove insufficient to drive innovation in critical sectors or address specific societal needs. By identifying these gaps, governments can strategically allocate support to companies engaged in areas such as renewable energy, healthcare, or emerging technologies, where the long-term societal benefits exceed immediate market returns. In doing so, public support acts as a catalyst, spurring private-sector involvement and advancing innovation in domains where market forces alone falter [2,3].

In this context, both the European Union (EU) and the Portuguese government actively engage in developing national partnerships for innovation, recognizing the pivotal role of collaboration in fostering innovation ecosystems [8,9]. Subprograms receiving public support at the national level further underscore the commitment to nurturing innovation. However, despite these efforts, companies encounter notable challenges when seeking public support for innovation, including bureaucratic hurdles, complex application processes, and uncertainties surrounding funding availability and allocation [10–12]. Addressing these barriers is crucial to maximizing the impact of public-support initiatives and unleashing the full potential of innovation across sectors and regions [1–3].

Companies that receive public support for innovation often demonstrate technological leadership and competence in their respective fields. They possess the necessary expertise, technical know-how, and track record of successful R&D projects. These companies are at the forefront of technological advancements and have a vision to translate their innovations into tangible solutions that address critical challenges and create value [3,5,13].

Companies supported by public initiatives typically exhibit scalability and substantial market potential. They possess innovative ideas or technologies that can be applied to a wide range of industries, products, or services. Their solutions have the potential to disrupt existing markets, create new business opportunities, and generate significant economic value [14]. The ability to scale and penetrate global markets is a crucial characteristic that attracts public support, as it aligns with the broader goal of economic growth and competitiveness [14,15].

Public support is often directed towards companies that demonstrate a clear societal impact and commitment to sustainability. These companies develop solutions that address pressing societal challenges, such as climate change, healthcare accessibility, or social inequality. By aligning innovation efforts with societal needs, these companies gain recognition for their positive contributions and are more likely to receive public support [16].

Companies that actively engage in collaborative partnerships, knowledge sharing, and technology transfer are more likely to receive public support. These companies recognize the importance of collaborative networks, leverage external expertise, and actively contribute to the wider innovation ecosystem [11]. By fostering an open innovation culture and demonstrating a willingness to share knowledge, they contribute to the collective progress and benefit from increased opportunities for public support [9,11].

Public support for innovation is crucial in nurturing an environment conducive to groundbreaking discoveries and technological advancements. By understanding the importance of public support and the characteristics of companies that receive it, policymakers and stakeholders can devise targeted strategies to drive innovation and enhance societal well-being [13]. By promoting technological leadership, scalability, societal impact, and collaboration, public support can unlock the transformative potential of innovation and pave the way for a prosperous and sustainable future [13].

Numerous studies have delved into the characteristics of companies benefiting from public support for innovation. What sets our study apart is its innovative approach,

which amalgamates findings from three successive Community Innovation Surveys (CISs) uniquely applied to the Portuguese context. By focusing exclusively on Portugal, our research endeavors to provide a comprehensive understanding of the distinctive realities faced by companies operating within the country's economic milieu.

By examining data from the Community Innovation Survey across multiple years, the research sheds light on the characteristics of companies receiving national and European support for innovation, particularly in the context of Portuguese firms. The findings provide valuable insights into the preferences of policymakers regarding the allocation of support. These insights can inform policymakers in designing more effective support programs to foster innovation, thereby promoting economic growth and technological advancement. Additionally, this study offers practical guidance for companies seeking to access such support, by identifying key criteria that increase their likelihood of securing national or European funding for innovation initiatives.

In this article, the theoretical foundation is first presented, identifying the main determinants that can lead to companies receiving public support. The data and their analysis are then presented, followed by the logit models referring to national support, European support, and both types of support. These models are analyzed, identifying which factors influence obtaining public support and the difference between national and European support. Finally, the conclusion of the study carried out is presented, highlighting its contribution to the state of the art and to policymakers.

2. Public Support for Innovation

Innovation plays a fundamental role in the competitiveness of organizations in different sectors, and this competitiveness can be reinforced through business model innovation [17]. By engaging in business model innovation, companies could redefine their value proposition, streamline operational processes, and explore novel approaches to serving their customers and stakeholders [4,13]. This proactive approach enables companies to differentiate themselves from their competitors and solidify their market position. Moreover, in today's dynamic business environment, characterized by rapidly evolving customer needs and market dynamics, the imperative for continuous innovation becomes increasingly evident [17]. Embracing a culture of innovation not only facilitates adaptation to changing landscapes but also empowers organizations to capitalize on emerging opportunities. Therefore, integrating innovative practices into businesses' core strategies becomes a strategic imperative for sustained growth and success in the modern marketplace. It is crucial to recognize that innovation serves as a vital source of competitive advantage for companies, whether by refining existing products or services or creating entirely new ones. Evaluating innovation through various methodologies or sources is paramount, and multidimensional metrics offer a comprehensive understanding of innovation within companies, providing a more nuanced perspective compared to one-dimensional assessments. This broader view is especially crucial for comprehending the true effects of innovation in organizational contexts, particularly in service-oriented industries [1,17,18].

It is also important to highlight the possibility of profiting from innovation, through the digital economy, highlighting the value of building technological capabilities, establishing industrial standards, and adopting effective licensing models [18]. In this sense, innovative technologies, such as automation and artificial intelligence, can generate efficiency and productivity gains in companies [19]. The adoption of these technologies can lead to significant improvements in operational processes, reduced costs, and improved overall performance [20].

As innovation is fundamental to market growth, special attention is paid to how technological development is the cornerstone of this growth. Effective innovation strategies can enable companies to expand into new markets, attract a broader customer base, and achieve sustainable growth [21]. Therefore, it is essential that organizations align innovation efforts with global business strategies to maximize their impact [17,21,22].

Furthermore, it is necessary to create appropriate strategies to overcome possible barriers to innovation through the creation of an organizational culture that stimulates the innovative spirit. The role of leadership, employee engagement, cross-functional collaboration, and knowledge-sharing mechanisms is crucial in promoting a climate conducive to innovation, thereby facilitating market growth and expansion [22].

Another strategy involves developing the company's absorptive capacity, in other words, the ability to acquire, assimilate, and explore new knowledge for innovation. Companies need to develop and leverage their absorptive capacity to effectively utilize external knowledge, collaborate with partners, and drive innovation, leading to greater efficiency and productivity [23].

As mentioned previously, innovation serves as a catalyst for economic growth, social progress, and technological advancement. Recognizing its importance, governments around the world have increasingly embraced the role of promoting innovation in their economies [17,23]. By providing support and incentives, governments aim to encourage companies to engage in innovative activities. There are several reasons why governments support innovation for companies, highlighting the various benefits and long-term advantages that it offers.

- **Economic Growth and Competitiveness:** One of the reasons why governments support innovation is to promote economic growth and increased competitiveness. Innovation has the potential to create new industries, products, and services, thus driving economic expansion [24].

By supporting companies in their innovation efforts, governments aim to create a favorable environment for entrepreneurship, job creation, and increased productivity. This can lead to higher GDP, better living standards, and a stronger position of the state in the global market [25].

Countries with higher levels of public investment in innovation have witnessed greater economic growth and competitiveness, and so by providing financial resources, infrastructure, and financing for R&D, governments create an environment conducive to innovation. This allows companies to develop new technologies, products, and services, driving economic progress [26].

Companies that receive public R&D funding are more likely to engage in innovative activities and achieve higher levels of productivity, and therefore, public support not only encourages companies to invest in R&D but also facilitates collaboration between universities, industry, and government [24,27]. These collaborations promote knowledge exchange and technology transfer, leading to accelerated innovation and economic growth [26]. And by reducing financial barriers and providing technical assistance, governments empower entrepreneurs to pursue innovative ventures. Furthermore, by supporting sustainable innovation, governments can create new industries, generate employment opportunities, and attract investment, thereby increasing a nation's competitiveness [24].

- **Job Creation and Workforce Development:** Innovation is linked to job creation and workforce development. Therefore, as companies engage in innovative activities, they often need a skilled and adaptable workforce to bring their ideas to fruition [28]. State support for innovation initiatives may include funding for research and development, education and training programs, and grants or tax incentives for companies. By promoting innovation, governments can stimulate employment opportunities and ensure the availability of highly qualified professionals, contributing to global economic growth and social well-being [29].

As mentioned, public support can take different forms, such as R&D, offering tax incentives, promoting collaboration between academia and industry, and creating supportive regulatory frameworks. And public support positively influences the innovation process, reducing the financial burden on companies, stimulating R&D activities, and encouraging risk-taking [30].

Investments in innovation have a high impact on job creation, as industries led by innovation tend to hire workers with advanced skills and knowledge, thus increasing the demand for highly qualified and specialized professionals. Furthermore, innovative companies often outperform their competitors, leading to expansion and the need for additional labor [31].

Government support can also enable training programs, educational initiatives, and job training to equip individuals with the skills needed for emerging industries. Countries with high public support for innovation tend to have higher levels of human capital, leading to a more adaptable and competitive workforce [32].

Regional policies that promote innovation in various industries, sectors, and geographic areas must also be highlighted. This is because by supporting innovation in traditionally disadvantaged regions, governments can stimulate job creation and reduce regional economic disparities. This approach ensures that the benefits of innovation and job creation are distributed more equitably, leading to inclusive economic growth [33].

- **Technological Advancement and Industry Transformation:** Governments are interested in promoting technological advancement in their economies. In this way, by supporting innovation, they encourage the development and adoption of new technologies that can transform existing industries and create entirely new industries [34,35]. Technological progress brings greater efficiency, sustainability, and improved quality of life, and by stimulating innovation, governments can ensure that their industries remain competitive in the global market, boosting economic development and attracting foreign investment [36].

There is a positive relationship between public investment in R&D and technological advances, and governments can provide financial incentives, grants, and tax credits to stimulate innovation and attract private investment. For example, publicly funded research programs such as the US National Institutes of Health (NIH) and the European Union's Horizon 2020 have significantly contributed to advances in the biotechnology, pharmaceutical, and renewable-energy sectors [37].

Publicly funded research consortia and innovation centers encourage interdisciplinary collaborations, promoting the cross-pollination of ideas and expertise. In this way, by bringing together researchers, entrepreneurs, and industry experts, these platforms facilitate knowledge sharing, technology transfer, and the development of innovative solutions to complex challenges [38].

- **Addressing Social Challenges:** Governments recognize that companies are the main drivers of innovation and can act to mitigate the impacts of climate change, improve healthcare, and promote energy security.

By helping companies develop sustainable technologies, clean energy alternatives, and advanced healthcare systems, governments can actively contribute to social well-being and environmental stewardship.

Public support is vital to ensuring that innovation benefits all segments of society because when citizens actively engage with innovative ideas and technologies, they provide valuable feedback, which helps refine and shape innovations to better align with the needs of the community and society [15,16].

As previously mentioned, public support for innovation is essential for sustainable development. This means that innovation can be a powerful tool for empowering marginalized communities, as governments and society can help bridge the digital divide, address social inequalities, and improve access to vital services such as health and education. Public support can enable innovations that empower marginalized communities, amplify their voices, and provide opportunities for economic and social development [39].

- **Strengthening National Security:** Innovation also has important implications for national security. States invest in supporting innovation to foster advancements in defense technologies, cybersecurity, and critical infrastructure protection. By encourag-

ing companies to innovate in these areas, governments ensure the safety and resilience of their nations, safeguarding against potential threats and risks.

Innovation plays a pivotal role in bolstering a nation's military capabilities, thereby safeguarding its security. Advancements in technology and innovation have revolutionized military operations, enabling the development of advanced weapon systems, enhanced situational awareness, and improved intelligence gathering techniques [40]. The ability to innovate in military hardware and software ensures that a nation remains prepared and equipped to tackle emerging threats effectively. Therefore, the importance of innovation in adapting the armed forces to the evolution of unconventional warfare tactics, cybersecurity challenges, and the growing dominance of space warfare is highlighted [40]. By fostering a culture of innovation, nations can stay ahead of adversaries, maintain deterrence, and secure their national security interests [40,41].

Innovation is pivotal in augmenting intelligence capabilities and strengthening cybersecurity, both of which are critical for national security in the digital age [42]. It highlights the importance of innovation in leveraging big data analytics, artificial intelligence, and machine learning to extract valuable insights from large amounts of information, enabling proactive threat detection and intelligence analysis.

Moreover, with the increasing interconnectedness of critical systems, cybersecurity has become a paramount concern. Innovation is essential to develop a robust cybersecurity framework, encryption algorithms, and defensive mechanisms to safeguard sensitive information, critical infrastructure, and government systems from cyber threats and attacks [43].

Considering the above, the role of governments as agents promoting companies' innovative initiatives stands out, with multiple objectives of innovation support policy, and innovation policymakers are concerned with identifying the most appropriate portfolio of support instruments that stimulate and guide R&D and business innovation; generate solutions that transform or even create new markets; promote economic growth; and overcome long-standing societal challenges such as health, energy, and the environment, or address short-term crises. This multiplicity of objectives often requires the use of a portfolio of support instruments, rather than relying on a limited set of policy tools [44].

There is a wide range of state support for innovation: grants for business R&D and innovation; corporate tax relief for R&D and innovation; loans and credits for innovation in firms; project grants for public research; innovation vouchers; national strategies, agendas, and plans; equity financing; institutional funding for public research; networking and collaborative platforms; tax relief for individuals supporting R&D and innovation; technology extension and business advisory services; center of excellence grants; procurement programs for R&D and innovation; and science and innovation challenges, prizes, and awards [44,45].

As mentioned, financial support is one of the main means of encouraging business innovation, and governments offer various financing mechanisms, such as grants, loans, and tax incentives, to support companies' R&D activities [46]. The CIS highlights that financial support programs often focus on supporting high-risk R&D projects and startups that may face challenges in accessing traditional sources of financing [47]. These initiatives help reduce the financial burden on companies by encouraging them to take risks and invest in innovative ideas [48].

R&D tax incentives play a vital role in promoting innovation by providing tax incentives or credits to companies involved in qualified R&D activities [7]. These incentives aim to offset the costs associated with innovation-oriented research, development, and experimentation. The CIS identifies that tax incentives for R&D encourage companies to invest in innovation, reducing the after-tax cost of R&D, allowing them to allocate resources more effectively to innovation-related activities [47].

Public support for business innovation often extends to the establishment of innovation networks and clusters. These initiatives bring together companies, research institutions, and other stakeholders in a specific geographic area or industry to promote collaboration, knowledge sharing, and technology transfer [9]. The CIS highlights that innovation

networks and clusters provide companies with opportunities to access specialized skills, resources, and market knowledge, creating an environment conducive to innovation through collaboration and synergy [49].

As mentioned in the World Intellectual Property Organization's 2022 World Intellectual Property Indicators report [8], protecting intellectual property is crucial for companies looking to commercialize their innovative ideas [27]. Public-support mechanisms, as identified by CIS, include assistance with patent costs, audits, and advice on intellectual property strategy. By offering this support, governments aim to reduce the barriers and risks associated with protecting intellectual property, allowing companies to safely protect their innovative products, processes, or designs and obtain commercial value from their inventions [14,49].

Public support for business innovation also includes initiatives focused on training and skill development, and the CIS highlights programs that offer companies access to training courses, workshops, and mentoring programs aimed at increasing their innovation capacity [49]. These programs focus not only on technical skills but also on promoting an innovative mindset, creativity, and entrepreneurial skills. By empowering a skilled and innovative workforce, governments aim to increase the competitiveness and productivity of companies in the evolving global landscape [5,50].

Public-support measures also cover efforts to provide companies with access to information, expertise, and research results [51]. The CIS reveals that governments establish information portals, technology transfer offices, and innovation centers to disseminate knowledge, connect companies with research institutions, and facilitate technology transfer [49]. By bridging the gap between academia and industry, governments enable companies to take advantage of the latest research and advances, promoting innovation and encouraging the adoption of new technologies [52].

In addition to the extreme importance that public support has for the innovative activity of companies, the possibility of companies receiving this support depends on their characteristics. For example, a fundamental characteristic of companies that receive public support for innovation is their commitment to R&D activities. There is a positive correlation between investment in R&D and the probability of receiving public support for innovation [53]. Therefore, it is possible to state that governments tend to prioritize companies that demonstrate commitment to R&D activities and allocate resources accordingly [2,54].

The sector of activity and its level of technological development also appear to be a crucial factor in obtaining support, and high-technology industries, such as biotechnology, nanotechnology, and information technology, have received substantial public funding. This is due to the nature of these industries, which often require substantial investments in R&D, have longer time horizons for commercialization, and involve high risks [6].

Analysis of the technological trajectories of companies receiving public support in South Korea found that although support was available at various technological levels, there was a notable focus on emerging technologies such as artificial intelligence, blockchain, and advanced materials [55]. Sectors such as biotechnology, information technology, and clean energy tend to attract more government support due to their potential for high-impact innovation [44,56].

No less important is collaboration between companies and other organizations, and companies that engage in collaborative activities and promote knowledge exchange are often more successful in securing public support for innovation [57]. Collaboration can occur through partnerships with other companies, universities, research institutions, and government agencies, and companies that actively engage in open innovation platforms are more likely to receive public support due to their commitment to collaborative innovation practices [11,57].

Companies that actively engage in partnerships and collaborative networks are more likely to secure public support. Collaborative ventures not only improve knowledge sharing and resource pooling but also showcase a company's ability to collaborate effectively with other stakeholders [10].

In conclusion, belonging to a group offers ample opportunities for collaboration and networking, both of which are crucial for innovation. Companies within these networks can form strategic partnerships, joint ventures, or research consortia, which allow them to pool resources, share risks, and combine complementary knowledge [10,12,57].

Similarly, the likelihood of securing public support for companies is impacted by their prior activities, particularly their innovation endeavors. This implies that if a company has already demonstrated innovative outcomes resulting in industrial property registrations, it enhances its chances of receiving public support [13]. Companies with a proven track record of innovative products, patents, or commercialization are favored by governments as they are seen as a reliable investment in achieving economic and social objectives [13,14].

Not only the results of companies' innovative activity but also their market orientation, reflected in the suitability of products for new markets and/or suitability of new products for current markets, are extremely important aspects. Companies that receive public support for innovation often have a strong market orientation and effective commercialization strategies [3,4].

Companies that introduce innovative offerings tend to experience greater revenue growth, which contributes to overall economic prosperity. In this way, public financing, when seeking to stimulate economic development, also stimulates companies that focus on developing new products, and these are the ones that, in theory, are most likely to receive financial assistance to fuel their growth and generate employment opportunities. [58].

Studies show that competent workers are essential for companies. In other words, the recent literature has consistently highlighted the importance of workers with higher education in promoting innovation and defining the success of supported companies [58]. Workers with higher education have advanced skills, knowledge, and critical-thinking skills, which are fundamental for solving problems and generating innovative ideas. Their academic background equips them with a solid foundation in theory and research methodologies, enabling them to contribute to cutting-edge research and development initiatives [59,60].

Furthermore, highly qualified workers often have a strong entrepreneurial mindset and a greater propensity to take risks. In other words, individuals with higher education are more likely to engage in innovative activities, undertake business ventures, and demonstrate a greater capacity for technological adaptation. Their ability to understand and navigate complex technological landscapes contributes to the overall innovative capabilities of supported companies [61].

Furthermore, workers with higher education play a crucial role in the transfer and dissemination of knowledge within organizations. Your experience can be disseminated through formal and informal networks, promoting learning and collaboration between team members. This culture of knowledge sharing improves the global innovation ecosystem in supported companies and contributes to their long-term competitiveness [62].

Finally, another aspect that seems to favor companies in obtaining public support is their export activity [63]. Export-oriented companies are, in theory, more likely to receive public support for innovation due to their ability to create jobs, increase productivity, and enhance competitiveness. Exporting allows companies to access larger markets, diversify their customer base, and mitigate the risks associated with operating exclusively in national markets [63].

Export-oriented companies have long been recognized as vital contributors to economic growth and competitiveness. Companies involved in exporting activities tend to be more innovative compared to their non-exporting counterparts. This is mainly due to exposure to international markets, which leads companies to continually update and innovate to meet global demands [1].

National support typically offers more streamlined procedures and tailored assistance, often focusing on local market needs and regulatory frameworks. In contrast, European support entails navigating more complex application processes but provides access to larger funding pools and opportunities for cross-border collaboration. While national

programs may foster quicker implementation of innovations within Portugal, European initiatives offer broader networking avenues and resources for scaling innovations across the European Union, enhancing competitiveness on a continental scale [53].

As highlighted, there are several studies that focus on the importance of public support for innovation, emphasizing its importance for economic growth, social progress, and national security. However, there is a pressing need to discuss the profile of companies that receive this support, given that there are several gaps in the literature on the topic. The need for limited exploration of specific criteria used by governments to determine eligibility for support in different sectors is highlighted. Furthermore, we mention the lack of discussion about the challenges that companies face in establishing and maintaining effective collaborative networks, especially for smaller companies or those in less developed regions.

Figure 1 summarizes the numerous benefits of public support for innovation in the long term. As highlighted, public support for innovation plays a crucial role in fostering economic growth, social progress, and environmental sustainability. By investing in R&D, fostering collaboration, and providing financial incentives, governments can stimulate innovation across various sectors, leading to long-term benefits for society, the economy, and the environment.



Figure 1. Long-term benefits of innovation and public support.

3. Methodology and Characterization of the Sample

Community Innovation Survey (CIS) operations are based on the conceptual framework set out in the Oslo Manual, as well as Eurostat's methodological recommendations [64]. This survey, which takes place every two years, aims to produce and update statistical indicators on innovation in companies through a survey harmonized at the European level, which allows the international comparison of data, as well as responding to national and international collection commitments, treatment, and dissemination of

official science and technology statistics, namely the commitments assumed with Eurostat to produce statistics on innovation.

The 2018 CIS survey comprises 13,701 companies, the 2016 CIS survey comprises 6775 companies, and the 2014 CIS survey includes 7083 companies. By compiling these 3 surveys into a single database, from 2012 to 2018, 1857 companies common to the 3 surveys were identified. The sample size used in this study is in line with similar studies, allowing for adequate robustness in the analysis performed [65,66].

When constructing the survey every two years, the questions and information collected may differ. The three CIS surveys were compared, and common information was identified, defining the variables shown in Table 1. It is important to highlight here that when crossing the three CIS surveys, building the database from 2012 to 2018, the information common to the three surveys becomes smaller, and the fact that each survey contains information for two years is added.

Table 1. Variables.

Acronym	Variable
HT *	High-tech industry (1 if the company is classified as a high-tech company)
MHT *	Medium-high-technology industry (1 if the company is classified as a medium-high-technology company)
MT *	Medium-technology industry (1 if the company is classified as a medium-technology company)
MLT *	Medium-low-technology industry (1 if the company is classified as a medium-low-technology company)
LT *	Low-technology industry (1 if the company is classified as a low-technology company)
AP	Applied for a patent (1 if the company applied for patent registration)
ID	Registered an industrial right or design (1 if the company registered)
Tm	Registered a trademark (1 if the company registered)
NIG	Introduced new or improved goods (1 if the company introduced a new product to the market)
NIS	Introduced new or improved services (1 if the company introduced a new service to the market)
TPNM	Percentage of turnover resulting from products that were new to the market (%)
TPI	Turnover coming from products that were identical or very similar to products already offered by competitors (%)
TPU	Percentage of turnover coming from products that were unmodified (or with only minor changes) (%)
NPP	New or improved processes that differ significantly from previous processes for methods of producing goods or providing services (1 if yes or 0 otherwise)
NPL	New or improved processes (logistics, delivery, or distribution methods) (1 if yes or 0 otherwise)
iRD	Amount spent by the company on intramural R&D (EUR)
eRD	Amount spent by the company on extramural R&D (EUR)
CC	Cooperation with other companies or organizations (1 if the company cooperated with other entities)
EHE	Percentage of people employed with higher education (%)
TPC	Percentage of turnover resulting from customers located in Portugal (%)
GC	Group of companies (1 if the company belongs to a group of companies)
NS	National support (1 if the company received national or regional support for innovation)
ES	European support (1 if the company received European support for innovation)

* Classified according to the sector of activity to which the company belongs in accordance with the Portuguese Classification of Economic Activities Rev.3.

First, to analyze the characteristics of companies that receive support for innovation at the national level, the NS variable was considered as a dependent variable and all other variables as independent. Then, to analyze the characteristics of the companies that receive support for innovation at the European level, the variable ES was considered as a dependent variable and the rest as independent variables. To make the analysis more robust, the analysis was also carried out for companies that simultaneously receive national and European support, using the dependent variable NES. The methodology used was logistic regression, using the STATA software version 18.

The logit model is based on the concept of logistic regression, which is a statistical approach used to model the relationship between a binary or categorical dependent variable and one or more independent variables [67].

Logit models are specifically designed to analyze binary outcomes, where the dependent variable can take only two values, typically coded as 0 and 1, and involve one or more independent variables, which can be continuous, categorical, or a combination of both.

These independent variables are used to explain the variation in the binary dependent variable. The model estimates the probability of the dependent variable taking the value 1 given the values of the independent variables [65,67].

The core component of logit models is the logistic function (also known as the sigmoid function or the logistic curve). This function transforms the linear combination of the independent variables into a probability value between 0 and 1 [68]. The formula for the logistic function is as follows:

$$P(Y = 1) = 1 / (1 + e^{-(X\beta)})$$

where

$P(Y = 1)$ is the probability of the dependent variable being 1.

X represents the independent variables.

β is a vector of coefficients to be estimated.

To estimate the model coefficients (β), logit models use a maximum-likelihood estimation method. This process finds the values of β that maximize the likelihood of observing the given binary outcomes based on the specified model [69].

That is, the primary goal of the logit methodology is to estimate the probability of an event occurring, given a set of explanatory variables. In its simplest form, the logit model employs the logistic function to transform the linear relationship between the independent variables and the log-odds of the dependent variable into a probability [69,70].

As previously mentioned, the data in this study refer to 1857 companies, referring to 6 years resulting from 3 biennia, thus having 3 data points for each company. In this way, from the database built by 23 variables, it results in 128,133 possible data, of which 13,508 missing data were identified, which corresponds to 10.54% of the data. This percentage is not an obstacle to applying the logit methodology [71–73].

Starting our analysis with the sources of support for innovation among companies, out of 1857 entities surveyed, 1245 reported receiving such assistance. Among these, 490 benefited from both national and European support, while 755 solely received support at the national level.

Of the total companies surveyed, the breakdown by technological sophistication is as follows: 5.1% are classified as high-tech, 12% as medium-high-tech, 14.2% as medium-tech, 32.7% as medium-low-tech, and 36% as low-tech.

In terms of intellectual and industrial property registration, 327 companies sought patent registration, 168 secured industrial or design rights, and 826 obtained trademark registrations.

The cumulative registrations across three biennia for each of the 1857 companies amount to 5571. In the domain of product innovation, there were 1982 observations for new or improved goods and 1499 observations for new or improved services. Additionally, 1895 observations pertained to novel or enhanced processes for goods or services production, while 1114 observations related to logistical or distribution process improvements.

Regarding turnover generated by new or minimally modified products or services, a majority (57.35%) of companies reported slight alterations.

Turning to investment in research and development (R&D), there were 3666 observations concerning in-house R&D investments, averaging EUR 379,444. External R&D investments, on the other hand, were documented in 3418 instances, with an average value of EUR 74,851, notably lower than internal investments.

Regarding collaborative efforts for innovation, 9.1% of the surveyed companies reported sustained cooperation over six consecutive years. Furthermore, 10.77% engaged in collaboration for four out of the six years studied, while 17.02% participated in such endeavors for only two of the six years.

As for the education of the companies' employees, the companies were asked to indicate the percentage range of workers with higher education. The scale used goes from 1 to 7, where 1 corresponds to 0%, and the following intervals correspond to 1–5%, 5–10%, 10–25%, 25–50%, 50–75%, and 75–100%.

Considering that the database under study includes information from 3 biennia, it should be noted that there are companies that do not always indicate the same percentage range of employees with higher education. However, over the 6 years under review, most companies indicated the range corresponding to 10–25%.

Another relevant piece of information to be analyzed is the percentage of sales according to the geographic location of the customers, and it was found that on average, 72.81% of the customers of the companies under study are in Portugal.

Finally, on whether the company belongs to a group of companies, of the 1857 companies, 851 belong to a group of companies, with 161 belonging to a group of companies only during 1 of the biennia, 169 during 2 biennia, and the majority, 676 companies, during all 3 biennia analyzed.

4. Analysis of Results

Starting our analysis with respect to the profile of companies that received national support for innovation in the period from 2012 to 2018, the logit model shown in Table 2 was estimated. Data relating to the goodness of fit of the estimated model are shown in Tables 2 and 3 and Table 4 present the results of the estimates for the marginal effects of the logit model.

Table 2. Measures of fit for logit of NS.

Correctly classified	0.7643	Log-Lik Full Model	−1131.975
Log.Lik Intercept	−1233.664	LR(20)	203.379
Only		Prob > LR	0.000
D (2223)	2263.950	McFadden's Adj R2	0.065
McFadden's R2	0.082	Cragg and Uhler's R2	0.087
Maximum Likelihood	0.087	Efron's R2	0.091
R2		Variance of error	3.290
McKelvey and	0.151	Adj Count R2	0.013
Zavoina's R2		AICn	2305.950
Variance of Y	3.876	BIC'	−49.059
Count R2	0.764		
AIC	1.028		
BIC	−14,888.752		

The probability χ^2 is less than a significance level of 1%, and therefore, we reject the null hypothesis (there is no statistically significant association between the variables) concerning all coefficients equal to zero; that is, the model is valid. We also have the pseudo R^2 value, in which 8.24% of the variation in the NS variable can be explained by the independent variables present in the model. The percentage of correctly classified values was also estimated, so we can say that the model correctly predicts 76.43% of the observations.

Based on the model presented above, it appears that the probability of the company obtaining public support for innovation, for the specific sample under study, is approximately 21.35%.

Considering a significance level of 5% and analyzing the statistically significant variables, we find that the level of technological development to which companies belong has an impact on their probability of obtaining national support for innovation. That is, the greater the technological development, the greater the probability of obtaining support. Companies belonging to a high-technology sector see their possibility of obtaining support increase by 22 percentage points (pp), followed by medium-high-technology companies with 18 pp, then medium-technology companies with 15 pp and medium-low-technology companies with 10 pp.

The strategies and knowledge flows analyzed through the industrial property records (AP, ID, and Tm) are not statistically significant.

As for product innovation analyzed by the NIG and NIS variables, the results suggest that the fact that the company introduces new or improved goods to the market contributes to an increase of eight percentage points in the probability of obtaining national support. The opposite is true when it comes to new or improved services, given that their contribution is negative by four percentage points.

Table 3. Logit model for national support.

National Support as a Dependent Variable						
Variable	Estimate	SE	z	p-Value	95% CI	
HT	1.0441	0.2263	4.61	0.000	0.6005	1.4878
MHT	0.9104	0.1850	4.92	0.000	0.5478	1.2730
MT	0.7759	0.1929	4.02	0.000	0.3979	1.1541
MLT	0.5719	0.1664	3.44	0.001	0.2458	0.8981
AP	−0.1349	0.1741	−0.78	0.438	−0.4761	0.2062
ID	−0.0823	0.2495	−0.33	0.742	−0.5713	0.4068
Tm	−0.1254	0.1331	−0.94	0.346	−0.3863	0.1356
NIG	0.53216	0.1849	2.88	0.004	0.1698	0.8946
NIS	−0.2629	0.1289	−2.04	0.041	−0.5157	−0.0102
TPNM	−0.2739	0.5133	−0.53	0.594	−1.2801	0.7321
TPI	−0.4811	0.4668	−1.03	0.303	−1.3960	0.4338
TPU	−0.0912	0.2565	−0.36	0.722	−0.5939	0.4115
NPP	0.2739	0.1211	2.26	0.024	0.0367	0.5111
NPL	0.1121	0.1173	0.96	0.339	−0.1178	0.3420
iRD	-3.96×10^{-8}	2.53×10^{-8}	−1.56	0.118	-8.92×10^{-8}	1.00×10^{-8}
eRD	-7.86×10^{-8}	7.98×10^{-8}	−0.98	0.325	-2.35×10^{-7}	7.79×10^{-8}
CC	0.5607	0.1119	5.01	0.000	0.3412	0.7801
EHE	0.0201	0.0385	0.52	0.601	−0.0553	0.0956
TPC	−0.4024	0.1503	−2.68	0.007	−0.6969	−0.1078
GC	0.3791	0.1124	3.37	0.001	0.1588	0.5994
_cons	−2.2674	0.2651	−8.55	0.000	−2.7869	−1.7479

N = 2244; LR χ^2 = 203.38; log likelihood = −1131.975; p-value = 0.0000; pseudo R² = 0.0824.

Table 4. Estimates of the marginal effects of regressors on national support for innovation.

National Support as a Dependent Variable							
Variable	Estimate	SE	z	p-Value	95% CI		X
HT	0.2158	0.0532	4.06	0.000	0.1116	0.3201	0.0731
MHT	0.1785	0.0403	4.43	0.000	0.0996	0.2574	0.1573
MT	0.1501	0.0413	3.63	0.000	0.0691	0.2311	0.1426
MLT	0.1014	0.0307	3.30	0.001	0.0413	0.1616	0.3258
AP	−0.0219	0.0275	−0.80	0.423	−0.0758	0.0318	0.1056
ID	−0.0135	0.0401	−0.34	0.736	−0.0921	0.0651	0.0463
Tm	−0.0206	0.0215	−0.96	0.336	−0.0627	0.0214	0.2193
NIG	0.0847	0.0277	3.06	0.002	0.0305	0.1389	0.6729
NIS	−0.0441	0.0216	−2.04	0.041	−0.0865	−0.0018	0.4938
TPNM	−0.0460	0.0862	−0.53	0.593	−0.2149	0.1229	0.0659
TPI	−0.0808	0.0783	−1.03	0.302	−0.2343	0.0727	0.0813
TPU	−0.0153	0.0431	−0.36	0.722	−0.0997	0.0691	0.7164
NPP	0.0454	0.0198	2.30	0.022	0.0066	0.0842	0.5802
NPL	0.0190	0.0201	0.95	0.344	−0.0204	0.0584	0.3382
iRD	-6.65×10^{-9}	0.0000	−1.57	0.117	-1.5×10^{-8}	1.7×10^{-9}	46,8953.0
eRD	-1.32×10^{-8}	0.0000	−0.98	0.325	-3.9×10^{-8}	1.3×10^{-8}	94,446.30
CC	0.0973	0.0199	4.88	0.000	0.0582	0.1364	0.3944
EHE	0.0034	0.0065	0.52	0.601	−0.0093	0.01605	3.5633
TPC	−0.0676	0.0253	−2.68	0.007	−0.1171	−0.0181	0.6679
GC	0.0636	0.0188	3.39	0.001	0.0268	0.1003	0.5067

Marginal effects after logit; y = Pr(NS) (predict) = 0.2135.

Still regarding product innovation, the variables associated with the financial return of products/services (TPNM, TPI, and TPU) are not statistically significant.

As for process innovation, the variable referring to the improvement or development of new production methods has a positive impact of five percentage points on the probability of the company obtaining public support for innovation.

Regarding the variables associated with research and development activities, the amounts invested in R&D, either internally (iRD) or externally (eRD), are not statistically significant. However, the fact that the company collaborates in innovation activities with other entities has a significant positive impact as it contributes to an increase of 10 pp for the probability of the company obtaining national support.

Finally, it should be noted that the greater the percentage of turnover arising from customers located in the national territory, the less likely the company is to obtain public support, reducing this probability by seven percentage points. In the opposite direction, the results suggest that the fact that the company belongs to a group of companies contributes positively, with an increase of six percentage points for the probability of the company obtaining national support for innovation.

Next is the analysis of the profile of companies that received European support for innovation in the period from 2012 to 2018, estimated using the logit model shown in Table 5. Data relating to the quality of fit of the estimated model are shown in Tables 6 and 7, which present the results of the estimates for the marginal effects of the logit model.

Table 5. Logit model for European support.

European Support as a Dependent Variable						
Variable	Estimate	SE	z	p-Value	95% CI	
HT	1.0286	0.2585	3.98	0.000	0.5219	1.5352
MHT	0.6932	0.2264	3.06	0.002	0.2494	1.1369
MT	0.7153	0.2424	2.95	0.003	0.2403	1.1905
MLT	0.9439	0.1993	4.74	0.000	0.5532	1.3346
AP	0.6092	0.1727	3.53	0.000	0.2707	0.9478
ID	0.6727	0.2478	2.71	0.007	0.1869	1.1585
Tm	0.2619	0.1445	1.81	0.070	−0.0214	0.5452
NIG	−0.2578	0.1983	−1.30	0.194	−0.6465	0.1309
NIS	−0.0649	0.1559	−0.42	0.677	−0.3704	0.2407
TPNM	−0.4160	0.5865	−0.71	0.478	−1.5655	0.7335
TPI	−0.5512	0.5558	−0.99	0.321	−1.6404	0.5381
TPU	0.2015	0.2952	0.68	0.495	−0.3772	0.7801
NPP	0.5904	0.1471	4.01	0.000	0.3022	0.8787
NPL	−0.1936	0.1402	−1.38	0.167	−0.4684	0.0812
iRD	7.05×10^{-8}	2.38×10^{-8}	2.97	0.003	2.39×10^{-8}	1.17×10^{-7}
eRD	-3.72×10^{-9}	8.01×10^{-8}	−0.05	0.963	-1.61×10^{-7}	1.53×10^{-7}
CC	0.9012	0.1327	6.79	0.000	0.6411	1.1612
EHE	0.2145	0.0458	4.68	0.000	0.12468	0.30441
TPC	−0.5531	0.1754	−3.15	0.002	−0.8969	−0.2093
GC	−0.4702	0.1322	−3.56	0.000	−0.7294	−0.2109
_cons	−3.3579	0.3272	−10.26	0.000	−3.9991	−2.7167

N = 2244; LR χ^2 = 302.08; log likelihood = −864.8324; p-value = 0.0000; pseudo R² = 0.1487.

The probability χ^2 is less than a significance level of 1%, and, therefore, we reject the null hypothesis referring to all coefficients equal to zero; that is, the model is valid. We also have the pseudo R² value, in which 14.87% of the variation of the ES variable can be explained by the independent variables present in the model. The percentage of correctly classified values was also estimated, so we can say that the model correctly predicts 84.45% of the observations.

Based on the model presented above, it appears that the probability of the company obtaining public support for innovation, for the specific sample under study, is approximately 12.76%.

Table 6. Measures of fit for logit of ES.

Correctly classified	0.8445	Log-Lik Full Model	−864.832
Log.Lik Intercept Only	−1015.873	LR(20)	302.082
D (2223)	1729.665	Prob > LR	0.000
McFadden’s R2	0.149	McFadden’s Adj R2	0.128
Maximum Likelihood R2	0.126	Cragg and Uhler’s R2	0.126
McKelvey and Zavoina’s R2	0.253	Efron’s R2	0.150
Variance of Y	4.407	Variance of error	3.290
Count R2	0.844	Adj Count R2	0.074
AIC	0.790	AICn	1771.665
BIC	−15,423.037	BIC’	147.761

Table 7. Estimates of the marginal effects of regressors on European support for innovation.

European Support as a Dependent Variable							
Variable	Estimate	SE	z	p-Value	95% CI		X
HT	0.15561	0.0491	3.17	0.002	0.0594	0.2519	0.0731
MHT	0.0918	0.0345	2.66	0.008	0.0242	0.1595	0.1573
MT	0.0959	0.0378	2.54	0.011	0.0218	0.1702	0.1426
MLT	0.1194	0.0277	4.32	0.000	0.0652	0.1736	0.3258
AP	0.0808	0.0269	3.00	0.003	0.0281	0.1335	0.1056
ID	0.0932	0.0414	2.25	0.024	0.0121	0.1743	0.0464
Tm	0.0308	0.0179	1.72	0.085	−0.0043	0.0659	0.2193
NIG	−0.0297	0.0239	−1.26	0.208	−0.0759	0.0165	0.6729
NIS	−0.0072	0.0173	−0.42	0.677	−0.0412	0.0268	0.4938
TPNM	−0.0463	0.0653	−0.71	0.478	−0.1743	0.0817	0.0659
TPI	−0.0613	0.0619	−0.99	0.321	−0.1826	0.0599	0.0813
TPU	0.02242	0.0328	0.68	0.494	−0.0419	0.0867	0.7164
NPP	0.06374	0.0153	4.18	0.000	0.0338	0.0937	0.5802
NPL	−0.0211	0.0149	−1.41	0.157	−0.0503	0.0081	0.3382
iRD	7.85×10^{-9}	0.0000	2.93	0.003	2.6×10^{-9}	1.3×10^{-8}	468,953
eRD	$−4.14 \times 10^{-10}$	0.0000	−0.05	0.963	$−1.8 \times 10^{-8}$	1.7×10^{-8}	94,446.3
CC	0.1086	0.0169	6.42	0.000	0.0754	0.1417	0.3944
EHE	0.0239	0.0051	4.73	0.000	0.0139	0.0338	3.5633
TPC	−0.0616	0.0195	−3.17	0.002	−0.0997	−0.0235	0.6679
GC	−0.0526	0.0149	−3.54	0.000	−0.0817	−0.0235	0.5067

Marginal effects after logit; $y = \text{Pr}(\text{NS})$ (predict) = 0.1276.

Considering a significance level of 5%, the results suggest that companies belonging to the high-technology sector are more likely to obtain support (16 percentage points). However, the medium-low-technology sector is next in impact with 12 percentage points, closely followed by the medium-technology sector with 10 pp and the medium-high technology sector with 9 pp.

As for strategies and knowledge flows, the results show that companies that register patents see the probability of obtaining support increase by 8 percentage points, and companies that carry out industrial registration or design see their probability increase by 9 pp.

Regarding process innovation, companies that introduce new or improved processes that differ significantly from previous processes for methods of producing goods or providing services are more likely (six percentage points more) to obtain European support for innovation.

As for R&D, investments made in-house and analyzed here using the variable iRD contribute positively to the probability of obtaining support for innovation. However, its expression is not significant since the coefficient associated with this variable is close to

zero. Likewise, companies that collaborate in innovation activities are more likely to obtain support, with an increase of 11 percentage points in this probability.

Finally, regarding other characteristics of companies, we found that the greater the percentage of workers with higher education, the greater the probability of obtaining European support for innovation, with the variable EHE being statistically significant and having an impact of over two percentage points. On the other hand, concerning turnover from sales to customers located in Portugal, it appears that the higher this percentage, the lower the probability of obtaining support for innovation, with this probability decreasing by six percentage points. Likewise, companies that belong to a group of companies see their probability of obtaining European support decrease by five percentage points.

In short, we can say that the results obtained suggest that national support tends to benefit sectors with a higher technological level, while European support does not make such a sharp distinction between high-technology sectors and medium-low-technology sectors.

With regard to knowledge strategies, based on industrial property registrations, the privilege given by European support to companies that register patents and industrial designs stands out. At the national level, industrial property registrations are not relevant.

Regarding the qualification of workers, while national support does not seem to favor companies with a higher proportion of workers with higher education, European support, in turn, favors this characteristic.

Finally, both national support and European support value companies that have a higher percentage of turnover from foreign markets.

This study's findings confirm that Portuguese companies that obtain public support for innovation typically belong to high-technology sectors, engage in collaborative innovation activities, invest in industrial property registrations, engage in export activities, and employ a highly educated workforce.

High-tech industries have long been recognized as significant drivers of economic growth and innovation. These sectors are characterized by the development and application of advanced technologies, often leading to groundbreaking products and services. Scientific studies conducted in various countries have consistently shown that companies in high-technology sectors are more likely to engage in innovative activities and are, therefore, more likely to benefit from public support for innovation [6]. The findings in Portugal mirror these global trends and provide a strong foundation for policy initiatives aimed at fostering innovation in high-tech industries.

Collaborative innovation, which involves partnerships and knowledge sharing between companies, has gained prominence in the modern business landscape. The synergy created through collaboration allows companies to access complementary resources, share risks, and expedite the innovation process. The scientific literature has consistently emphasized the benefits of collaborative innovation for improving a firm's innovative capabilities [10,12,56]. This study underscores the significance of this practice in the context of public support for innovation.

The study's results align with existing research demonstrating that firms that invest in securing intellectual property rights tend to be more innovative. Patents are often regarded as a measure of a company's technological prowess and willingness to invest in research and development [8,26]. Public support for innovation in Portugal is, therefore, more likely to be directed towards companies that show a proactive approach to intellectual property protection, a strategy that has been widely endorsed by the international innovation community.

Exporting is a clear indicator of a company's global competitiveness and often goes hand in hand with innovation. Companies that export are exposed to diverse markets, which require adaptability and continuous improvement to meet varying customer needs [1,62]. This study confirms this fact, given that the less internationalized the company is, that is, the more focused it is on the national market, the less likely it is to obtain public support for innovation.

A well-educated workforce is more capable of generating and implementing new ideas, technologies, and processes. This insight is consistent with numerous scientific studies highlighting the positive correlation between a highly educated workforce and a company's capacity for innovation [58]. As such, public support for innovation in Portugal is likely to be channeled towards companies that recognize the significance of human capital development.

As previously mentioned, with the aim of making the analysis more complete and more robust, the models in which the dependent variable is NES are presented below, which corresponds to the company having simultaneously received national and European support for innovation.

Below is the analysis of the profile of companies that received national and European support for innovation in the period from 2012 to 2018, with data relating to the quality of adjustment of the model presented in Table 8. The respective logit model presented in Table 9 and the model logit with marginal effects presented in Table 10.

Table 8. Logit model for national and European support.

Correctly classified	0.7233	Log-Lik Full Model	−1244.660
Log.Lik Intercept	−1516.26	LR(20)	543.206
Only		Prob > LR	0.000
D (2223)	2489.319	McFadden's Adj R2	0.165
McFadden's R2	0.179	Cragg and Uhler's R2	0.215
Maximum Likelihood R2	0.215	Efron's R2	0.228
McKelvey and Zavoina's R2	0.294	Variance of error	3.290
Variance of Y	4.662	Adj Count R2	0.320
Count R2	0.723	AICn	2531.319
AIC	1.128	BIC'	−388.885
BIC	−14,663.4		

Table 9. Measures of fit for logit of NES.

National and European Support as a Dependent Variable						
Variable	Estimate	SE	z	p-Value	95% CI	
HT	1.514332	0.221052	6.85	0.000	1.081077	1.947586
MHT	1.015850	0.167585	6.06	0.000	0.687389	1.344311
MT	0.933813	0.176785	5.28	0.000	0.587320	1.280306
MLT	0.900648	0.145552	6.19	0.000	0.615373	1.185924
AP	0.478704	0.172255	2.78	0.005	0.141091	0.816318
ID	0.422072	0.236469	1.78	0.074	−0.041401	0.885544
Tm	0.050659	0.124463	0.41	0.684	−0.193285	0.294603
NIG	0.229965	0.158245	1.45	0.146	−0.080189	0.540121
NIS	−0.281337	0.125208	−2.25	0.025	−0.526741	−0.035936
TPNM	−0.433798	0.488108	−0.89	0.374	−1.390472	0.522876
TPI	−0.734381	0.436269	−1.68	0.092	−1.589451	0.120691
TPU	0.077904	0.226705	0.34	0.731	−0.36643	0.522238
NPP	0.566926	0.111318	5.09	0.000	0.348746	0.785106
NPL	−0.028374	0.111482	−0.25	0.799	−0.246874	0.190127
iRD	5.79×10^{-8}	2.92×10^{-8}	1.99	0.047	7.30×10^{-10}	1.15×10^{-7}
eRD	-7.29×10^{-8}	7.31×10^{-8}	−1.00	0.319	-2.16×10^{-7}	7.05×10^{-8}
CC	1.03553	0.104536	9.91	0.000	0.830643	1.240417
EHE	0.14584	0.035731	4.08	0.000	0.075814	0.215878
TPC	−0.711599	0.141518	−5.03	0.000	−0.988971	−0.434229
GC	0.00791	0.105342	0.08	0.940	−0.198551	0.214382
_cons	−2.02889	0.241562	−8.40	0.000	−2.502343	−1.555437

N = 2244; LR χ^2 = 543.21; log likelihood = −1244.66; p-value = 0.0000; pseudo R² = 0.1791.

Table 10. Estimates of the marginal effects of regressors on national and European support for innovation.

National and European Support as a Dependent Variable							
Variable	Estimate	SE	z	p-Value	95% CI		X
HT	0.359064	0.04533	7.92	0.000	0.270213	0.447914	0.073084
MHT	0.247763	0.03992	6.21	0.000	0.169512	0.326014	0.157308
MT	0.228284	0.04257	5.36	0.000	0.144851	0.311717	0.142602
MLT	0.216322	0.03453	6.27	0.000	0.148650	0.283993	0.325758
AP	0.116802	0.04278	2.73	0.006	0.032956	0.200648	0.105615
ID	0.103125	0.05889	1.75	0.080	−0.012304	0.218553	0.046346
Tm	0.012026	0.02964	0.41	0.685	−0.046063	0.070116	0.219251
NIG	0.053852	0.03661	1.47	0.141	−0.017907	0.125611	0.672906
NIS	−0.066456	0.02948	−2.25	0.024	−0.124243	−0.00867	0.493761
TPNM	−0.102653	0.11549	−0.89	0.374	−0.329018	0.123712	0.065989
TPI	−0.173782	0.10322	−1.68	0.092	−0.376083	0.028518	0.081288
TPU	0.018435	0.05365	0.34	0.731	−0.08671	0.12358	0.716359
NPP	0.131974	0.02529	5.22	0.000	0.082413	0.181535	0.580214
NPL	−0.00671	0.02632	−0.25	0.799	−0.05830	0.044886	0.338235
iRD	1.37×10^{-8}	0.00000	1.98	0.048	1.5×10^{-10}	2.7×10^{-8}	468953
eRD	$−1.72 \times 10^{-8}$	0.00000	−1.00	0.319	$−5.1 \times 10^{-8}$	1.7×10^{-8}	94446.3
CC	0.245656	0.02425	10.13	0.000	0.198131	0.29318	0.394385
EHE	0.034512	0.00844	4.09	0.000	0.017966	0.051059	3.56328
TPC	−0.168392	0.03351	−5.02	0.000	−0.234073	−0.10271	0.667892
GC	0.001873	0.02493	0.08	0.940	−0.046983	0.050729	0.506684

Marginal effects after logit; $y = \text{Pr}(\text{NES})$ (predict) = 0.38440542.

Finally, analyzing the characteristics of companies that simultaneously receive national support and European support for innovation, it appears that the probability of being supported is strongly leveraged by the level of technological development of the sector to which they belong, and this probability is higher when the degree of technological development is greater. This association is intuitive, as more technologically advanced sectors probably present more opportunities for innovation and, therefore, are more likely to attract support for this purpose.

Regarding the impact of industrial property registrations, both patent and design registrations have a positive impact (11.6 p.p. and 10.3 p.p.), with trademark registration not being statistically significant. This highlights the importance of legal protection of intellectual property as an indicator of innovative activity and, in turn, as a factor influencing financing decisions.

The introduction of new services on the market has a negative impact on the probability of simultaneously receiving national and European support (6.6 p.p.), as well as the variable referring to the percentage of turnover resulting from products like products already offered by the competition. This can be explained by the fact that product innovation often attracts more attention and investment compared to service innovation, although the latter is also important for economic development. On the other hand, the creation of new production processes has a statistically significant and positive impact on the probability of simultaneously obtaining national and European support (13.2 p.p.).

As for investments in R&D, their expression is small with practically zero impact, although statistically significant, but only when these investments are carried out internally. This may indicate that other factors, such as the quality of project proposals or execution capacity, may be more decisive in obtaining support than simply the volume of investment itself.

Another variable that has a high impact is the degree of collaboration, increasing the probability of obtaining both types of support simultaneously by around 24.6 p.p.

The workforce with higher education confirms itself to be relevant with a positive impact of 3.4 p.p., and the degree of internationalization also proves to be relevant given that the higher the percentage of business volume that results from customers located

in Portugal, the lower the probability of simultaneously obtaining both types of support (16.8 p.p.). This aspect leads us to believe that companies more oriented towards the global market are more attractive for innovation support programs.

5. Discussion

The research provides a thorough examination of the factors influencing Portuguese companies' eligibility for national, European, or combined innovation support. It elucidates key insights concerning sector focus, knowledge strategies, international engagement, and workforce qualifications.

Firstly, it reveals that high-technology sectors are more inclined to receive national support, while European support displays a more balanced approach across technology sectors. This implies a preference for high-tech industries in national programs, whereas European initiatives offer broader opportunities.

Secondly, collaborative innovation emerges as pivotal in securing support, irrespective of national or European contexts. Companies involved in collaborative efforts stand a better chance of accessing support, underlining the significance of partnerships in fostering innovation.

Thirdly, the study underscores the importance of intellectual property protection, notably patents and industrial designs, in support acquisition. This echoes global trends where companies prioritizing intellectual property rights tend to be viewed as more innovative and attract greater support.

Moreover, the research underscores the role of internationalization in innovation support, indicating that companies with higher international sales proportions are more appealing for support programs. This underscores the belief that exporting firms are better positioned to adapt and innovate to meet diverse market needs.

Lastly, the study emphasizes the relevance of a highly educated workforce, particularly in the European context. Companies with a greater share of educated employees are more likely to receive European support, underscoring the importance of human capital development in innovation efforts.

The analysis involves three models that assess the likelihood of companies securing public support for innovation, considering variables such as technological advancement, intellectual property registration, and R&D collaboration. While there is consensus on the importance of technological advancement in support eligibility, discrepancies arise regarding the impact of introducing new services and the correlation between internationalization and support acquisition.

For instance, the introduction of new products appears beneficial for obtaining national support but may have a negative effect on securing both national and European support. Furthermore, variables like internal R&D investments exhibit varying impacts, highlighting the intricate dynamics in obtaining public innovation support. Nonetheless, all texts underscore the significance of industrial property registration and collaboration in innovation activities in enhancing support prospects.

6. Conclusions

In conclusion, this scientific article clarified the characteristics of public support for business innovation, highlighting the complex and multifaceted nature of this phenomenon. Through an in-depth analysis of the existing literature and empirical evidence, several important findings emerged.

The study analyzes the determinants that influence the likelihood of Portuguese companies receiving innovation support at national and European level, examining factors such as sectoral focus, collaboration, intellectual property protection, internationalization, and workforce education. It reveals that high-technology sectors tend to receive more national support, while European support presents less prejudice between technological levels. Collaborative innovation and intellectual property protection are identified as crucial to securing national and European support, underlining the importance of partnerships

and intellectual property rights in innovation efforts. Furthermore, the study highlights the importance of internationalization, since companies with greater international sales are more attractive for support programs, and highlights the role of a well-qualified workforce, especially in the European context, in ensuring support for innovation. Overall, the findings shed light on the multifaceted dynamics that shape innovation support in Portugal and offer insights into strategic considerations for companies seeking such assistance.

This study emphasized the need for policymakers and stakeholders to consider the heterogeneity of public attitudes towards innovation. Recognizing the diverse perspectives and concerns of different social groups can lead to more inclusive and effective policy interventions. Tailoring public-support measures to address specific barriers and challenges faced by different sectors or regions can promote greater engagement and acceptance of innovation.

The practical implications of distinguishing between the profile of companies that receive national support and those that receive European support include its contribution to political decisions, as they can adapt innovation strategies more effectively, differentiating between companies that receive national and European support. This allows for better allocation of resources and more targeted policy interventions to meet the specific needs of beneficiary companies. Likewise, policymakers can implement specific measures to promote innovation in regions that face disadvantages, thus promoting regional development. It could contribute to a better analysis and promotion of employment opportunities, as innovation often leads to job creation. By understanding the characteristics of beneficiary companies, policymakers can promote sustainable employment opportunities, thereby contributing to economic growth and stability. Finally, policies can be targeted to improve digital inclusion and social innovation for segments of society with limited access to innovative resources. Furthermore, investments in education and training can ensure that the workforce is adequately prepared for emerging innovation opportunities.

The scientific implications of this study highlight the importance of coordinating policies between national and European levels to maximize the impact of innovation strategies while minimizing overlaps. Companies can also use analysis to compare their performance against competitors and identify areas for improvement in their innovation and resource allocation strategies. Finally, this study could contribute to a research base on promoting the study of sustainable innovation, encouraging a focus on sustainability and responsible resource management, aligning with national and European environmental objectives.

The study presented here has several limitations that must be acknowledged. Firstly, its applicability is confined to Portuguese companies, thereby restricting the generalizability of findings to companies in other countries. This limitation underscores the need for caution when attempting to extrapolate the results beyond the context of Portuguese businesses.

Moreover, the CIS survey utilized in this study may not comprehensively capture all innovative activities or accurately depict the level of support received by companies. This deficiency could lead to an incomplete depiction of the innovation landscape and introduce biases into the analysis. Furthermore, relying on self-reported data, as is common in surveys like CIS, raises concerns about the reliability and accuracy of the findings, potentially skewing the analysis results.

These limitations highlight the necessity of supplementing data sources and methodologies to ensure a more thorough and reliable assessment of the effectiveness of innovation support programs and their impact on company dynamics.

Incorporating data from multiple surveys introduces another set of challenges. Discrepancies in the questions posed to companies across surveys can complicate cross-referencing of data, resulting in the omission of pertinent information. This loss of data prevents a comprehensive analysis of factors such as company size, the influence of legislation or regulations on innovative initiatives, barriers to innovation, and motivations behind companies' decisions not to innovate.

Lastly, it is essential to recognize that Portugal's position in innovation is not at the forefront globally. Therefore, the findings of this study may not be directly transferable to companies in other countries. As such, caution should be exercised when attempting to apply these findings beyond the Portuguese context.

As a suggestion for future research, it is intended to create a database with information obtained in other countries where the CIS questionnaire is applied, comparing results by country. It will also be interesting to analyze the degree of innovation results obtained by companies, possibly measured through innovation outputs such as industrial property registrations, and which variables contribute to these outputs. Finally, the existence of subsidy dependency can be analyzed, and the profile of companies that consecutively resort to support for their innovation activities and whether their results only exist because of the support obtained can be determined.

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