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# Dynamic Innovation Strategy Model in Practice of Innovation Leaders and Followers in CEE Countries—A Prerequisite for Building Innovative Ecosystems

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**Abstract:** The task of each firm's strategic management is to identify those sustainable sources of competitive advantage that represent a way to achieve business goals and competitive advantage. Business management should be able to define determinants that fundamentally influence the innovation activity of business. Innovation leaders are influenced by the same set of determinants that allow them to maintain their position in the market. Identifying these determinants is a key source of knowledge for defining or adjusting corporate strategies, enabling sustainable benefits and for efficient building and functioning of countries' innovation ecosystems based on cross-agents' interactions leading to sustainable development. The goal of this paper is to identify the combination of innovation determinants in Dynamic Innovation Strategic Model (DISM) driving creation and sustaining innovation leaders' competitive advantage in selected European countries belonging to the group of moderate innovators. Likewise, authors define a unique set or combinations of factors that will (fundamentally embedded in a company strategy) have a significant impact on the innovative production of the business, which are one of the key elements of innovative ecosystems. With the use of CIS data (from Eurostat) on the innovators and followers of nine EU countries and own regression models, the key determinants of the success of the innovation leaders and followers were found. These determinants are (also in appropriate combination) mainly: in-house R&D activities, co-operation with various partners, and marketing and design. The results clearly show that for innovative leaders, key determinants have a positive impact on produced innovations; for the followers, the same group has a negative influence.

**Keywords:** innovation leader; innovation follower; development; determinant; sustainable firm strategy; strategic management; innovation ecosystems

## 1. Introduction

Nowadays, companies are increasingly being pushed to contribute to building national innovative ecosystems to promote socio-environmental sustainability and development [1] and to flexibly react to their competitors. Contemporary companies gain sustainable competitive advantage, primarily, by the creation and commercialization of various innovations. There is a huge range of literature and evidence that shows that innovation has a direct impact on performance as well as competitive advantage and a firm's success in domestic and international markets. There is a certain departure from fundamental theories, which only see resources as a competitive advantage. The reason for this is the low or no dynamics of these resources [2]. In response to these conclusions, there are several models that change the resource-based approaches by complementing other dynamic elements. These are, for example

according to Li & Liu [3]: “*absorptive capacity, integrative capacity, construct capacity, higher order capacity and so on to explore and explain the ways to success*”. Hargreaves, Longhurst & Seyfang [4] provided evidence of the relationship between sustainability and a company’s ability to produce innovation. In addition, Rauter et al. [5] showed a relation between sustainable and economic innovations that could lead separately or together to defined goals, by using similar innovation strategies and practices.

Many studies show that there are other factors that effectively influence a firm’s innovation performance. Bassett-Jones [6] stated: “*that diversity is a recognizable source of creativity and innovation that can provide a basis for competitive advantage*”. Leković & Marić [7] and other scholars postulated that the essence of success is innovativeness itself, which needs to be developed by the company’s culture and is affected by an internal and external innovation environment (ecosystem). The innovativeness will then become the basis of every worker’s activity, and innovation processes will be realized much faster and cheaper in practice. Hansen et al. [8] or Melane-Lavado & Álvarez-Herranz [9] stressed that sustainability-oriented innovations must also be considered, specifically in the process of building countries’ innovation ecosystems.

Porter & Ketels [10] and other scholars demonstrated that business success in the market is also dependent on management, its goals, and strategic management activities. The strategic objectives of the firm are that there must be the realization of innovative activities with the subsequent creation of innovations, as well as the cultivation of social capital that has a direct and indirect impact on the quality of innovative processes as well as on innovation performance.

Li & Liu [3] summarized in their study that it is the task of strategic management to identify those sources of competitive advantage that represent a way to achieve business goals. However, D’Aveni, Dagnino, & Smith [11] agreed with this and other studies that it is increasingly difficult to identify current sources of firm position in the market in the current globalized economy, which is facing economic turbulence, shorter or longer economic crises, new inventions, and ICT phenomena.

Therefore, it is necessary to perceive individual approaches to the sources of sustainable competitive advantage while firms need to accept, adjust, and change internal and external sources and possibilities in line with changes in the market, local and global economy, attitudes, and the innovation environment as well as the ecosystem in general [12]. According to previous studies (see for example, [13,14]), it is necessary to update strategic or innovative corporate management and examine the conditions, factors, and circumstances that form the framework of the business environment (innovation systems and platforms) and to address their institutional anchoring, specifically within Central and Eastern Europe (CEE) countries. These countries, especially in comparison with Western European countries, face problems such as lack of funds and insufficient incentives to cooperate, difficulties in sharing information and strategic planning, less developed social capital, or mental lock-in [15]. For these reasons, we primarily focus on CEE countries and, moreover, we take into account a new perspective on the role of firms in terms of their innovation performance (innovation leaders and followers) as key actors within national innovation ecosystems where cross-agent networks arise and allow the emergence of co-creating and co-evolving of new innovations [16].

The rest of this paper is structured as follows. The theoretical background section presents the theoretical research on the competitive advantage and innovation environment approaches as the fundamental ecosystem of firms’ activities leading to innovation and the aim of research. The third section introduces the data and methodology. The last section shows the results of the experimental research. In the Conclusion section, the results are presented together with proposals applicable in practice.

## 2. Theoretical Background

Innovation has become the core element for creating added value and a sustainable source of market advantage [17,18]. Many scholars (for example [19,20]) support this statement by claiming that innovative companies have processes in place to implement innovative solutions and translate ideas into practice. It means exploiting of new avenues as well as exploitation of existing sources to a

higher efficiency than the competition [21]. Within this context, the role of innovation has changed from simple development of new ideas to the creation of a strategic option that enables response to a rapidly changing environment. In this context, sustainable-oriented innovation as a new element of the innovation ecosystem should be recalled. However, there is a lack of innovation strategy in many companies [22,23]. This, according to Pisano [22], causes the biggest problem in innovation improvement efforts, because creating a capacity to innovate starts with strategy. Moreover, sustainable business models as an innovation strategy, including various innovation outputs, are prerequisites for sustainable development within countries' innovation ecosystems [24,25].

At the same time, innovation has become the main topic of academic discussion in management-oriented papers and books. The ways of defining innovation, influencing determinants, effects of innovation on companies' success are still questionable and vary in the literature in many ways. For the purposes of this paper, innovation is meant as a broader concept spanning from technological innovations (products like goods and services), processes, and those that are non-technological—organizational and managerial innovations or sustainable-oriented innovation [8].

What have been already proven by many empirical studies are the positive relationships between innovation and company performance [19,26–28]. On the other hand, the understanding of importance of determinants and their influence on the ability of a company to innovate is still unsatisfactory [29]. Cohen [30] or Karbowski & Prokop [31] in their studies draw attention to the need for further research on the determinants that influence the innovative absorption of industrial enterprises. According to these authors, it is necessary to focus on research of variables at the level of industry and companies in the market at the microeconomic level. Laeque [32] adds that managers are the main policy-makers in their companies that need to obtain information and conclusions from scientific studies. This group of workers must apply them in practice. The same conclusion came to other scholars such as Ferreira et al. [33], Yan et al. [34], or Alexandrova & Prudsky [35].

In recent literature, it is possible to find several studies where determinants of innovation performance are discussed from various views [36]. These two groups are most often studies of internal and external determinants of innovation. Jasinsky [37] adds the need to examine in-house resources, social capital, material availability, and finance; and internal quality processes into internal factors group. Vega-Jurado et al. [38] classified the internal determinants of innovation within the broader category of "basic competence", which include the ability to use high-tech technologies (measured by R&D intensity), knowledge, and creative potential of their own workers, the ability of the company to operate according to strategic plans, to organize its activities efficiently and to communicate both internally and externally. Romijn & Albaladejo [39], on the other hand, consider education and the ability to use workers' competences as an internal factor, as they believe that the knowledge and skill competences of people can be significantly influenced [40]. A closer look at empirical studies show that most of them deal with evaluation of one individual factor on innovation performance, e.g., Tsai [41] focused on technological infrastructure, Klomp and van Leeuwen [26] on activation of the R&D department in the company, Lopez and Crawford [42] on corporate innovative culture, Beugelsdijk [43] on HR practices, and Farooq [44] on learning organization practices. In the context of sustainability, Schaltegger & Wagner [45] complement the determinants in creating sustainable innovations.

The results of these studies revealed a significant effect on innovative performance. Norek [36] supports the conclusions of previous studies and emphasizes the importance of developing a corporate strategy and implementing strategic management in the context of the company's internal capabilities, but also the potential opportunities offered by external environments (ecosystems), including markets. However, the opinion remains that a company can most effectively influence its internal factory. Nevertheless, there are opposing views. Rigby and Zook [46] concluded that even the world's largest companies use external resources as part of their innovation processes (their internal resources prove to be too expensive, and in a rapidly changing society, few large companies want to invest in expensive and volatile technologies).

Therefore, external resources and their role in shaping innovation performance are at the forefront of research interest. For example, Jasiński [37] concluded that the ability to generate innovation in a company is also influenced by the situation in the industry and the market where the company operates, as well as ecosystem conditions and specific conditions that exist in regions (legislative, cultural, environmental conditions, etc.). Because clients, suppliers, lawmakers, and other authorities can directly or indirectly influence companies to innovate, it is necessary to perceive and analyse these determinants [47]. Ribaric [48] concludes that the main external determinants are: government regulations, policy actions that is not conducive to innovation, lack of access to funding, weak contract enforcement, less developed local labour markets, networks and relationship or knowledge networks. Yang et al. [49] also add legislative and bureaucratic systems to the significant external factors, as well as the so-called social competences of people, which must also be accentuated by corporate strategies. Güngör and Gözlu [50] stressed the importance of customer expectation (local demand) and competition.

Currently, many researchers are paying attention to the benefits of opening-up a sustainable innovation process through cooperation. In this way, additional knowledge and technology can be obtained that will complement the company's in-house resources and support (possibly streamline) internal research activities [51]. Liu & Liu [52] have shown that external knowledge resulting from collaboration can be a more important source of innovation than existing in-house knowledge. García-Muiña et al. [53] point out, however, that this way of acquiring knowledge is expensive and may be associated with legislative risks.

There is also a group of studies (e.g. [54,55]) that has looked at the importance of breadth and depth of external knowledge for innovation.

The previously mentioned studies have dealt with individual determinants of innovation activities of companies in various countries and industries. However, while different needs and interests emerge in different communities [56], less scholars are dealing with different combinations of different determinants and their impact on innovation. Moreover, even less, they deal with their impact on the fulfilment of business strategies. This may be because there are many factors, and few studies deal with the common influence of internal and external determinants. One exception is Vega-Jurado et al. [38]. However, it is crucial for efficient functioning of sustainable national innovation ecosystems. This is because finding proper combinations of various determinants influencing different innovations for sustainable development is a key challenge [57]. In addition, a suitably designed business model, in which companies successfully apply innovative strategies, creates the background and framework for sustainable innovations [58]. Moreover, Shakeel et al. [59] show that there are analogies between business models and sustainable (innovation) business models, while these models and proper innovation strategies represent a future to deal with sustainability challenges.

This study therefore builds on the above-mentioned literature review that highlights the crucial role of factors such as knowledge and innovation [60], and proposes a new conceptual framework for the Dynamic Innovation Strategy Model (DISM; Figure 1), which is a prerequisite for building effective national innovation ecosystems where firms are able to capture economic value and still maintain (or regenerate) economic and social, as well as natural, capital [61]. The model sums up the necessary drivers of each firm's innovation environment (microeconomic view), but also a region or state (macroeconomic view) and helps to understand how these issues relate to firms' strategies and business models, and how they could be connected to innovation ecosystems which represent dynamic networks, including various actors in different spheres [62] and generating innovations [63].

The model perceives continuity and processes between attributes, including effectiveness of innovation processes. Its new elements are the pursuit of dynamic changes and business strategies, which are a vital strategic asset of any business that has the ability to influence other variables in this model as well as its surrounding innovation environment (ecosystem). It is crucially needed within CEE countries, which, unlike Western European countries, lack functional models of their innovation

ecosystems and have previously faced low productivity growth and mismatch between R&D and education system outcomes and industry needs [64].

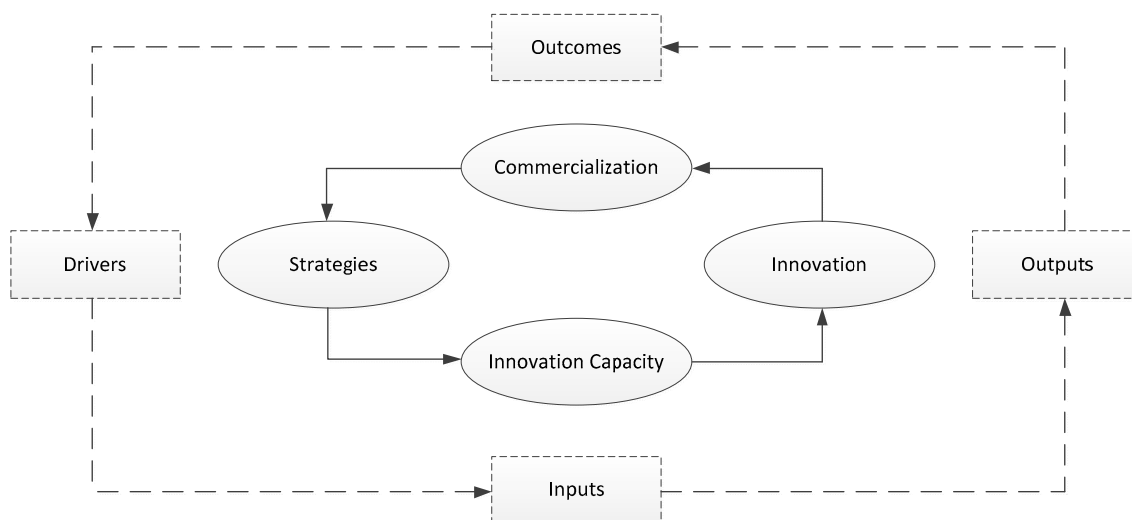


Figure 1. Dynamic Innovation Strategy Model; Source: own processing.

DISM describes general relationships in an innovation system. It can, however, help to unite analytical views on innovation processes, even within the diverse economies of various developed countries. Conclusions from previous research show that the situation in different European countries varies considerably. For example, Griffith et al. [65] found significant differences in diverse productivity resulting from different outcomes of innovation processes in various EU countries (France, Germany, Spain, and the UK—innovation leaders). Prokop et al. [66] showed different influence of knowledge economy determinants (e.g., cooperation and R&D activities) on firms' turnover in another group of different EU countries—in the Czech Republic, Hungary, and Slovakia—moderate innovators. It can be assumed that moderate innovators have the greatest development potential. If business managers from companies of innovative moderator countries know the key determinants (key to competitive advantage) of innovative leaders, they can tailor their managerial decisions and adjust the company's development strategies. To verify the validity of these claims, the following research question was defined:

*RQ: Are innovation leaders and innovation followers from countries belonging to the group of Moderate Innovators influenced by different innovation determinants?*

Arora et al. [67] assume these differences and state that companies make decisions based on the market situation and their own position in the market (whether they are leaders, followers, or weak innovators). According to their findings, innovative leaders have less ability to work within the unintended spill-over effects (they have less control over them, and their rivals benefit from this situation). Battisti et al. [68] describe that there are significant differences in the group of innovation leaders and followers. They highlighted that radical innovations occur exclusively in knowledge-intensive companies with strong in-house R&D.

Moderate innovators are not able to create novel innovations; therefore, they usually innovate e.g., via imitation and reverse engineering [69]. Zhang & Gallagher [70] focused on corporate strategies. They encourage companies to dynamically change their strategies in the context of environmental change, as well as changes in their internal skills and competencies. They can be inspired (benchmarked) by innovative industry leaders. For these reasons, this research follows the findings of Grimpe et al. [71] and has included marketing innovations in the choice of research determinants. Marketing innovations can affect new product performance and its interaction with R&D and assume the significance of marketing innovations within countries belonging to the group of Innovation Followers that are not able to fully exploit their R&D potential.



Therefore, the main aim of this paper is to identify the combination of innovation determinants driving creation and sustaining innovation leader competitive advantage in selected EU countries belonging to the group of moderate innovators and propose their incorporation into the innovation follower's strategy.

### 3. Data and Methodology

The data for the analyses were collected by Eurostat and published as Community Innovation Survey (CIS) 2012–2014. This survey uses a harmonized questionnaire created for all EU Member States and combines stratified random sampling with exhaustive surveys. Unfortunately, newer data is not available. The available data is used to provide evidence that the proposed DISM model presented in the paper provides significant results. However, the authors consider the outdated data to be a limitation of the present research.

The dataset exclusively contains companies with more than 10 employees. For the analyses, the data representing Moderate Innovators countries were used (according to the Innovation Performance Scoreboard 2012 created by the European Commission). This includes Croatia (123 firms), Greece (420 firms), Spain (2529 firms), Czech Republic (707 firms), Hungary (255 firms), Lithuania (274 firms), Portugal (1104 firms), and Slovakia (128 firms). These are countries that have brought their innovation performance closer to the EU's average innovation performance, according to the latest European Innovation Scoreboard. The second condition for the company to be included in the dataset was that the company had had to launch a new product, undertake process innovation, or carry out at least organizational innovation. This decision is in line with the above-mentioned definition of innovation and a study by Damanpour et al. [72], who confirmed that the performance of a company depends on the implementation of various types of innovation or co-adoption of different innovation types rather than the adoption of a single innovation type.

It should be noted that not all businesses in the dataset answered all the questions. The dataset was therefore adjusted—the missing values were replaced by the median values for the countries and sectors concerned. The dataset can be characterized using the data in Table 1.

**Table 1.** Descriptive statistics of selected countries (in %).

	HR	EL	ES	CZ	HU	LT	PT	SK
Participation in the firm group	40.7	30.7	50.7	61.4	60.8	51.8	38.9	71.1
In-house R&D	68.3	72.9	74.6	74.4	67.1	54.7	60.1	65.6
External R&D expenditure	45.5	38.6	35.1	47.9	29.8	29.6	38.9	29.7
Acquisition of equipment	93.5	87.9	34.9	82.3	87.5	80.7	72.3	79.7
Acquisition of external knowledge	41.5	49.8	4.5	26.3	22.7	33.6	25.1	34.4
National public financial support	37.4	26.6	34.2	39.6	25.9	18.6	33.9	5.5
Financial support from the EU	5.7	13.8	13.2	29.4	35.7	35.1	18.7	8.6
Cooperation on innovation	56.9	70.5	58.3	61.4	68.6	63.7	39.1	74.2

Legend: HR = Croatia, EL = Greece, ES = Spain, CZ = Czech Republic, HU = Hungary, LT = Lithuania, PT = Portugal, SK = Slovakia. Source: Authors processing.

The binary logistic regression analysis using the ordinary least squares (OLS) estimator was chosen for the analysis because the input data were binary variables. The relation between input and output variables was analysed (discrete Y responses with two values 1 or 0). This method is used when the relationship between two variables needs to be examined (for similar previous related studies, see [73,74]).

Input data quality testing was performed. According to a methodology set by Hudec et al. [75], data were tested for collinearity. The Spearman correlation coefficient ( $\rho$ ) was used, which found that the correlation between variables is significantly different from zero ( $\rho$  ranges between  $-1 \leq \rho \leq 1$ ). Independent variables were also tested for collinearity using Variance Inflation Factor (VFI) for each

regression model. Multicollinearity was not found; all models had VIF < 5. All tests were performed in IBM SPSS.

The methodological process consists of two main steps:

1. In the first step, the authors followed the analytical part and analysed what innovation factors determine companies' innovations while they focused on firms' product innovations (note: because of data availability, the authors did not focus on eco-innovations, however, it is an important challenge for future research). According to Le Bas [76], the authors expect that product innovations could also have some properties of environmental innovation and their successful creation can create a prerequisite for the efficient functioning of innovative ecosystems and subsequent introduction of environmental innovations. Moreover, according to Sousa-Zomer & Miguel [24], sustainable development requires different innovations that, when based on business models concepts, can be more efficient. To support these effects, this research also distinguishes between two specific innovation groups (leaders vs. followers).

To reveal the impact of factors determining companies' innovations, the process started with binary regression analyses of selected countries belonging to the group of moderate innovators. Only firms that introduced product, process, and organizational innovations together were analysed. Moreover, in every country, the authors distinguished between innovation leaders (introduced innovations new to the market) and followers (introduced innovations new to the firm).

Data of individual countries were processed separately. The following groups of variables (dependent and independent) were included in the models: R&D var., innovation cooperation, and marketing innovation. For details, please see Table 2, where all the factors are described. Note that according to the CIS questionnaire, firms answered questions on whether some of those activities were realised during the three years—2012 to 2014; only one answer (1 or 0) was obtained for this period. The variables were chosen according to the above-presented review of references. It was also necessary to consider the availability of primary data in the CIS questionnaire.

**Table 2.** Variables of the proposed model.

<b>Outputs (Dependent Var.)</b>	
<b>NEWMKT</b>	Firm introduced a new or significantly improved product into market before their competitors (Innovation Leader in the market).
<b>NEWFRM</b>	Firm introduced a new or significantly improved product that was already available from their competitors in the market (Innovation Follower in the market).
<b>Inputs (Independent Var.)</b>	
<b>RRDIN</b>	Research and development activities undertaken by firm to create new knowledge or to solve scientific or technical problems (include software development in-house that meets this requirement). Internal R&D and capabilities are key for managing innovation in order to integrate inflows of knowledge with internal innovation activities; successfully apply knowledge from internal and external sources; and direct innovation actions [77].
<b>RRDEX</b>	R&D that firm has contracted out to other firms (including other firms in their group) or to public or private research organisations. These external sources of knowledge may account for a substantial share of complementary inputs necessary for the development of successful innovations [78] and other different performance outcomes such as patenting, organizational growth, and manufacturing procurement efficiency [79].
<b>RMAC</b>	Acquisition of advanced machinery, equipment, software, and buildings to be used for new or significantly improved products or processes. Generally, import of external capital (also called hybrid resources) seems to be one of the dominant activities influencing firms' innovation [80]. The acquisition of machinery and software can also enhance the performance of business processes, which in turn might enhance a firm's material and eco-efficiency [81].

Table 2. Cont.

Outputs (Dependent Var.)	
NEWMKT	Firm introduced a new or significantly improved product into market before their competitors (Innovation Leader in the market).
NEWFRM	Firm introduced a new or significantly improved product that was already available from their competitors in the market (Innovation Follower in the market).
Inputs (Independent Var.)	
ROEK	Acquisition of existing know-how, copyrighted works, patented, and not-patented inventions, etc. from other firms or organisations for the development of new or significantly improved products and processes. It is essential for firms because they increasingly rely on a combination of internal and external sourcing that have an absolute positive effect on the firm's new knowledge generation capability [82]. In-house or contracted out training for firms' personnel, specifically for the development and/or introduction of new or significantly improved products and processes. Innovation training has the potential to help firms create more successful product offerings and innovation [83]. For example, Naranjo-Valencia et al. [19] show that training is closely related to non-technological innovation (organisational and marketing innovation), but it could also support technological innovation (innovation in products and processes).
RTR	In-house or contracted out activities for the market introduction of new or significantly improved goods or services, including market research and launch advertising. The constant and successful market introduction of new products is of major concern to companies in all industries. It is clear because bringing new products successfully to the market contributes substantially to long-term financial success and represents an effective strategy to enhance primary demand as well as foster the competitive position of the company [84].
RMAR	In-house or contracted out activities to design or alter the shape or appearance of goods or services that play crucial roles in creating innovations and new forms of value co-creation with customers, organizations, and societal actors in general [85].
RDSG	Other in-house or contracted out activities to implement new or significantly improved products and processes such as feasibility studies, testing, tooling up, industrial engineering, etc.
RPRE	Cooperation on any innovation activities with other firms or institutions. It is valuable because it pools firms' complementary capabilities and could lead to increases in the amount of innovative output or total created value, even when R&D expenditures are held constant [86].
CO	Significant changes to the aesthetic design or packaging of a good or service (exclude changes that alter the product's functional or user characteristics; [87]).
MKTDGP	New media or techniques for product promotion (i.e. first time use of a new advertising media, new brand image, introduction of loyalty cards, etc.).
MKTPDP	New methods for product placement or sales channels (i.e. first time use of franchising or distribution licenses, direct selling, exclusive retailing, new concepts for product presentation, etc.).
MKTPDL	New methods of pricing goods or services (i.e. first time use of variable pricing by demand, discount systems, etc.). Innovative product design, packaging, pricing, promotion strategies can be a promising source of innovative product performance, even if the innovative products are not based on technological innovation [71].
MKTPRI	

Source: descriptions of the variables were adopted from CIS questionnaire.

Most often, new or significantly improved products are used in similar analyses as output of innovative processes and are easily measurable [88]. It has already been argued above that a new or improved product (innovation) is an essential key element in fulfilling a corporate strategy if the market position is improved or a new position on a foreign market is to be gained [89]. Based on this assumption, the authors can distinguish between innovation leaders and followers. In the proposed model, innovative inputs were used with respect to the results of literature search. Thanks to them, an internal and external driver were discovered, which determine the efficiency of innovation processes



in the company. This aspect complements existing models with a managerial perspective. Within this framework a combination of inputs was applied: the traditional determinants such as in-house R&D activities, technological infrastructure or market-related activities, where a positive effect on performance has been already explored [26,41], are complemented by lesser-studied determinants, where the influence is still debatable (cooperation or acquisition of external knowledge). One reason is that the existing studies have revealed an interconnection among these determinants [90]. Other studies recommend using and acquiring knowledge from an external environment. This is due to lower costs and higher acquisition dynamics [67]. In addition, this approach brings a higher added value in the technological value chains of the company. Often, companies implement their own marketing innovations [91].

2. In the second step, researchers have identified the predictors whose variables fundamentally affect the production of innovation across EU countries. An analysis of the aggregate dataset (a combined data set from eight countries) is performed. Using this procedure, it is possible to obtain results that are significant for all countries in the sample (i.e. for the moderate innovators group). Not all countries had the same number of elements in the file. Therefore, in the framework of methodological adjustments, the sample sizes were adjusted (reduced by random sampling; Portugal and Spain) to be identical. The sample sizes were: LT 274, HR 123, EL 420, HU 255, PT 552, ES 843, CZ 707, and SK 128 firms.

#### 4. Results

The results of the regression models for individual selected countries as well as for the whole group of countries (innovation leaders and followers) are shown in Table 3.

From the Table 3 above, it is clear that in-house R&D is the most positively significant innovation activity that influences the creation of new products for innovation leaders within countries belonging to the group of moderate innovators according to the European innovation performance scoreboard. This factor is positively significant in all countries surveyed, most strongly in the Czech Republic, Spain, Portugal, and Hungary. This is clear because internal R&D and knowledge increase firms' absorptive capacity and stock of prior knowledge, and also leads to savings because firms are not forced to buy external knowledge from the market. In-house R&D allows firms to effectively scan, screen, and absorb external know-how which (when combined with other company's assets) help the company to achieve synergy effects [92]. Within the company's internal environment, internal knowledge can include knowledge acquisition, transfer or diffusion, as well as in-house research and development, in-house training and the promotion of creativity and innovation to increase innovation [93]. Therefore, firms do not need to invest in external R&D and innovation training (see below).

The second strongest positively significant factor in this group of innovation leaders is market-related activities, including market research and launch advertising. It seems to be critical because firms need to reconcile customer-based value creation and innovation with market values for firms and it is necessary to strengthen own competitive position in both international and domestic markets [94]. If the company management correctly evaluates the market situation and the company has sufficiently dynamic processes, it can estimate future trends and focus on innovations in this direction. This will significantly strengthen its competitive edge and can become an innovative leader [95]. However, this is not easy in practice and is a very costly and risky operation. It is less risky to engage in a collaborative network and systematically work on innovation within the company. However, this requires voluntarily providing knowledge, trust, and willingness to cooperate, as well as improving foreign products, which can strengthen competition [96]. This collaboration can only take place virtually; online communities according to Mahr & Lievens [97] are a potential source of new ideas and knowledge.

Table 3. Regression model results.

	Czech Republic		Greece		Spain		Croatia	
	Leader NEWMKT	Follower NEWFRM	Leader NEWMKT	Follower NEWFRM	Leader NEWMKT	Follower NEWFRM	Leader NEWMKT	Follower NEWFRM
RRDIN	0.001 *** (0.642)	0.152 (−0.367)	0.092 * (0.454)	0.040 ** (0.618)	0.000 *** (0.823)	0.077 * (−0.212)	0.446 (0.358)	0.875 (−0.095)
RRDEX	0.737 (−0.060)	0.281 (0.238)	0.546 (0.155)	0.219 (0.366)	0.017 ** (0.231)	0.049 ** (0.215)	0.057 * (0.882)	0.491 (−0.378)
RMAC	0.029 ** (0.472)	0.299 (0.268)	0.021 ** (−0.912)	0.054 * (0.705)	0.067 * (−0.171)	0.299 (0.110)	0.474 (−0.651)	0.015 ** (2.097)
ROEK	0.692 (−0.080)	0.954 (0.015)	0.687 (0.099)	0.007 *** (0.765)	0.173 (0.294)	0.424 (−0.188)	0.649 (0.202)	0.820 (0.121)
RTR	0.351 (−0.203)	0.988 (−0.004)	0.047 ** (−0.551)	0.193 (−0.406)	0.496 (−0.064)	0.853 (0.020)	0.361 (0.502)	0.737 (−0.249)
RMAR	0.001 *** (0.669)	0.328 (−0.254)	0.002 *** (0.791)	0.254 (−0.338)	0.268 (0.102)	0.467 (−0.076)	0.240 (0.561)	0.809 (−0.143)
RDSG	0.244 (0.233)	0.242 (0.293)	0.841 (0.053)	0.352 (0.275)	-	-	0.225 (0.574)	0.524 (−0.386)
RPRE	0.955 (0.013)	0.583 (0.149)	0.256 (0.304)	0.337 (−0.296)	0.836 (0.026)	0.261 (0.166)	0.336 (−0.444)	0.294 (−0.619)
CO	0.233 (0.207)	0.625 (0.104)	0.571 (0.147)	0.140 (−0.451)	0.000 *** (0.477)	0.344 (−0.098)	0.383 (−0.393)	0.374 (0.481)
MKTDBG	0.006 *** (0.512)	0.083 * (−0.420)	0.551 (0.147)	0.760 (0.086)	0.002 *** (0.277)	0.812 (0.024)	0.965 (−0.020)	0.387 (−0.502)
MKTDPD	0.961 (0.010)	0.401 (0.205)	0.157 (−0.369)	0.833 (0.061)	0.766 (−0.031)	0.122 (0.186)	0.179 (−0.698)	0.613 (0.312)
MKTDDL	0.548 (0.125)	0.325 (0.254)	0.194 (0.377)	0.824 (−0.073)	0.002 *** (0.353)	0.382 (−0.111)	0.312 (0.576)	0.851 (0.119)
MKTPLR	0.941 (−0.016)	0.373 (0.251)	0.494 (−0.171)	0.083 * (0.513)	0.808 (0.026)	0.390 (0.105)	0.824 (−0.103)	0.893 (0.074)
	Hungary		Lithuania		Portugal		Slovakia	
	Leader NEWMKT	Follower NEWFRM	Leader NEWMKT	Follower NEWFRM	Leader NEWMKT	Follower NEWFRM	Leader NEWMKT	Follower NEWFRM
RRDIN	0.003 *** (1.001)	0.103 (−0.547)	0.049 ** (0.568)	0.127 (−0.538)	0.000 *** (0.618)	0.053 * (−0.292)	0.044 ** (0.950)	0.695 (−0.187)
RRDEX	0.472 (0.289)	0.813 (0.081)	0.012 ** (0.867)	0.710 (0.151)	0.430 (−0.118)	0.542 (−0.093)	0.851 (−0.099)	0.308 (−0.516)
RMAC	0.017 ** (−1.415)	0.262 (0.463)	0.437 (−0.269)	0.733 (0.136)	0.975 (−0.005)	0.472 (0.113)	0.014 ** (−1.570)	0.444 (−0.423)
ROEK	0.053 * (0.885)	0.957 (−0.020)	0.710 (0.119)	0.187 (0.515)	0.112 (0.261)	0.718 (−0.059)	0.562 (−0.303)	0.198 (0.664)
RTR	0.642 (0.165)	0.921 (0.033)	0.079 * (−0.593)	0.618 (−0.192)	0.689 (−0.063)	0.634 (0.079)	0.391 (−0.445)	0.881 (−0.073)
RMAR	0.184 (0.446)	0.006 *** (−0.890)	0.515 (0.221)	0.761 (0.121)	0.000 *** (0.696)	0.038 ** (−0.330)	0.352 (0.478)	0.176 (−0.674)
RDSG	0.982 (0.008)	0.141 (0.495)	0.245 (0.388)	0.979 (−0.010)	0.825 (0.033)	0.196 (0.203)	0.044 ** (1.172)	0.590 (0.315)
RPRE	0.319 (−0.348)	0.936 (−0.025)	0.279 (0.349)	0.969 (−0.015)	0.135 (0.211)	0.346 (−0.139)	0.506 (−0.330)	0.851 (−0.089)
CO	0.668 (0.143)	0.331 (−0.313)	0.219 (−0.368)	0.406 (0.292)	0.010 ** (0.387)	0.090 * (0.264)	0.015 ** (1.288)	0.920 (0.049)
MKTDBG	0.301 (0.441)	0.441 (0.284)	0.247 (0.378)	0.868 (0.064)	0.972 (0.005)	0.229 (0.184)	0.139 (0.770)	0.718 (−0.186)
MKTDPD	0.598 (0.188)	0.679 (0.135)	0.425 (0.258)	0.402 (0.326)	0.777 (0.042)	0.957 (0.008)	0.452 (−0.397)	0.771 (0.149)
MKTDDL	0.841 (0.085)	0.958 (0.020)	0.170 (−0.513)	0.727 (−0.157)	0.024 ** (0.364)	0.726 (−0.058)	0.701 (0.215)	0.301 (0.585)
MKTPLR	0.612 (0.204)	0.565 (0.203)	0.678 (0.151)	0.059 * (0.862)	0.841 (0.03)	0.138 (0.232)	0.595 (−0.278)	0.022 ** (1.405)

Legend: \* statistically significant at  $p = 0.10$ , \*\* at  $p = 0.05$  and \*\*\* at  $p = 0.01$ ;  $p$ -values are shown in Table 3 and Beta coefficients are shown in brackets and denote whether an independent variable caused increase or decrease of firms' innovation activities. Source: Authors' processing.

The third most positively significant factor affecting innovation leaders are activities related to design, that which alter the shape, appearance, or usability of goods or services. The design makes it easy to distinguish two products from one another [98]. Product design is essential to create a group of customer followers. The more demanding a customer, the more he demands innovation, which is stimulating for the business [99]. Companies often also focus on marketing innovations, which can be an important part of innovation processes. The influence of other activities like external R&D,

acquisition of knowledge, cooperation, and marketing innovation related to promotion and pricing cannot be clearly identified.

Contrary to that, the most negatively significant activity (except one in all countries) is the acquisition of advanced machinery, equipment, software and buildings. Surprisingly, the negatively significant factors also belonged to activities for training of personnel for the development and introduction of product innovation. There are several possible explanations, but most likely, in-house research is potent enough, providing enough incentives to generate innovation. The results of the study show that low dynamics in the organization or business processes can be an obstacle to the transfer and use of knowledge and skills within the company. This often happens for two reasons. First, Antons & Piller [100] have proven that knowledge is a part of human capital and can only be absorbed or transmitted or put into practice by human. However, when it comes to absorbing external knowledge for innovation, the most frequently mentioned bias influencing individual decision making is the not invented-here syndrome (NIH). This syndrome characterizes a human's negative attitude to knowledge and technology that come from the external environment. Symptoms of this syndrome can be observed in ICT and old people.

Hussinger & Wastyn [101] complement this theory and state that the effectiveness of adapting new knowledge in the environment is dependent on the openness of workers to new technologies. Workers must not feel that new technologies and knowledge will deprive them of their jobs. If these changes in the corporate culture are not sufficiently communicated, there are barriers to the creation and implementation of innovations. Coalitions against change, including resilience to radical innovations, can also emerge. All this threatens the company's position in the market and the dynamics of innovation. One more obstruction is to be considered, and the thesis is that all innovation systems work with a certain delay [102].

Interestingly, we show that what is true for innovation leaders does not apply to innovation followers. It is in accordance with Stiglitz [103], who states *that what is optimal for a leader may be different from that which is optimal for the follower*. Applying this thesis, it can be argued that innovation leaders can earn additional revenues from applying the right corporate strategy in the future, while innovative followers only get average returns [104]. On the other hand, innovative followers can draw on the spill-over effects of knowledge that spread uncontrollably in the economic system. If it uses these effects correctly, it gains additional returns that reduce the "returns gap" between the innovation leader and the innovation follower [105]. The behaviour of innovative leaders can therefore serve as a benchmark for innovative followers. Here, the most positively significant factor influencing innovation followers is marketing innovations related to product promotion and pricing. These results are consistent with empirical studies that analyse the conditions for innovation. According to Chen [87], the size and market situation strongly determine the emergence of marketing innovations. Innovation followers emphasise these kinds of marketing innovation because they feel safe and competent in that. The second most positively significant innovation activity of innovation followers is acquisition of machinery and other equipment. This is the case when the results are exactly the opposite of the innovation leaders. The same situation is repeated in in-house R&D, which is the most negatively significant factor for innovation followers.

In accordance with research methodology, the second step in research was also taken. Dataset from eight selected EU countries was created and its analysis will be able to obtain results valid for all countries in the file moderate innovators. According to Lang et al. [106], Macko & Donahue [107] or Mawlawi et al. [108], in the current globalised world, firms that belong to the specific group according to their innovation performance (e.g., leaders and followers) commonly share similar characteristics, even though they are innovating in another country. The authors therefore assume that selected European firms, divided into groups of innovation leaders and followers, share the same characteristics in terms of participation in the group of companies, market orientation, and public funding. Therefore, to check the results, three control variables were added to the logistic regression model—participation

in the group of companies (GP), market orientation (MARKET) and public funding (FUND). The results are shown in Table 4.

**Table 4.** Regression model for the crucial innovation variables.

		R&D activities							
		RRDIN	RRDEX	RMAC	ROEK	RTR	RMAR	RDSG	RPRE
<b>Target group (8 selected EU countries)</b>	Leader	0.000 ***	0.719	0.266	0.173	0.046 **	0.000 ***	0.026 **	0.755
	(NEWMKT)	(0.545)	(0.036)	(−0.129)	(0.140)	(−0.210)	(0.594)	(0.229)	(0.031)
	Follower	0.145	0.783	0.064 *	0.013 **	0.375	0.003 ***	0.016 **	0.575
	(NEWFRM)	(−0.166)	(0.030)	(0.229)	(0.284)	(−0.104)	(−0.346)	(0.277)	(0.063)
<b>Germany</b>	Leader	0.000 ***	0.922	-	-	-	-	-	-
	(NEWMKT)	(0.728)	(−0.017)	-	-	-	-	-	-
	Follower	0.018 **	0.413	-	-	-	-	-	-
	(NEWFRM)	(−0.755)	(0.177)	-	-	-	-	-	-
		Coop.		Marketing			Control Var.		
		CO	MKTDGP	MKTPDP	MKTPDL	MKTPRI	GP	MARKET	FUND
<b>Target group (8 selected EU countries)</b>	Leader	0.009 ***	0.005 ***	0.155	0.094 *	0.583	0.516	0.567	0.182
	(NEWMKT)	(0.251)	(0.285)	(−0.145)	(0.187)	(0.058)	(0.061)	(−0.054)	(0.126)
	Follower	0.912	0.597	0.047 **	0.901	0.023 **	0.986	0.296	0.325
	(NEWFRM)	(−0.012)	(−0.059)	(0.224)	(0.015)	(0.268)	(0.002)	(−0.110)	(0.103)
<b>Germany</b>	Leader	0.000 ***	0.002 ***	0.459	0.441	0.219	-	-	-
	(NEWMKT)	(0.705)	(0.515)	(0.128)	(0.134)	(0.220)	-	-	-
	Follower	0.020 **	0.604	0.109	0.017 **	0.844	-	-	-
	(NEWFRM)	(−0.509)	(0.113)	(0.360)	(−0.532)	(−0.044)	-	-	-

Legend: \* statistically significant at  $p = 0.10$ , \*\* at  $p = 0.05$  and \*\*\* at  $p = 0.01$ ;  $p$ -values are shown in Table 4 and Beta coefficients are shown in brackets and denote whether an independent variable caused increase or decrease of firms' innovation activities. Source: Authors processing.

The strategy that is apparent from the above-mentioned results (Table 4) is confirmed even in the overall results for all moderate innovators. Moreover, it reveals other interesting facts:

The most positively significant innovation activities influencing development of innovative products (in-house R&D, market-related activities, marketing innovation related to design and packaging) in the group of innovation leaders were all negatively significant for the group of innovation followers. On the other hand, R&D activities influence the firms' innovation of both leaders and followers. Firms therefore must properly find significant determinants according to their innovation group. In addition to previous findings, cooperation is added to these activities. Cooperation represents one of the most important sources of innovation and competitive advantage. Van Beers & Zand [109] have demonstrated with their results that collaboration is a stimulating part of the business environment and leads to active learning among cooperating partners. The expected result is therefore an increase in the company's innovative capacity. Therefore, both active (e.g., within innovation networks) and passive (e.g., through sectors' spill overs) cooperation could significantly influence firms' innovation [110]. Conversely, there are significant differences in the firms' incentives to become part of the networks. Small companies tend to be a part of innovation networks and groups of companies for the marketing purposes or to gain competitive advantages. Collaborative knowledge can be the source of this benefit, but also the certainty of being part of a large group of businesses and a certain prestige that helps in attracting collaborative partners [111]. On the other hand, large companies are not forced to cooperate and create networks because they do not want to share their costs, knowledge, and technologies.

The design and marketing innovations related to product placement have a positive influence for innovation leaders as well as innovation followers; for the leaders, the significance is stronger. This result again underlines the importance of product design for innovation performance. On the contrary, acquisition of machinery and other equipment and marketing innovation related to product promotion negatively influences the development of innovation products for the innovation leaders, while positively for the innovation followers. Training for innovative activities has negative influence for both the groups. Other activities (RRDEX, ROEK, RPRE, MKTPRI) positively contribute to the creation of new products, but only very weakly.

For an even deeper understanding of the factors influencing innovation performance and their verification, the same analysis was also carried out in Germany (the same data from CIS question form; some of them are not available—see Table 4), which has long been one of the innovation leaders according to the European Innovation Scoreboard. Moreover, German firms are creating important cooperative networks with European competitors, public sector clients, governments, research institutions, and universities [112]; and the German government has published several strategies and action plans supporting creation of sustainable innovation [113]. According to Holger et al. [114], the German society successfully achieved sustainable development goals through innovation paths set by the German government. Therefore, it can be assumed that Germany, as a benchmark, will be able to provide relevant information for other countries, especially the countries of Central and Eastern Europe (CEE). These countries have a similar historical experience with a centrally planned economy and long-term isolation from Western Europe and its innovation and sustainable ecosystems [115].

The analysis revealed the same results for the innovation leaders, with the difference that all marketing innovations are positively influencing the output and conversely external R&D negatively. German innovation leaders can fully exploit the potential of marketing innovations, which can play a vital role in building and sustaining a company's competitive advantage. Moreover, cooperation is strongly positively significant for innovation leaders and negatively significant for innovation followers.

## 5. Discussion

The main benefits (contributions) of this study can be seen both on the theoretical and practical level. While there are significant differences in innovation activities within the EU, we extend the current state of knowledge and provide, on a theoretical basis, a Dynamic Innovation Strategy Model and interesting way of analysis, which takes into account the new perspective on the role of firms in terms of their innovation performance (innovation leaders and followers) within select European countries. Unlike previous studies that have compared individual countries, whether they are innovation leaders or followers (in terms of innovation performance), we compared companies within these selected countries and showed significant differences between innovation leaders and followers. Moreover, our results show that significant determinants of innovation activities influencing development of innovative products in the group of innovation leaders are all negatively significant or insignificant within the group of innovation followers in these countries. It helps to better understand the role of R&D activities. Internal R&D, unlike external R&D, represents one of the key determinants of firms' innovation activities that were used by innovation leaders across the select European countries.

The results of the proposed model are in line with previous studies. For example, Denicolai et al. [116] found that internal research produces new knowledge differently, with fluctuations over time. This is mainly due to the revolutionary emergence of knowledge. They postulate that internal research is more effective in the long term, whereas knowledge transfers and acquisition in the short term. An important addition is that a condition of effective external knowledge acquisition is a sufficiently high-quality in-house basis for the application of external knowledge. It is important to ensure a balance between external and internal knowledge generation. Estrada et al. [117] emphasize that internal R&D and knowledge sharing reduce the gap between the company's innovation potential and realized innovation volume. Sofka & Grimpe [118] add that in-house investment in science and research is most effective when combined with a market-oriented search strategy. Du et al. [119] have shown that focusing the company's strategy on market needs or market-based partnerships promotes a more prominent role in co-operation networks, creating access to various innovative activities of other companies in the market or market segment. For this reason, it is appropriate to embed the principle of establishing a business partnership or alliance in sustainable corporate strategy. Moreover, Dahlander & Wallin [120] and West & Lakhani [121] also proposed other various sources of market innovation (communities and communities of practice).

On a practical level, we focus on firms, managers, and policy makers and propose some practical implications. First, firms wishing to develop highly innovative products must have a strong in-house



R&D system, which is key to building the company's innovation capabilities. Research findings show that the effectiveness of companies' science and research activities depends on their employees, their potential, and their ability to learn. It is only through them that innovation activities can be realized. Therefore, it is essential to invest in the quality of workers and develop their potential. External R&D should be used especially for projects that require expertise not available in-house or a totally different perspective. This means that managers should seek for skilled labour forces that help to meet strategic goals of the company. At the same time, managers must be able to anticipate the situation in globalized markets and respond effectively to the needs of the end customers. Similarly, it is impossible to forget to support the remember ability of their own brand through the design and care of existing customers. Moreover, for firms that want to be successful within the rapidly changing environment of innovation ecosystems—both radical innovation leaders and incremental innovation followers—it is also crucial to incorporate into firms' strategies R&D investments in sustainability-oriented innovation infrastructure, skilled human resources, and modern technology [122].

Secondly, managers must promote systematic cooperation in complex technological innovations. The results of the study show that the success of a company depends on a number of indicators and determinants, many of which can be positively influenced by the company's ability to cooperate with partners. This is crucial for the building of efficient national innovation ecosystems where complex cooperation between various agents results in both sustainable and conventional innovation [123]. It allows the creation of knowledge spillovers in research and development, both vertical and horizontal that are important because it could significantly affect various modes of sustainable innovative activities [124,125]. This conclusion is consistent with the results of a study by Atallah [126]. All this must be reflected in the corporate strategy, which will make it clear that innovation is an important means of achieving corporate and sustainable goals. As early as 1994, Gilbert [127] recommended companies to have a special innovation strategy.

Finally, it should be remembered that public policies and public spending programs must also consider the results of this research. It is not possible to define general policy objectives, but rather to see the need for diversified support, depending on whether it is an innovative successor or a leader. A more rigorous definition of public policies is to increase the efficiency of the public support system as well as to increase sustainability and avoid innovation paradox or innovation failure. In the context of sustainable development, public policies and public funding should be aimed to underline the social contract for science and to support research practices that could help to connect science to sustainability [128]. Moreover, it should help to avoid barriers of efficient sustainable innovation ecosystems. These are, according to Bocken & Geradts [129], institutional (e.g., uncertainty), strategic (e.g., prioritizing short-term growth), and operational (e.g., fixed resources).

## 6. Conclusions

These results confirm the validity of the proposed Dynamic Innovation Strategy Model, as well as presented assumption that its individual determinants differ among countries with different innovation performance. The results allowed us to answer the above-defined research question. It can be stated that there is a different intensity of the individual determinant groups for Innovation Leaders and Innovation Followers from countries belonging to the group of Moderate Innovators. In summary, it can be recommended to the companies to incorporate these unique combinations of innovation factors into sustainable strategies:

- Innovation leaders: in-house R&D, cooperation, market-related activities (market research and launch advertising) and design
- Innovation followers: acquisition of existing know-how, copyrighted works, patented and no patented inventions, machinery acquisition, new media or techniques for product promotion, new methods of pricing goods or services and design.

These results provide a benchmark for innovation followers because firms within this group of innovators focused primarily on marketing innovation or on the acquisition of machinery and other equipment. To become more innovative and support innovation activities, these firms should focus on activities that are successfully used by innovation leaders in their countries as well as within all countries together.

This research has some limitations. The first is the quality of primary data. The primary data comes from Eurostat and is properly processed. However, the models worked with anonymized data and the quality of the research target group could not be verified. The authors assumed that this is data used by a number of scholars who make a number of significant conclusions. The second limitation is the age of the data itself. Unfortunately, the most recent data is from 2014 and the captured fact from business practice is so slightly obsolete. A certain problem may also be the time delay between the implementation of the innovations and the output, influencing the output variables respectively. However, there are studies that perceive time lag as a continuous matter, not an obstacle to the realization of research. Thirdly, the conducted analyses work with firms' product innovation (not eco-innovations); however, according to Silvestre [130] and Carayannis et al. [131], enhanced sustainability performance, as well as organizational sustainability, which are key prerequisites for efficient innovation ecosystems, cannot be achieved without different kinds of innovations. Moreover, these limitations create a challenge for future research.

Future research should be geared towards exploring whether firms belonging to innovation leaders or followers are adapting their strategies according to research findings and, if so, whether it helps them to influence the fulfilment of their business goals or other obstacles that need to be removed so that innovation activities are realized more to represent a real competitive advantage. An interesting goal of the followers' next research is to focus on sustainable-oriented innovation and see if the same indicators apply to the creators of this kind of innovation. Therefore, the authors also plan to conduct subsequent analyses that will focus on firms' eco-innovations in terms of products and processes innovations.

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