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## Article

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## Article

# European Fund Absorption and Contribution to Business Environment Development: Research Output Analysis Through Bibliometric and Topic Modeling Analysis

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## Abstract

In recent years, the field of European funds for business development has generated significant interest in the academic literature, stimulated by European Union (EU) regulations and the implementation of business financing programs. This context has led to an increase in research on the impact and use of European funds, particularly in terms of support for economic development and infrastructure. This paper presents a bibliometric analysis, using topic modeling, to examine academic publications on the use and absorption of European funds and how they influence the business environment. Using a dataset of 74 publications indexed in the Clarivate Analytics Web of Science Core Collection, covering the period 2005–2024, the present study aims to identify the main authors, institutions, journals, and collaboration networks involved. It also analyzes research trends, dominant themes, and the countries with the largest contributions in this field, using Latent Dirichlet Allocation (LDA) and BERTopic analysis as a complement to the classical bibliometric approach. The thematic analysis reveals a thematic cohesion around entrepreneurship, EU structural funds, regional development, and innovation. In addition, there has been a significant annual increase in publications in this field, and through the use of thematic maps, word clouds, and collaboration networks, this study provides an overview of the evolution of research on the absorption of European funds and its impact on the business environment. These findings contribute both to deepening academic knowledge and to formulating more effective European policies for optimizing fund absorption and supporting the sustainable development of the business environment.

**Keywords:** European funds; business environment; bibliometric analysis; thematic map; thematic evolution; BERTopic; Latent Dirichlet Allocation



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## 1. Introduction

Taking into account the current global development context, with a view to shaping the best possible future in which to reduce poverty and inequality, to understand and subsequently combat climate change, to provide each individual with access to the highest quality education, and to build a more developed and resilient economy, the United Nations, through the “2030 Agenda”, have set 17 Sustainable Development Goals (United

Nations, 2015) which aim to address these challenges, whether social, environmental, or economic. Over the years, the European Union (EU) has recognized its role in achieving these objectives, which contribute to creating the most harmonious environment possible. Moreover, they are constantly providing financial support to the most significant developments within member states (Bădîrcea et al., 2025; Šostar et al., 2023).

As a global power, the EU has taken a leading role in sustainable policies, working constantly to implement and deliver on the goals set, be it at the European or international level (European Union, 2016). With these objectives well established, the EU has developed over the years a number of financial utilities with which it aims to support member states. These utilities are a very important source of help in creating a more prosperous future. The most important of these are the Cohesion Fund (CF), the European Regional Development Fund (ERDF), the European Social Fund (ESF), and the European Agricultural Fund for Rural Development (EAFRD) (Dubel & Majczyk, 2024).

The above-mentioned funds were created in order to respond to different needs in EU member states, aiming to bring social inclusion to the attention of the population, to help reduce unemployment or social inequality (Fusaro & Scandurra, 2023; Mussida et al., 2023; Natili et al., 2023; Šostar et al., 2023), to modernize the rural environment, and even to encourage the development of different agricultural practices (Ferasso et al., 2021; Slätmo et al., 2019). While the EU makes these funds available to member states, they are responsible for their integration and absorption. It is worth noting that the uptake of these funds varies from country to country, with some countries having an extraordinary capacity to implement different projects quickly, while for others the process is long and difficult due to various logistical or administrative problems (Aivazidou et al., 2020; Bădîrcea et al., 2025). It has been observed over the years that Eastern European countries often have management problems (European Union, 2021; Pîrvu et al., 2018). For approval, there are always questions about how these funds will be used and their ability to target different problems in European economies (Ciani & de Blasio, 2015; Hermans et al., 2023).

Between 2007 and 2013, the CF spent around EUR 347 billion to support less developed regions (European Union, 2007). While much of these funds ended up being invested in public infrastructure, around 10% were used to directly finance small and medium-sized enterprises (SMEs), with the aim of encouraging firm growth, productivity, and entrepreneurship in general, making the program one of the most significant sources of grants for businesses (Dvoulety et al., 2021).

It is important to note that the intensity of non-reimbursable financial funds differs according to economic disparity, i.e., the ratio of Gross Domestic Product (GDP) to inhabitants at the regional level compared to the EU average GDP per inhabitant ratio (Bostan et al., 2022). Thus, there are often situations where planned allocations are not the same as the actual absorption of resources (Aivazidou et al., 2020; Antohi et al., 2020; European Union, 2015; Santamarta et al., 2021).

Over the years, there have been many researchers who have tried to elucidate the impact of the use of European funds. Becker et al. (2018) conducted an analysis for the period 1989–2013, looking at regions that received EU support through several multiannual programs. The researchers found only positive effects over the whole period. Even if in some countries that were hit hard by different events, such as financial or economic crisis, the absorption of funds was lower, it was still constant. An interesting aspect that was observed is that the effect of structural funds was higher in the short term. Jurevičienė and Pileckaitė (2013) observed at the micro level how SMEs use the possibility of using European funds. The authors deduced that economic agents do not behave in a rational way, preferring to implement various secondary projects in order to benefit from the funds. Moreover, a correlation was observed between foreign investment and European

funds. Šelebaj and Bule (2021) argue that, the support received has a positive impact on companies and business indicators, and Muraközy and Telegdy (2023) emphasize the idea that the funds not only help companies, but also have an effect on capital deepening and labor productivity.

According to the literature, the effects of absorption of EU funds are varied. The researchers identified the following: favorable effects through increases in GDP, population incomes, consumption, public investment, reductions in unemployment, improvements in the labor market, and educational, social, or demographic changes (Becker et al., 2018; Palevičienė & Dumčiuvienė, 2015); conditional effects due to bureaucracy or corruption (Farole et al., 2011); and even negative effects such as immoral behavior found in some firms (Jurevičienė & Pileckaitė, 2013).

Looking through the specialized literature, the results observed in these studies can be organized on several levels. At the macro level, we can mention those studies that focus on the contribution of European funds to GDP growth, unemployment reduction, and economic convergence between member states (Becker et al., 2018; Ciani & de Blasio, 2015). At the meso-level, research has been identified that highlights the sectoral or regional impact through investments in agriculture, tourism, infrastructure, or rural development (Dinu et al., 2020; Pădurean et al., 2015). At the micro level, analyses carried out at company level can be classified which aim to show how SMEs use financial support to increase productivity, innovation and strengthen their market position, but at the same time raise the alarm about various dysfunctions, such as the inefficient use of funds or opportunistic behavior (Bostan et al., 2019; Prokop & Stejskal, 2018).

For this paper, a bibliometric analysis was chosen in order to be able to observe the academic interest and the topics studied over time by researchers in terms of the absorption of European funds and their impact on the business environment. In this work, the following research questions were proposed to be answered:

- RQ1: How have European funds evolved over time in the business environment?
- RQ2: Which authors have distinguished themselves in research on the use of European funds?
- RQ3: What characterizes articles that have stood out in the field of the use of European funds?
- RQ4: Which were the publications that researchers preferred when they wanted to publish their articles in this field?
- RQ5: Which were the most common universities of origin of the authors who researched the absorption of European funds and their benefits for business?
- RQ6: Which are the research topics that can be associated with this field?

Taking into account specialized terminology, the term “absorption” of European funds has been used not only to express the simple allocation of financial amounts but also as a complex process that refers to the contracting, transformation, and management of financial resources into social and economic results. Most often, this process is presented as the capacity of institutions to manage funds. In fact, absorption capacity is closely linked to factors such as the quality of institutions or administrative infrastructure, which are considered essential determinants of the performance of European programs. At the same time, another frequently encountered concept is that of “additionality”, which has the capacity to highlight the added value created by European funds, in the sense that they should not replace existing national investments but rather generate additional and sustainable effects on economic and social development. On the other hand, another term, “administrative burden”, is important in analyzing the chosen field, describing the complexity of the bureaucratic procedures associated with accessing and managing funds. This can even be a major obstacle for small and medium-sized enterprises, which

have limited resources and are often discouraged by complicated and costly procedures, making it essential to reduce this burden. At the same time, the business environment is perceived in this study in a broad sense, going beyond the individual dimension of firms and including the institutional and legislative framework, access to finance, infrastructure, human capital, and the level of innovation.

In terms of structure, the first part of this paper focuses on the collection and selection of a relevant database, using specific filters that will be detailed in the next chapter. This is followed by a description of the methodology applied and the materials used to analyze the data. The selection of articles has been made carefully, with the aim of identifying the most relevant sources for the study of the absorption of European funds and their effects on entrepreneurship and economic development. The third part of this paper includes a detailed analysis of the selected articles published between 2005 and 2024, examining the authors, their collaborations, the most cited publications, and thematic trends. Thematic maps, word clouds, and various networks were developed to highlight emerging patterns and fund influences on different sectors. The final part of this paper discusses the limitations of the research and the main conclusions drawn from the analysis of the absorption of EU funds.

To ensure clarity of the terms used throughout this paper, a list of the main abbreviations encountered in the text was compiled (Table 1). The purpose of this was to ensure consistency between the abbreviated form and the full term, thus contributing to a better understanding of the analysis and maintaining terminological consistency.

**Table 1.** List of abbreviations.

Abbreviation	Full Term
CF	Cohesion Fund
EAFRD	European Agricultural Fund for Rural Development
ESD	Economic and Social Development
ERDF	European Regional Development Fund
ESF	European Social Fund
EU	European Union
GDP	Gross Domestic Product
LDA	Latent Dirichlet Allocation
NTC	Normalized Total Citations
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
SMEs	Small and Medium-Sized Enterprises
TC	Total Citations
TCY	Total Citations per Year
WoS	Web of Science

## 2. Materials and Methods

### 2.1. Justification of the Methodology

With the objective of tracking the evolution of those articles over time aiming to observe the effects on the business environment of the use of European funds, it was decided that it was necessary to carry out a bibliometric analysis. Using both statistical and mathematical techniques, it was considered appropriate to observe scientific activity (Donthu et al., 2021). Regarding bibliometric analysis, it has been observed that it is used in many fields of activity, such as cybernetics (Cibu et al., 2023), machine learning

(Domenteanu et al., 2024), the use of artificial intelligence in local or regional studies (Delcea et al., 2024a), school dropout (Profiroiu et al., 2024), and even efforts to combat misinformation (Tătaru et al., 2024).

## 2.2. Data Sources

The formation of our database for our research was carefully carried out by analyzing the literature and observing what other researchers decided to do (Ge et al., 2025; Z. Liu et al., 2025; Wang et al., 2025). Thus, data were extracted from the Web of Science Core Collection of Clarivate Analytics (Web of Science, 2025). Over time, this has been considered a suitable database due to the indexing it has for several renowned journals, but also due to the totality of papers from different fields, being one of the most widely used sources of scientific papers at the academic level (Bakır et al., 2022; Cobo et al., 2015; Dobre et al., 2025; Domenteanu et al., 2025; Mulet-Forteza et al., 2018; Profiroiu et al., 2024; Sandu et al., 2023).

Furthermore, looking back, this database dates back to 1964, covering at that time approximately 700 journals, reaching a total of 1573 articles in just two years (Garfield, 1964). According to Birkle et al. (2020), it is not just a collection of publications, but is a structural, balanced, and selective database. The platform consists of a complex citation network, with a solid set of tools integrated into the Clarivate system and advanced analytical tools, making it a leader in terms of the benefits it brings to research performance (Clarivate Web of Science Teardown, 2023). According to researchers, combining it with other databases (such as Scopus) would have required complex processes to ensure that data were not duplicated, thereby reducing efficiency and jeopardizing analytical consistency (Caputo & Kargina, 2022; Kumpulainen & Seppänen, 2022). Therefore, based on existing studies (Cotfas et al., 2025; Delcea et al., 2023; Dobre et al., 2025; Sandu et al., 2025), it was considered relevant to use WoS exclusively as a data source.

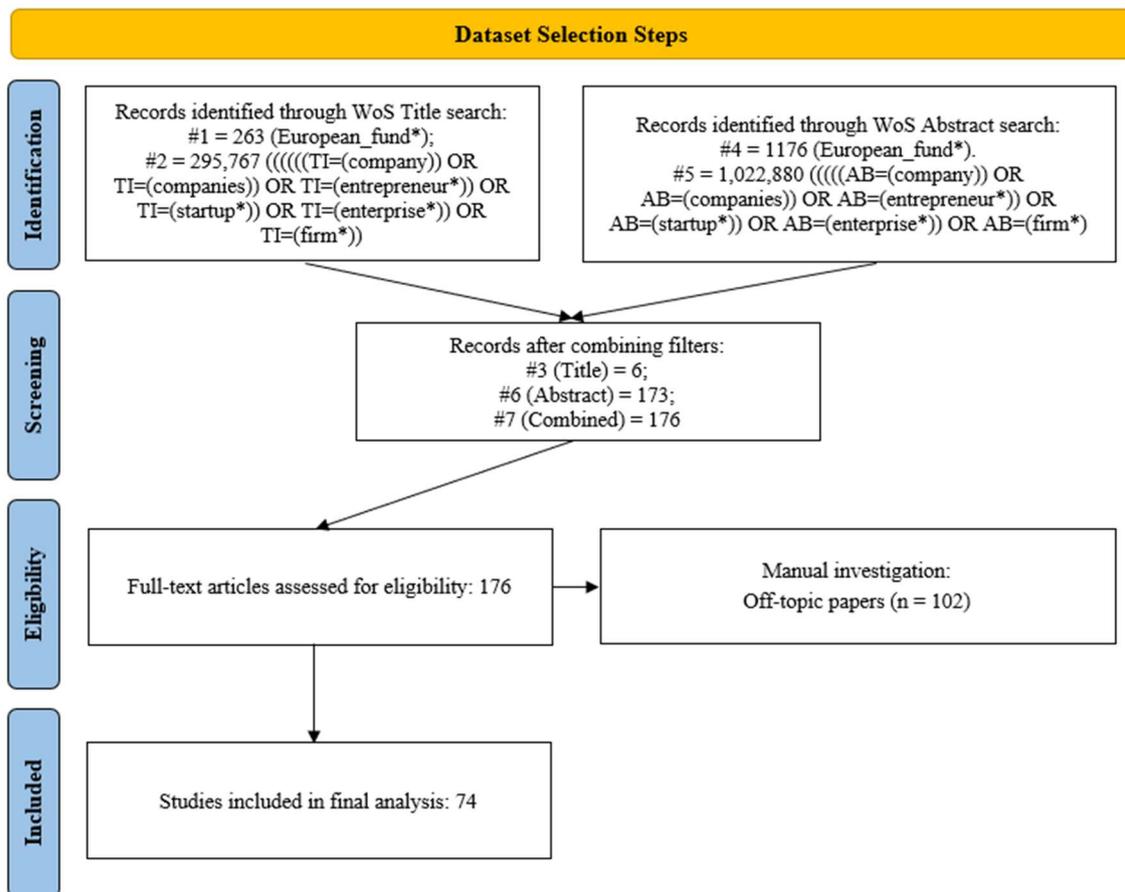
## 2.3. The Dataset Selection Process

In order to extract the data suitable for the present work, a subscription was used. The researchers deduced that the type of subscription used and consequently the indices that can be arrived at are very important in conducting research and need to be specified (F. Liu, 2023; W. Liu, 2019). Therefore, Table 2 has been created to present the indices as well as the period since they have been used, with all of them being up to date.

**Table 2.** Indexes used for data extraction.

Index Name	Period
Science Citation Index Expanded (SCIE)	1900–present
Social Sciences Citation Index (SSCI)	1975–present
Emerging Sources Citation Index (ESCI)	2005–present
Arts & Humanities Citation Index (A&HCI)	1975–present
Conference Proceedings Citation Index—Social Sciences and Humanities (CPCI-SSH)	1990–present
Conference Proceedings Citation Index—Science (CPCI-S)	1990–present
Book Citation Index—Science (BKCI-S)	2010–present
Book Citation Index—Social Sciences and Humanities (BKCI-SSH)	2010–present
Current Chemical Reactions (CCR-Expanded)	2010–present
Index Chemicus (IC)	2010–present

In presenting the steps taken in the selection process for the studies included in this analysis as concretely as possible, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guideline was used. The PRISMA diagram (Figure 1) shows the stages of identifying, filtering, and including studies, indicating the number of those retained and eliminated. The use of the PRISMA guideline (Page et al., 2021) contributes to standardized and clear reporting, which allows for the assessment of the credibility of the results and facilitates the replication and updating of the research, as well as its integration into meta-analyses or good practice guidelines.



**Figure 1.** Dataset selection steps.

In order to identify the most appropriate dataset for this bibliometric analysis on the use of European funds and their impact on the business environment, the first step was to select relevant terms at the title or abstract level. Using the expression “European\_fund\*”, 263 papers were identified, while for terms related to the business environment (“company”, “companies”, “entrepreneur\*”, “startup\*”, “enterprise”, or “firm\*”), the total number of publications was 295,767. By combining the two terms, a reduced number of only 6 articles was obtained, according to the “Identification” and “Screening” stages in the PRISMA diagram. The same filters were applied to the abstracts. Following this stage, 1176 papers were identified for the term “European\_fund\*” and 1,022,880 papers for the business terms. Combining the two conditions in the “Screening” stage resulted in a total of 173 articles. Subsequently, combining the results obtained at the title and abstract level (#3 and #6), a corpus of 176 articles was obtained.

In selecting the keywords used to identify the works included in the database, other bibliometric studies in the field were also analyzed. Thus, it was observed that Pricope et al. (2024) used terms such as “European funds” to extract from WoS the dataset used to review

the literature on the impact of European funds on rural development; [Alnajjar \(2025\)](#) used terms such as “startup\*” to select the works used in the bibliometric and topic modeling analysis he conducted on research in the field of startups, observing a significant increase in interest in startups over the last decade; [Paru et al. \(2022\)](#) also used the keyword “startup” to conduct a bibliometric analysis of the correlation between business performance and startup development, identifying major publishing trends over the last two decades and the regions with the most intense research activity.

If the search query had been further expanded by including additional search words, at least in the area related to the European funds, for example by using “structural funds”, “cohesion policy”, or the names of various European funds such as “European Regional Development Fund” (ERDF) or “European Structural and Investment Funds” (ESIF), the resulting dataset might have been larger, but at the same time could have contained more works from the specific areas from which the additional search words have been selected. As the “european funds” keyword is a larger umbrella for the above-mentioned keywords and the purpose of this paper is specifically stated (both in title and abstract) to be related to European funding absorption for enterprises and business environment development, we consider that the used keyword matches the purpose of this paper. Also, by conducting another search and expanding the keywords list, it has been observed that by adding generic synonyms, the dataset can capture irrelevant and off-topic domains (law, finance, taxation, unrelated grants).

It is important to note that when applying the filters, the singular form of the searched keywords was used, followed by an asterisk (“\*”). This is a technique often used in bibliographic queries, as it allows for the automatic extraction of all derivative forms, whether plural or other specific endings.

The “Eligibility” stage played an essential role in building the dataset. Often, the terms used in the queries were quite general, so many of the articles did not fit the research objectives. Therefore, careful manual selection was necessary based on the title and abstract of each article. Following this evaluation, only 74 of the initial 176 articles were considered relevant enough for the final analysis. The process of eliminating articles was carried out independently by the authors. In situations where there were differences in opinion regarding the inclusion or exclusion of certain works, the opinion of a third author was sought to ensure the objectivity and consistency of the final selection.

In the final “Included” stage, the corpus of 74 articles forms the basis of the analysis presented in this paper, consisting of the works most relevant to the topic of European fund absorption and their impact on the development of the business environment.

#### *2.4. Statistical Analysis*

For the purpose of further validating the trends observed across various analyses conducted in this paper, a series of statistical analyses were conducted. Below, a description of these analyses from a theoretical point of view is provided.

First, Spearman’s rank correlation coefficient measures both the direction and intensity of a monotonic association between two variables, which does not assume a specific data distribution or linearity of the relationship ([Hauke & Kossowski, 2011](#)). The coefficient was developed by Charles Spearman and is a nonparametric rank statistical test.

Kendall’s tau is a nonparametric statistical test that measures the association between two variables based on the difference between the dissimilarity between pairs of observations and the similarities between pairs of observations. It is often used as a distribution-free measure of the correlation between two ordinal variables ([El-Hashash & Hassan, 2022](#)).

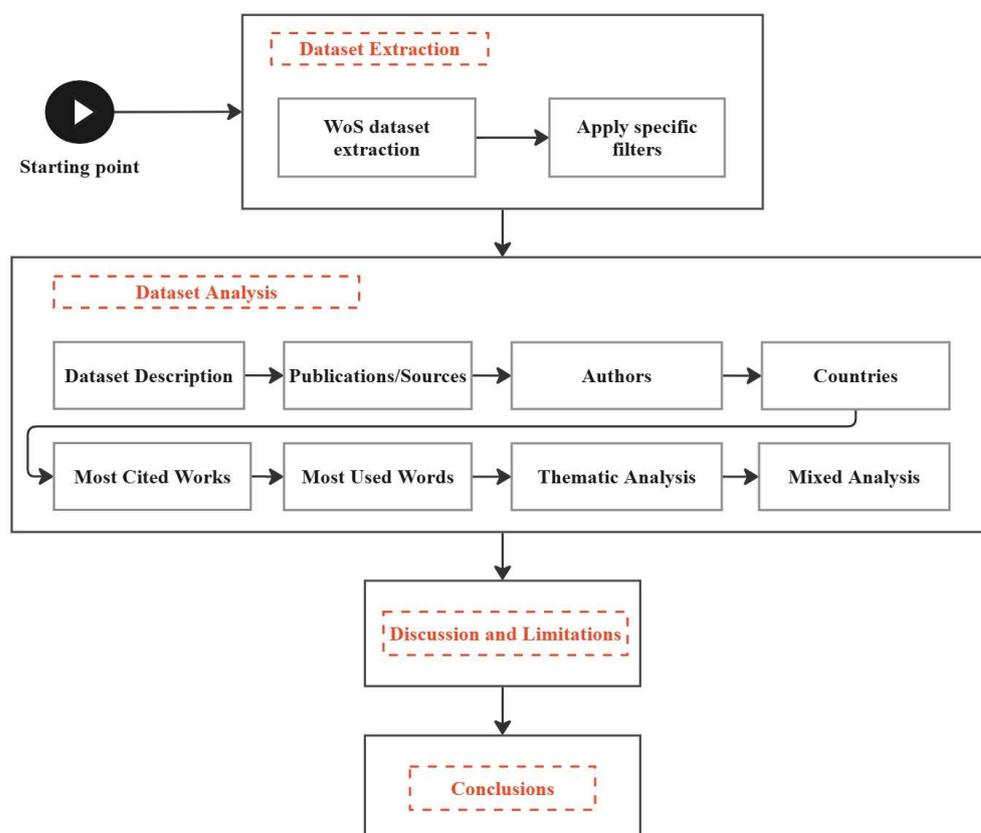
Additionally, the Mann–Kendall test was used. This test is also a nonparametric statistical test often used to detect the presence of a monotonic trend, whether decreasing

or increasing, in a time series, without requiring the data to have a specific distribution. It is often used to investigate statistically significant trends (Hipel & McLeod, 1994; Yue et al., 2002).

### 2.5. Structuring the Analysis

For the second part of the analysis, the RStudio 4.3.2 program was utilized, specifically the Bibliometrix library (Aria & Cuccurullo, 2017).

In terms of structure, the work was divided according to the specialized literature during the extraction and analysis of the database, and then based on the results obtained, various discussions were carried out, the limitations of the research were presented, and finally some conclusions were drawn (Anaç et al., 2023; Marín-Rodríguez et al., 2023). Figure 2 provides a clearer picture of this structure.



**Figure 2.** The steps considered in the analysis.

To begin with, using the specific filters discussed earlier, the dataset to be analyzed in this paper was extracted from the WoS database. For the analysis, a special package called Bibliometrix was used, which is part of a development environment (RStudio) that is integrated in R, a programming language that is often used for various graphs and statistical computation (Aria & Cuccurullo, 2017). In order to structure the analysis clearly, it has been divided into eight sub-chapters, as detailed in the following.

In the Dataset Description step, the dataset was characterized with a focus on understanding the trends and impact of the respective documents over the chosen time period in order to have a clear view of their evolution over the years. The analysis included the total number of sources and documents, the average number of citations per document, the annual rate, the total number of references, the total number of authors, how many authors collaborated to produce the papers, what was the annual scientific output, or what was the average number of citations recorded per year.

In the second step, the analysis of the most significant publications and sources is depicted. The most relevant publications and sources were identified, and we tracked the annual output over time and the impact of the publications according to the H-index, thus allowing for an objective assessment of the influence and relevance of both authors and publications.

In the third step, the most significant authors, their output, the universities at which they teach, and a collaborative network contributing to a deeper understanding of the academic context and research developments, emphasizing the interconnection between researchers and the institutions that support their work, were presented.

In the fourth step, countries were analyzed, noting both productivity and the most cited countries over time, and even a collaborative network and a map were created to highlight teamwork.

In the fifth step, the focus was on the most cited papers globally, highlighting the number of authors who wrote the paper, the year of publication, the publication itself, the data used in the analysis, the total number of citations (TC), the TC per year, and the total number of citations normalized (NTC). Furthermore, each paper was summarized briefly in order to see the purpose and techniques used to obtain the desired results.

In the sixth step, word clouds, bigrams, and even trigrams were used to highlight the most frequently used words and word groups, both at title and abstract levels.

In the seventh step, with the help of a thematic map, the most frequently used additional keywords at the title level were observed in order to visualize and analyze trends and connections between specific concepts. In addition to the bibliometric analysis, in this step, a Latent Dirichlet Allocation (LDA) analysis and a BERTopic analysis were used for better shaping the topics associated with this field.

A preprocessing step was first carried out to improve the performance of both LDA and BERTopic. During this step, the URLs were removed with the help of regular expressions, while certain terms, such as “ai” and “artificial intelligence”, were normalized. As bigrams and trigrams can often be more informative than unigrams, they were also included in the analysis. The random seed was fixed at 13 in order to facilitate the reproducibility of the results.

To determine the best hyperparameters for the LDA model (Řehůřek & Sojka, 2010), a grid search approach was chosen, varying the values of the parameters alpha (0.01, 0.1, 1.0, ‘symmetric’, ‘asymmetric’), eta (0.01, 0.1, 1.0, ‘symmetric’, ‘auto’), and the number of topics (3, 5). This approach yielded a total of 75 parameter combinations, for which the results were evaluated in terms of coherence scores (c\_v measure) in order to select the best values for the hyperparameters.

In the case of BERTopic (Grootendorst, 2022), the chosen sentence transformer model (Reimers & Gurevych, 2019) was “all-MiniLM-L6-v2”. The model maps sentences and paragraphs to a 384-dimensional vector space and provides a good tradeoff between speed and performance. The default settings were kept for dimensionality reduction (UMAP) and clustering (HDBSCAN).

In the eighth step, three-field graphs were created to track the links between countries, authors, and keywords as well as between affiliations, authors, and additional keywords.

### 3. Dataset Analysis

This section represents the core of our research, containing all the information related to the dataset. In other words, initially some general details are presented, followed by a description of the most significant papers related to the influence of the use of European funds on the business environment, the form of collaboration both at author and country

levels, which were the most common clusters of words, and how they came to be grouped based on different clustering techniques.

### 3.1. Dataset Description

As seen in Table 3 below, the dataset was built with papers published from 2005 and stretching up to 2024. In order to be able to gather relevant papers for the research, a total of 60 sources were consulted, referring to different specialized publications such as books, journals, etc. From the above-mentioned sources, a total of 74 papers were identified to be analyzed in detail during the course of this work.

**Table 3.** Main dataset information.

Indicator	Value
Time period	2005–2024
Sources	60
Documents	74
Average years since publication per document	8.46
Average citations per document	4.257
Annual growth rate (%)	5.95%
References	1764

In comparison with another bibliometric analysis conducted by Milošev et al. (2024), where the impact of European funds was assessed and where a total of 240 papers were identified for the period 1996–2023, it can be stated that, in our case, the difference in the number of papers included in the dataset might be due to the additional condition of the works relating to the occurrence of specific keywords linked to the business environment.

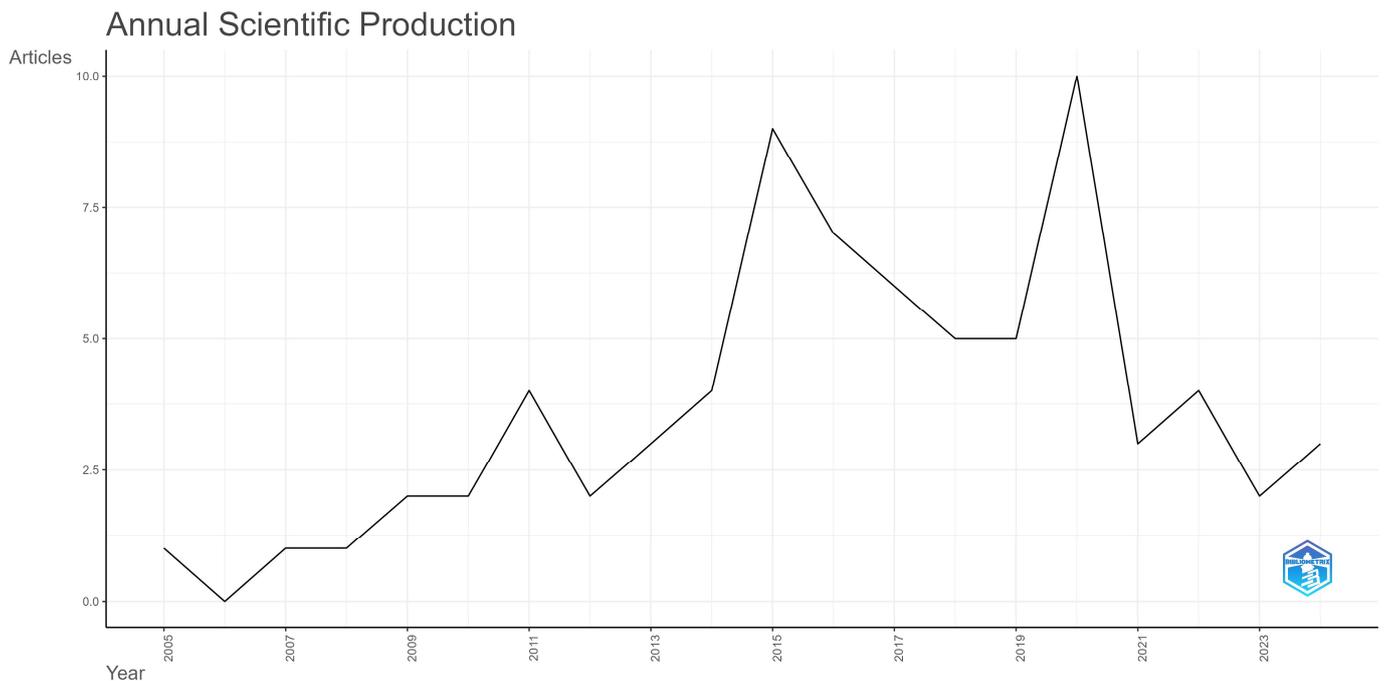
The average number of years since publication is 8.46, which indicates that more papers were written in the last 8–9 years. Taking into account that the interval over which the papers have been extracted is 20 years, it can already be inferred that there has been a greater interest over time. Moreover, on average, the number of citations per paper has increased annually by 5.95%, again indicating a positive trend of increasing impact over time. In terms of citations, each of the 74 papers was cited on average about 4 (4.257) times by other researchers in their studies. Even the total number of 1764 citations is a representative number for the impact brought about by the selected papers within the field studied.

Out of the total number of 194 contributing authors (Table 4), 18 of them produced papers on their own, while the remaining 176 authors preferred to collaborate to conduct different studies on the influence of the use of European funds in business. On average, there was about 3 (2.68) co-authors per paper, from which it can be concluded that the majority of the papers have 3 authors. Out of the total number of papers, almost 15% (14.86%) were conducted through international collaborations, which may suggest a beneficial global research area in terms of broad knowledge. Also, in terms of the keywords used by the researchers, a total of 260 words are associated with the documents.

**Table 4.** The main information about the authors.

Indicator	Value
Authors	194
Single-authored documents	18
Authors with multiple involvement within documents	176
Co-authors per document	2.68
International collaborations (%)	14.86%
Authors' keywords	260

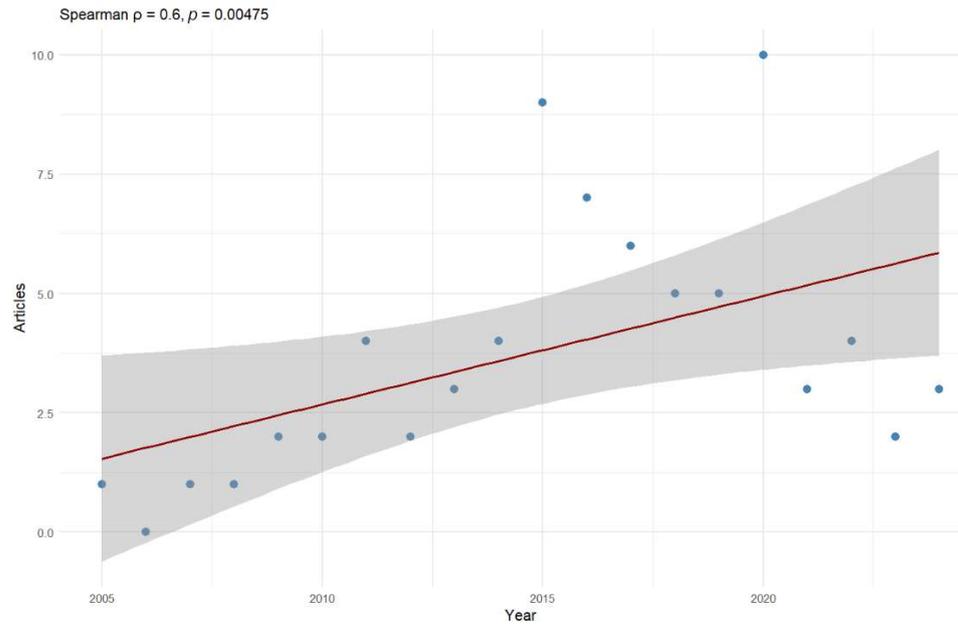
In order to gain an even clearer picture of the annual scientific production, in Figure 3, a graph is presented which shows the growth for the 20 years analyzed of the interest in the field. The vertical axis indicates the number of existing articles, starting from 0 and increasing from 2.5 up to 10, which is the maximum number of articles identified. Even though the scale is created in this way, the number of articles is always a whole number. In 2005, the first article was published and in the following year, 2006, none were identified. Until 2010, the scientific output varied between one and two articles. The year with the highest number of articles is 2020, with a total of 10 publications, followed by 2015, with a total of 9 articles. It can be stated that on average during the analyzed period, about 4 articles were published (3.7).



**Figure 3.** Annual scientific production.

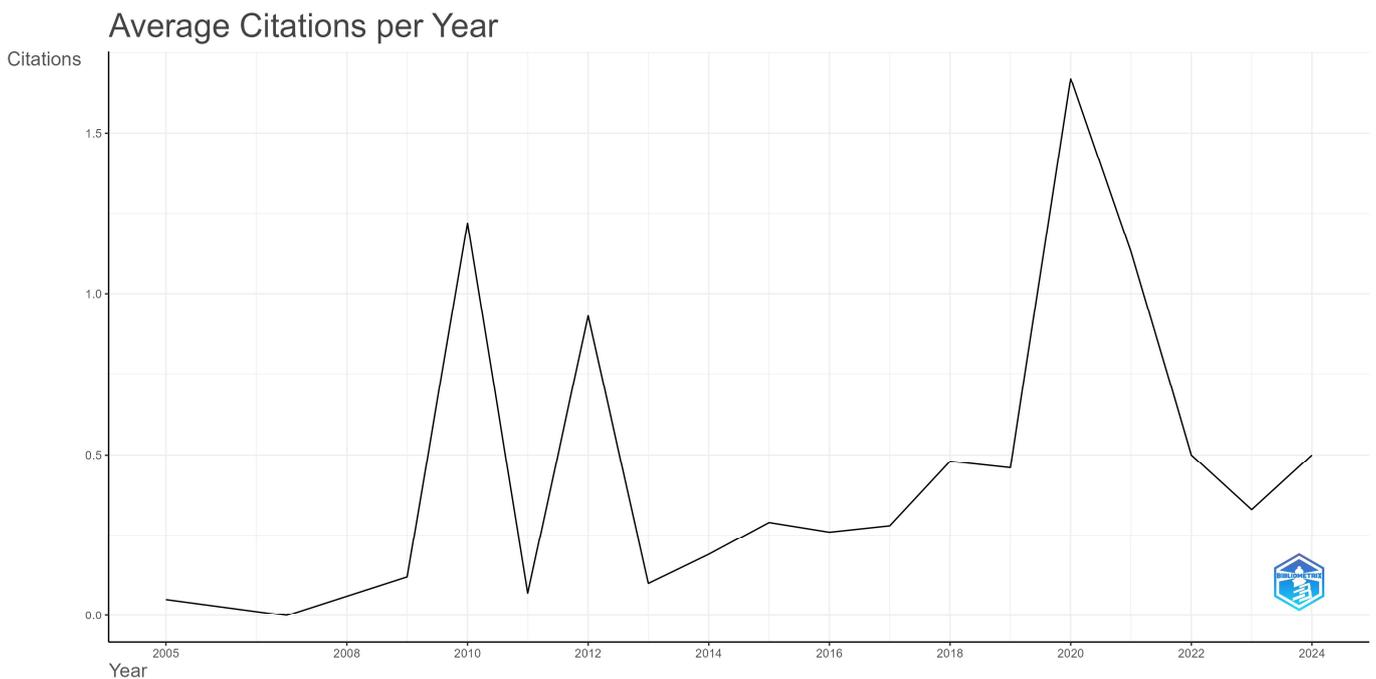
In the year 2005, [Bacali and Cordos \(2005\)](#) set out to investigate entrepreneurial activities with a focus on sources of finance, different constraints, access to European and governmental funds, and the degree of awareness. Moreover, the authors tried to observe what was the impact of different expenditures on market and financial performance, analyzing a sample of 385 entrepreneurs. At the other pole, in 2024 [Iacob Pargaru et al. \(2024\)](#) wrote a paper aiming to expose the challenges that arise when an entrepreneur wants to implement a project with the help of European funds. As a paper written in Romania, it demonstrated that these funds have helped the economic and social development of the country.

With the aim of validating the trends observed in the descriptive analysis, a Spearman correlation test was applied (Figure 4) between the year of publication and the number of articles in order to deduce the correlation between them. The results indicate a moderately strong and statistically significant positive correlation ( $\rho = 0.6$ ,  $p = 0.0047$ ), confirming that the upward trend in academic output between 2005 and 2024 was not random. This supports the previously stated idea that scientific interest in the absorption of European funds and the impact on the business environment has grown steadily and significantly over the last two decades.



**Figure 4.** Annual production evolution.

In order to be able to analyze how many citations the papers selected in the analysis had, Figure 5 shows a graph illustrating the average citations by year. This indicator is calculated as the ratio between the TC recorded in a given year and the total number of years. As regards the graph, the situation is similar to that in the previous figure. The vertical axis represents the TC, increasing from 0.5 points to 0.5, except that, this time, as it is an average value, it is possible that the value is not a whole number. Thus, as can be seen, in 2005 there was an average of 0.05 citations per year, with only one article published in that year. Gradually, this reaches in 2010 an average of 1.22 and in 2020 even 1.67. As an interpretation, articles published in 2020 were cited on average about twice. The decreases overtime may be due to the time lag between when a paper is actually published and when it starts to register citations.



**Figure 5.** Average annual citations.

Applying Kendall’s test (Figure 6), a positive but weak association was found between the year of publication and the average number of citations per article ( $\tau = 0.18$ ), but this was not statistically significant ( $p = 0.289$ ). Thus, the result obtained suggests that, although some peaks in citations can be visually observed in certain years, it cannot be concluded that there is a constant upward trend in the impact measured by citations.

```

Kendall's rank correlation tau

data: df$Year and df$MeanTCperArt
z = 1.0611, p-value = 0.2886
alternative hypothesis: true tau is not equal to 0
sample estimates:
      tau
0.1813691
    
```

Figure 6. Kendall’s test.

### 3.2. Sources

The focus so far has been on the papers that make up the database, so we now move on to the publications which have gained exposure (Figure 7 and Table 5). The journals identified, totaling 60, registered between seven and one article each. There is only one journal that managed to publish seven articles, “Proceedings of the International Conference on Business Excellence”, followed by “Scientific Papers-Series Management Economic Engineering in Agriculture and Rural Development” with a total of four articles published. After these two, there are five journals with two, articles each: “Economic and Social Development (ESD)”, “Innovation Vision 2020: from Regional Development Sustainability to Global Economic Growth, vol I-VI”, “Local Economy”, “Metalurgia International” and “Vision 2025: Education Excellence and Management of Innovations Through Sustainable Economic Competitive Advantage”. Figure 7 and Table 5 illustrate the top 7 journals, with only 3 of the journals with only one article presented, but the real number is higher, with a total of 53 journals with one article each.

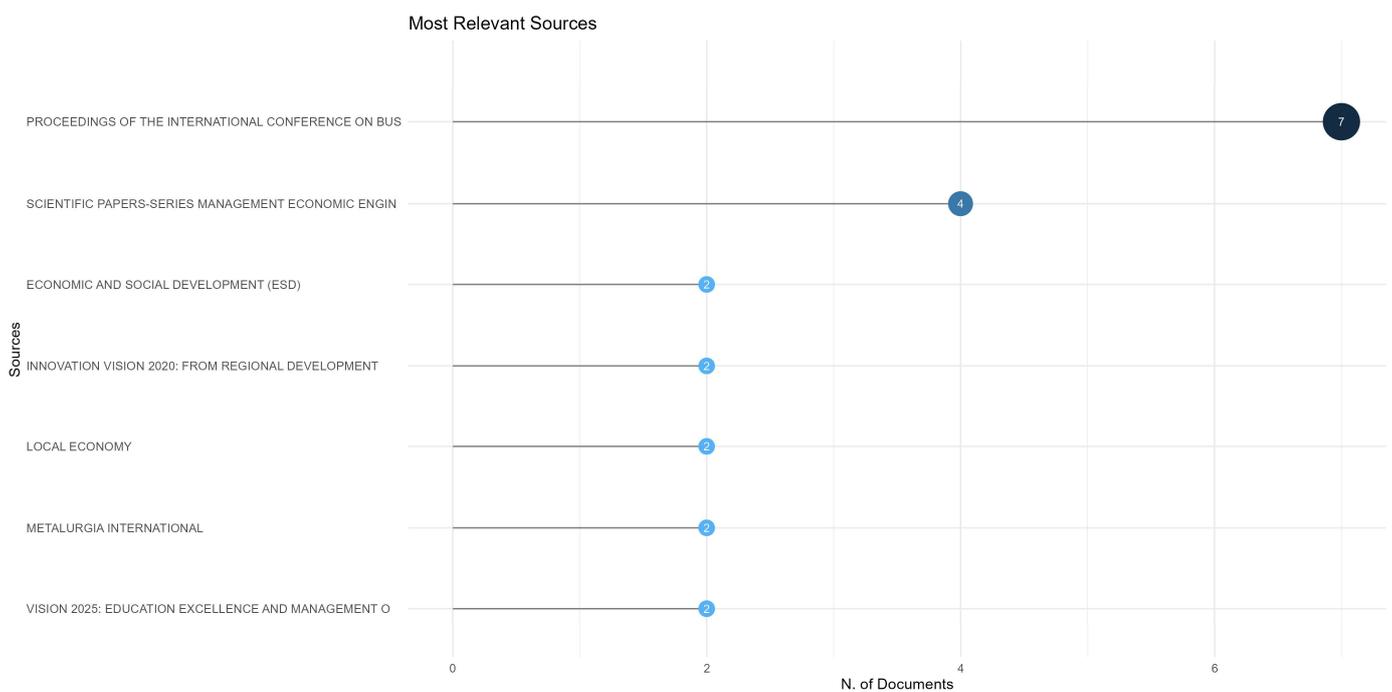
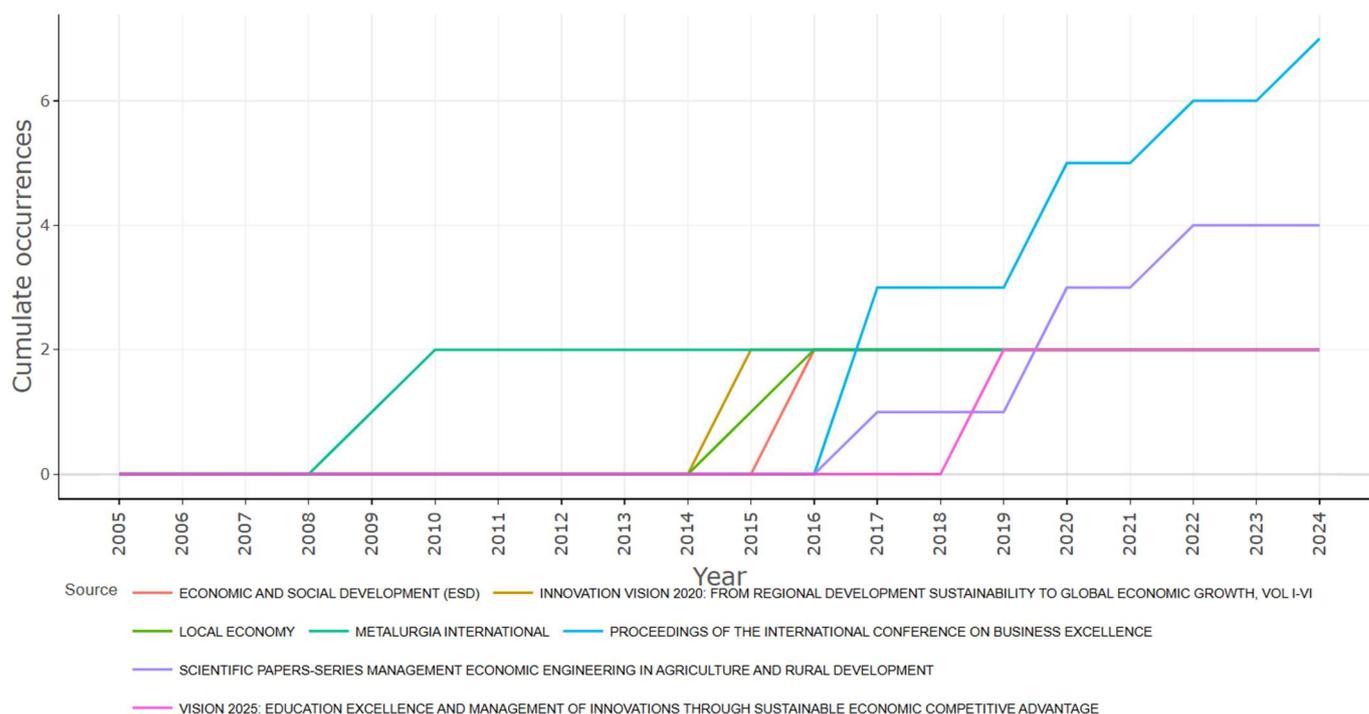


Figure 7. Top 7 most relevant publications.

**Table 5.** Top 7 most relevant publications.

Sources	Articles
Proceedings of the International Conference on Business Excellence	7
Scientific Papers-series Management Economic Engineering in Agriculture and Rural Development	4
Economic and Social Development (ESD)	2
Innovation Vision 2020: from Regional Development Sustainability to Global Economic Growth, Vol I-VI	2
Local Economy	2
Metalurgia International	2
Vision 2025: Education Excellence and Management of Innovations Through Sustainable Economic Competitive Advantage	2

Figure 8 represents the output over the period under investigation of the most significant publications, also shown in Figure 7. It is interesting to note that although “Proceedings of the International Conference on Business Excellence” has the highest number of publications in the field, the articles only began to be published in 2017, even though according to the conference website (<https://bizexcellence.ro/>, accessed on 20 March 2025), the conference is in its 19th edition. The seven papers were published as follows: three in 2017, two in 2020, one in 2022, and one in 2024.



**Figure 8.** Cumulative productivity of publications over time.

By applying the Mann–Kendall test (Table 6), strong upward trends (between 0.645 and 0.791) were identified, all of which are statistically significant according to the *p*-value. Even “Direction” indicates a significant increase in the number of articles on European funds and the business environment during the period analyzed, reinforcing the relevance of the topic in the specialized literature. “Proceedings of the International Conference on Business Excellence” obtained  $\tau = 0.791, p < 0.001$ , and “Scientific Papers-Series Management Economic Engineering in Agriculture and Rural Development” obtained  $\tau = 0.785, p < 0.001$ , both showing strong upward trends.

**Table 6.** Mann–Kendall test results for publication trends by source.

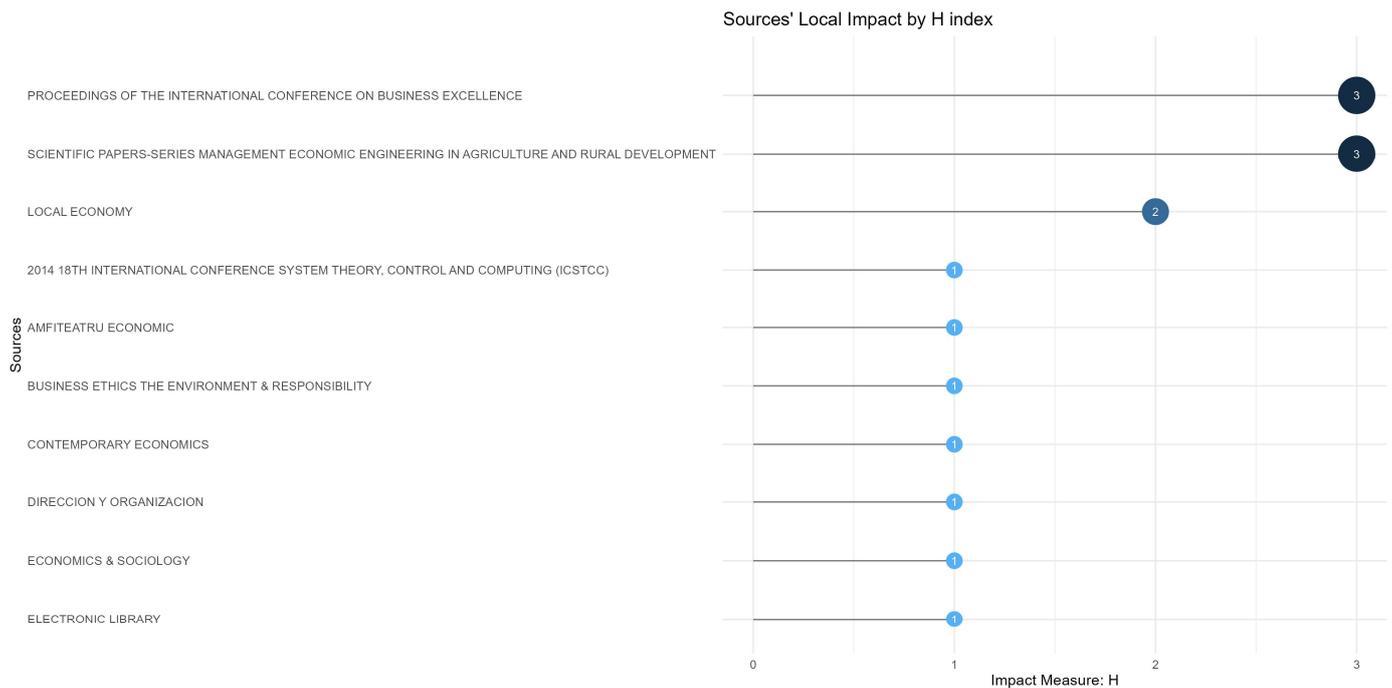
Source	Kendall $\tau$	$p$ -Value	$p$ -adj (BH)	Trend	Direction
Proceedings of the International Conference on Business Excellence	0.791	0.0000129	0.0000609	significant increasing trend	↑
Scientific Papers-Series Management Economic Engineering in Agriculture and Rural Development	0.785	0.0000174	0.0000609	significant increasing trend	↑
Local Economy	0.757	0.0000663	0.000155	significant increasing trend	↑
Innovation Vision 2020: From Regional Development Sustainability to Global Economic Growth, Vol I-VI	0.725	0.000183	0.000276	significant increasing trend	↑
Economic and Social Development (ESD)	0.722	0.000197	0.000276	significant increasing trend	↑
Vision 2025: Education Excellence and Management of Innovations Through Sustainable Economic Competitive Advantage	0.665	0.00062	0.000723	significant increasing trend	↑
Metalurgia International	0.645	0.000729	0.000729	significant increasing trend	↑

Even though an increased interest has been evident in recent years, the journal “Metalurgia International” published in 2009 the first article entitled “Rural Entrepreneurship Financing Opportunities” (Vintilă et al., 2009), followed in 2010 by “The Effect of the Island Syndrome on the Process of European Funding Absorption” (Neamtu, 2010). Both articles focused on analyzing and promoting both social and economic development through the absorption of European funds in Romania, emphasizing their impact on different sectors.

In 2015, the journal “Innovation Vision 2020: from Regional Development Sustainability to Global Economic Growth, vol I-VI” published two articles in the field (“Peculiarities of Innovation on Romanian SMEs” (Ceptureanu, 2015) and “Funding Policies for Youth in the Romanian Rural Area” (Petrescu, 2015)), and the journal “Local Economy” published one (“An Appropriate Tool for Entrepreneurial Learning in SMEs? the Case of the 20 Twenty Leadership Programme” (Clifton et al., 2015)).

As shown in Figure 9, there is also an analysis of publications in terms of the H-index. This is an important index because it manages to combine in a single indicator both the number of citations and the number of papers (Hirsch, 2005).

The journal “Proceedings of the International Conference on Business Excellence” has the highest impact, as would be expected from what has been observed so far, with a total of 30 citations and an H-index of 3. This means that the journal has three papers that have been cited at least three times. Immediately after this journal, with the same H-index equal to 3, is the journal “Scientific Papers-Series Management Economic Engineering in Agriculture and Rural Development”, but this time the TC is 13, which may be due to the lower number of articles published in this field compared to the first journal mentioned. Then follows the journal “Local Economy” with an H-index of 2 and a TC equal to 15. The other journals have an H-index equal to 1, with the TC ranging from 1 to 20.



**Figure 9.** Impact of top 10 publications by H-index.

### 3.3. Authors

In the following, authors who have left their mark on this field will be studied by researching representative articles. This sub-chapter is essential to understand their impact, allowing for the identification of collaborative networks between researchers, highlighting trends in teamwork and knowledge sharing between institutions. Moreover, the author survey also helps to track the evolution of the research field, indicating emerging directions of interest and new authors who could become influential in the future, stimulating a more connected and performing scientific environment.

To begin with, in Figure 10, the first 10 authors have been illustrated according to their scientific output. As shown, four authors contributed with two articles each. Regarding Hapenciuc C. V. and Morosan A. A., the two authors collaborated on the papers “The Performance of European Funded Projects” (Hapenciuc et al., 2012) and “The Effects of Structural Funds Absorption on the Business Environment in the North-Eastern Region of Romania” (Moroşan et al., 2014), both analyzing the impact of European funds on Romanian enterprises, with a focus on how they are implemented and used by the beneficiaries. In the same situation are the following two authors, Prokop V. and Stejskal J., who collaborated to write the papers entitled “Determinants of Innovation Activities: Public Financing and Cooperation: Case Study of Czech Republic and Hungary” (Prokop & Stejskal, 2018) and “Fostering Czech Firms? Innovation Performance Through Efficient Cooperation” (Prokop et al., 2021). The two papers emphasize the importance of collaboration between different entities, focusing on analyzing the impact of public funds, including European funds, on the innovation activities of manufacturing firms in Central and Eastern European countries, in particular the Czech Republic and Hungary. The remaining 190 authors contributed one paper each.

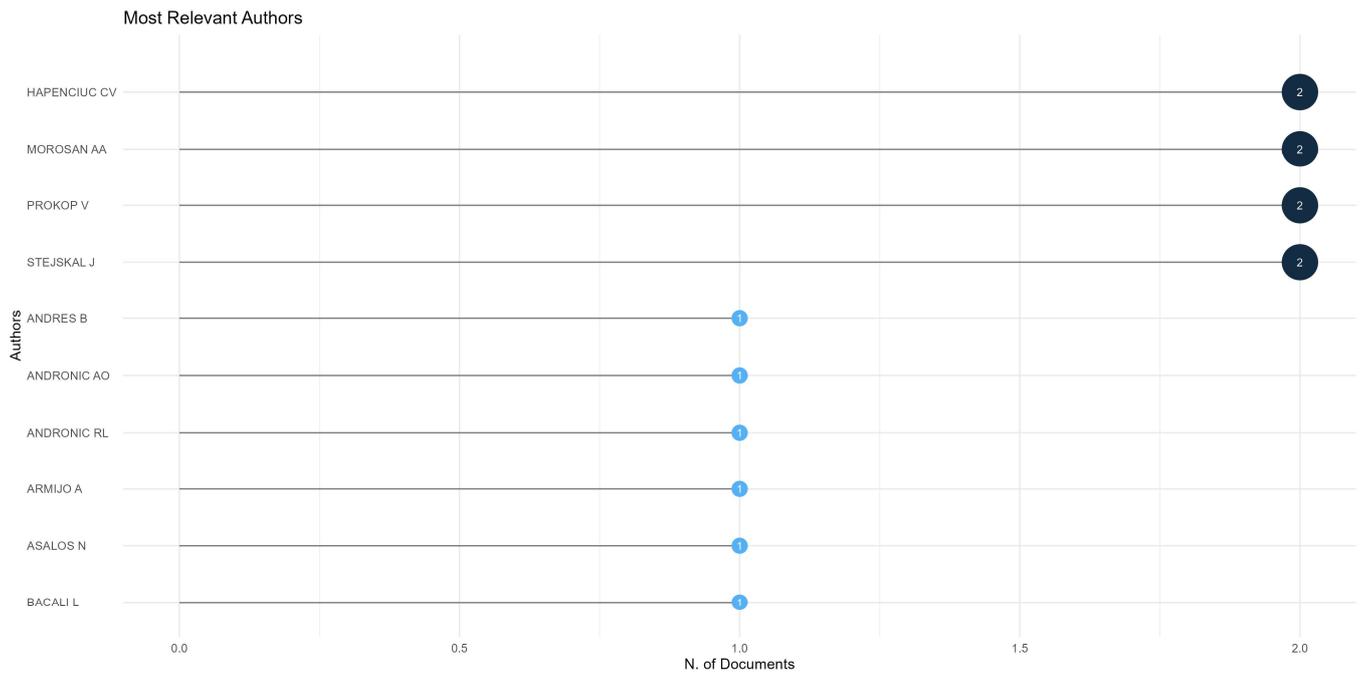


Figure 10. Top 10 authors by scientific output.

To go into even more detail, for the 10 authors mentioned above (Figure 10), Figure 11 was created in order to be able to observe the years of publication as well as the TC. The articles created by Hapenciu C. V. and Morosan A. A. were published in 2014 and 2012, respectively, with only one of the two managing to register a citation. On the other hand, Prokop V. and Stejskal J. published their two articles in 2018 and 2021, one of them having a total of 17 citations, while the second one recorded 5 citations. The other six authors listed in Figure 11 each have only one paper published: Andronic A. O., Andronic R. L. and Asalos N. published in 2019 with a maximum TC equal to 11, Andres B. in 2018 with a total of 5 citations, Armijo A. in 2011 without registering any citation, and Bacali L. in 2005 with 1 citation.

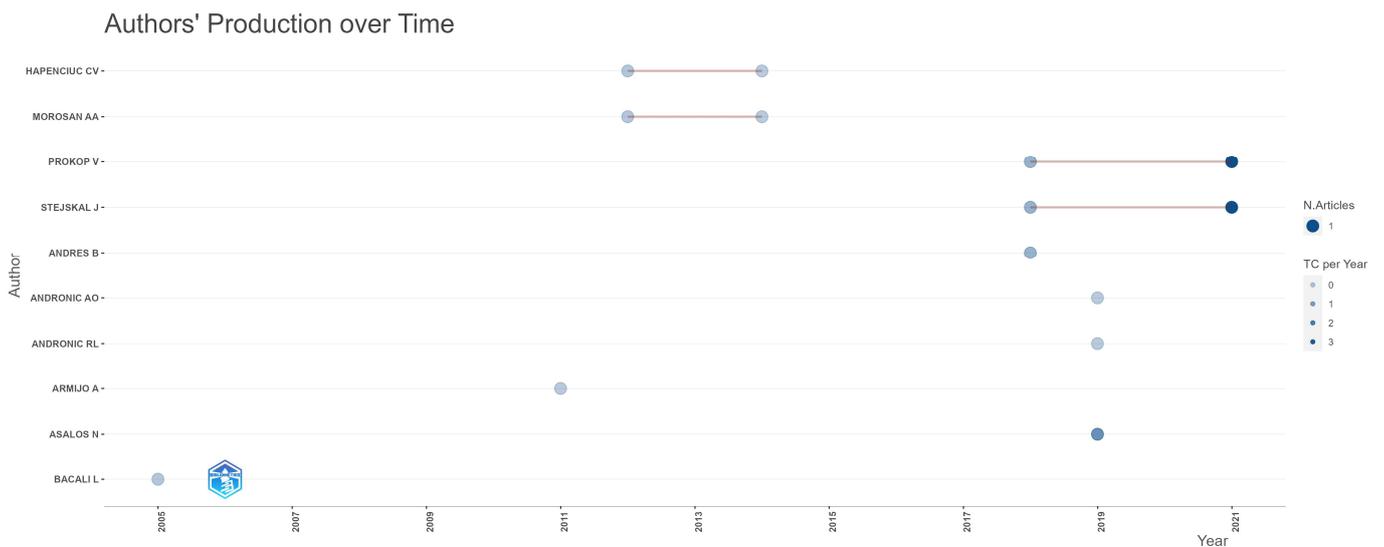


Figure 11. Authors' scientific output over time.

Knowing already the authors and their contribution, Table 7 presents the top 10 affiliations according to the articles published. As can be seen, the “Bucharest University of Economic Studies” has the highest number of published articles, totaling 14 articles. Due

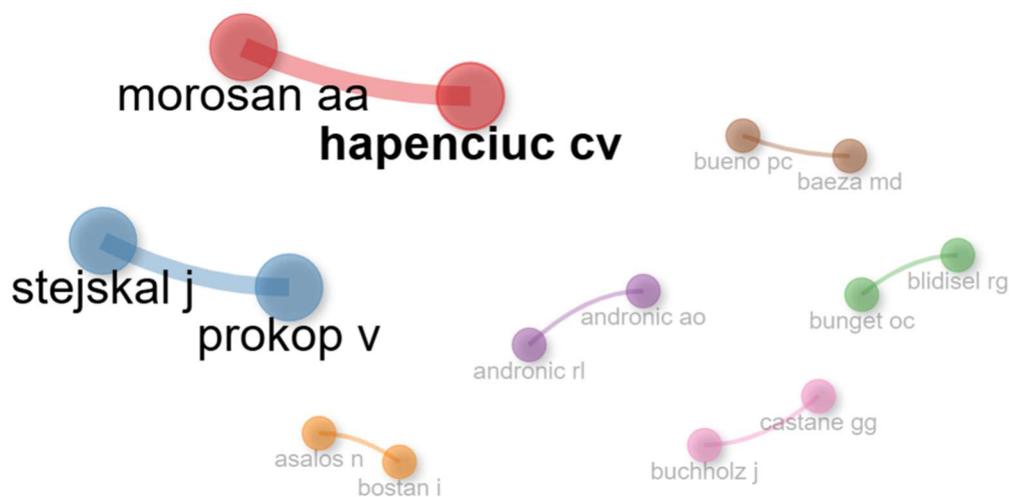
to the economic profile and the business-oriented inclination for which this university is known, this result was to be expected. The university in second place managed to register four articles, the “Stefan cel Mare University of Suceava”, and in third place with three articles is the “University of Pardubice”. The rest of the universities that are part of this top group managed to register two articles each.

**Table 7.** Top 15 most relevant affiliations.

Affiliations	Articles
Bucharest University of Economic Studies	14
Stefan cel Mare University of Suceava	4
University of Pardubice	3
Instituto Politecnico de Braganca	2
Valahia University of Targoviste	2
Alexandru Ioan Cuza University	2
Dunarea de Jos University Galati	2
Instituto Politecnico de Braganca	2
National University of Science and Technology Politehnica Bucharest	2
University of Oradea	2

What is interesting to note is that most of the universities listed in Table 7 are located in Romania, which indicates a high interest of this country in analyzing the influence of European funds on the prosperity of enterprises.

Figure 12 shows the collaborative network formed among the top 30 authors, according to the work they have conducted. The reason why there are 14 authors in the figure is that there are a number of authors whose research has been conducted individually. We turned on a setting that isolated nodes so they will not be illustrated, and as such they are not included in the picture.



**Figure 12.** Authors’ collaborative network.

In total, seven clusters were formed, each consisting of two authors. In the following, a description of each cluster and the works conducted by the authors is provided in order to offer more insight into the research conducted in this field.

Cluster #1, in red, is formed by Hapenciuc C. V. and Morosan A. A., authors who have been discussed in the course of our analysis due to their scientific contribution being representative. The first paper of the two was published in 2012, aiming to analyze the complex process of Romania’s integration into the EU, with a special focus on economic efficiency in the context of recurrent economic crises. Moreover, it considered a crucial

aspect of this integration, the use of non-reimbursable European funds, which are an opportunity for Romanian businesses. However, the article details the lack of correct information about investors in terms of the obligations of European funds, analyzing the costs and responsibilities assumed and emphasizing the importance of understanding the “social and institutional costs” of the process (Hapenciuc et al., 2012). The second paper was published in 2014, also in collaboration with Condratov I. The article analyzes the efficiency of the use of European structural funds by companies in the northeast region of Romania, focusing on a comparative analysis of the annual financial statements of the companies that received these funds and those that did not. The results showed no significant differences between the two groups, concluding that the structural funds had a limited impact on businesses in the short term (Moroşan et al., 2014).

Cluster #2, in blue, is composed of Prokop V. and Stejskal J., who as in the previous case have been mentioned during our analysis. The first paper published by the two of them was in 2018, starting from the premise that innovation plays a very important role for the competitiveness of economies and firms. The article analyzes the effect of innovation, collaboration between industry and academia, and public funding on turnover growth in Hungary and the Czech Republic. It was concluded that both collaboration and European funds are better managed in Hungary, and the article proposed to improve the use of national funds (Prokop & Stejskal, 2018). In 2021, together with Striteska M. K., the same authors analyzed the influence of national and European subsidies on the innovation performance of firms in the Czech Republic, also focusing on the role of knowledge and cooperation in innovation activities. The research showed that European subsidies had a significant impact on innovation, while national funds had less effect. Cooperation with research institutions was also found to be crucial for successful innovation. The study contributes to the understanding of the effects of public policy on innovation and catching-up in Central and Eastern Europe (Prokop et al., 2021).

Cluster #3, in green, is composed of Blidisel R. G. and Bunget O. C. Their paper analyzes the use of EU funds in Romania at the SME level, which is only one-quarter of the total number of EU allocations. This delay is considered to be caused by various financial and technical factors, even information asymmetry, which has the effect of limiting SMEs’ access to external funding. The study uses linear regression to demonstrate the relationship between cash flow and investment, using a sample of 15 SMEs that used grant funds between 2010 and 2011 (Bunget et al., 2013).

Cluster #4, in purple, is formed by Andronic A. O. and Andronic R. L. The authors tried to explain the involvement of Spiru Haret University in the implementation and development of a project designed to support startups in the central part of Romania, as part of a European program where universities are eligible. A total of 371 out of 403 selected participants completed entrepreneurial training courses, supported by academic staff (Andronic et al., 2019).

Cluster #5, in orange, is composed of Asalos N. and Bostan I. The researchers focused on the influence of European funds on SMEs in the Danube Delta, maintaining a balance between environmental conservation and economic development. Their research analyzed the environmental, economic, and social effects of the funds on SMEs’ competitiveness. It was observed that European funds have made a significant contribution to increasing competitiveness, but emphasized the need to improve access to them in the future (Bostan et al., 2019).

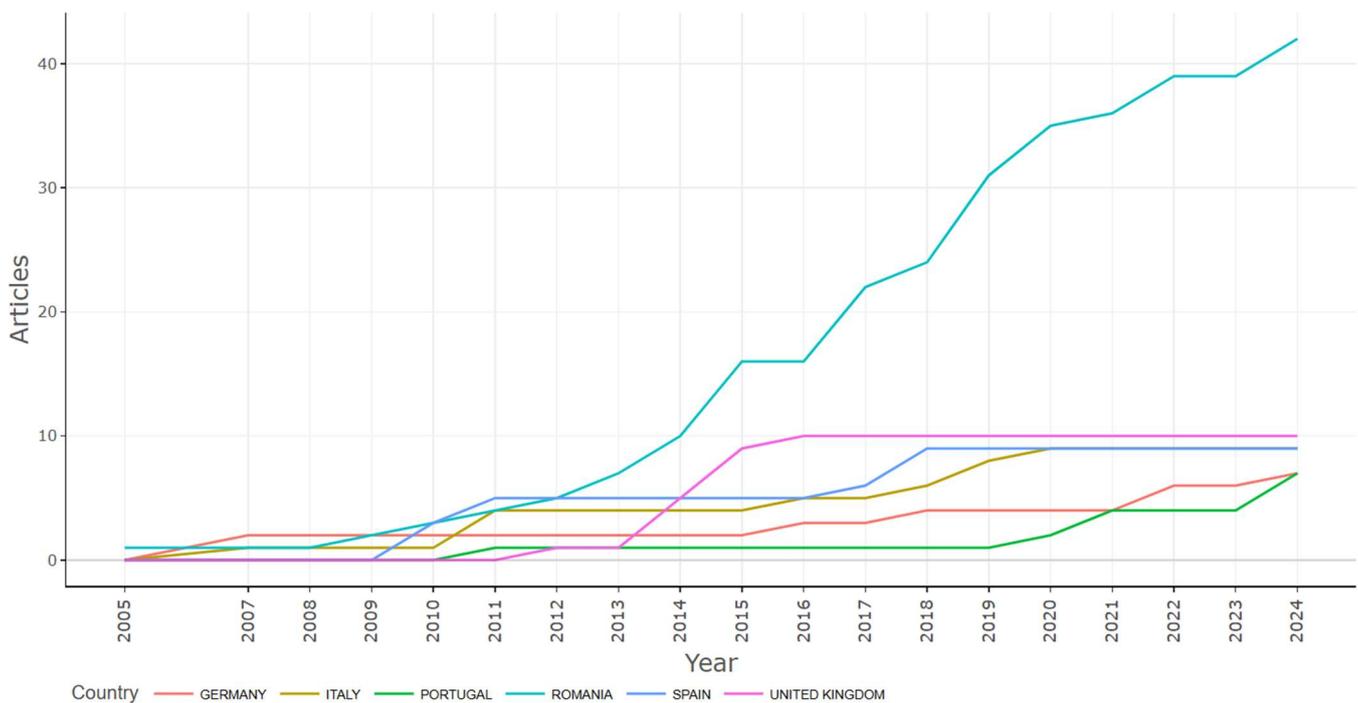
Cluster #6, in brown, is made up of Baeza M. D. and Bueno P. C. The paper analyzes the Europe 2020 Project Bond Initiative (PBI), which aims to stimulate infrastructure financing by using European funds and attracting institutional investors. Using SWOT analysis, the constraints and attractiveness of this initiative are examined, based on case

studies and responses from public consultations. While the initiative has the potential to support infrastructure financing, there are still challenges to be addressed for its effective implementation (Vassallo et al., 2018).

Cluster #7, in pink, is composed of Buchholz J. and Castane G. G. The research of the two focused on the development of ethical frameworks with a view to emphasizing the responsible use of artificial intelligence (AI) in industry, highlighting the existing gap between principles and their application. The analysis focused on lessons learned from European projects and the importance of risk management in order to bridge the existing gaps in responsible AI implementation in industry (Vyhmeister et al., 2022).

### 3.4. Countries

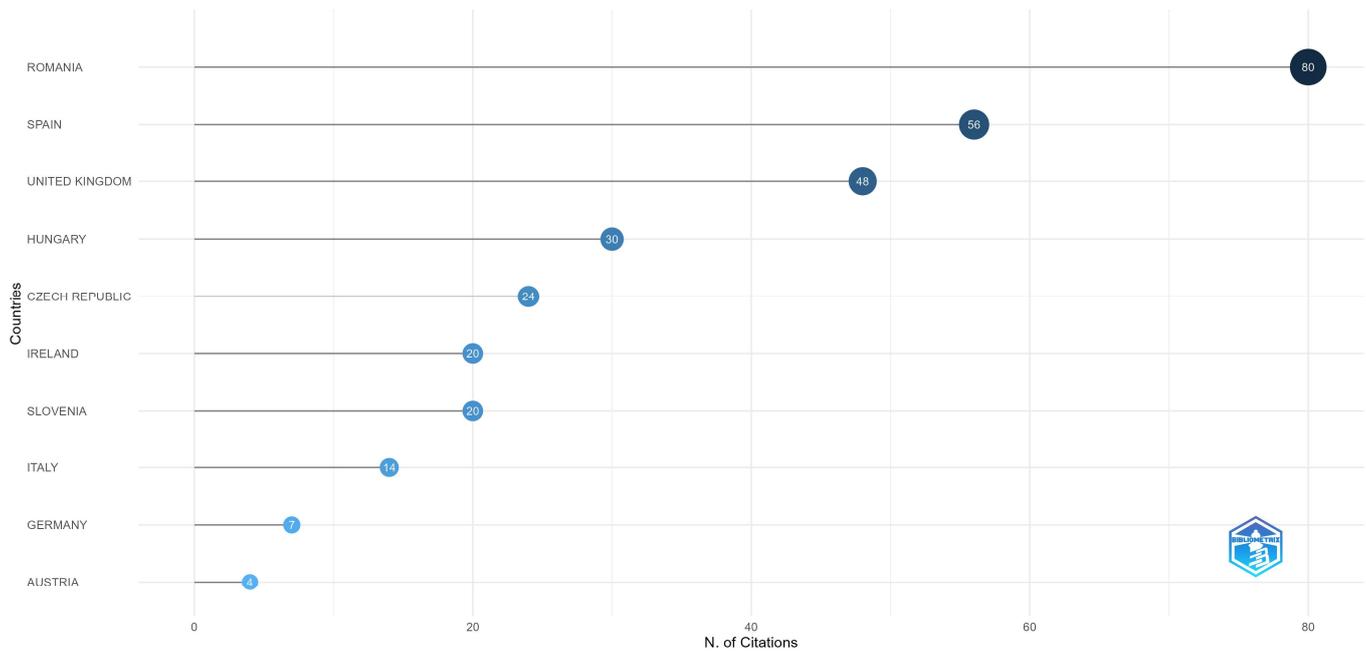
Knowing information about the authors and the universities where they teach, it was considered relevant to identify those countries with the highest scientific productivity (Figure 13).



**Figure 13.** Scientific output by country.

Thus, as expected, due to the affiliations observed in the previous sub-chapter (Table 7), Romania is the country with the highest productivity identified. Starting in 2005, when it registered its first article, it managed to total 42 articles by 2024. In Germany, the first two articles were published in 2007 and by the end of 2024 it had a portfolio of seven articles. In Italy, the first article was published in 2007, reaching a total of nine articles by 2024. Spain published its first three articles in 2010, reaching a total of nine articles in 2024, the same as in Italy. As for Portugal, they published their first article later, in 2011, and by the end of 2024 they had a total of seven articles, as in the case of Germany. Compared to the rest of the countries, the United Kingdom (UK) published its first article much later in 2012, but by the end of 2024, it had a total of 10 articles.

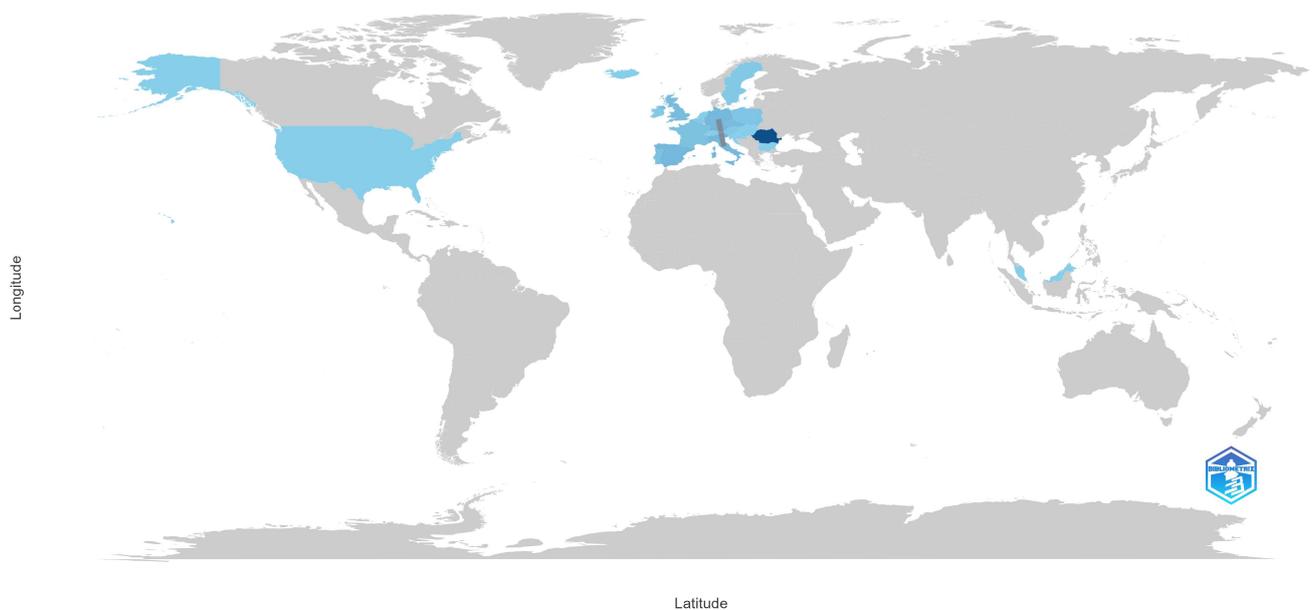
With the later scientific output of different countries examined, we will now discuss which countries formed the top most cited (Figure 14).



**Figure 14.** Top 10 most cited countries.

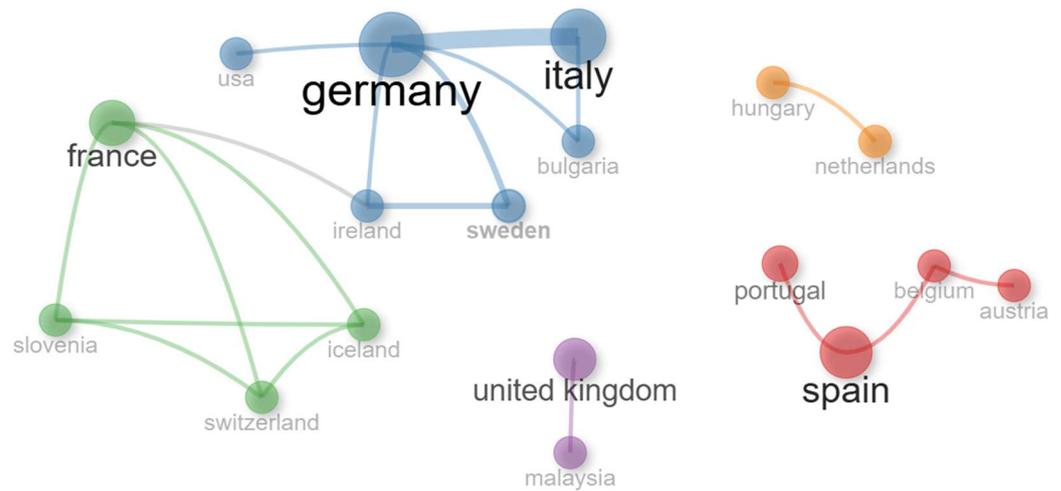
Therefore, the country with the highest number of citations is Romania, with a total number of 80 citations and an average number of citations per article of 2.80. This is followed by Spain with a TC of 56 and an average of 9.30, followed by the UK with 48 TC and an average of 9.60. Hungary, Czech Republic, Ireland, Slovenia, and Italy are the countries with a TC between 30 and 14, with the rest of the countries with a TC below 10.

The most productive countries are identified in Figure 14. In Figure 15, they can be visualized using a global collaborative map. The colors represent the following: the higher the productivity of the country, the darker the shade of blue.



**Figure 15.** Map of collaborations between countries.

Moreover, in order to show the existing collaboration between countries, Figure 16 shows a collaborative network between them, forming clusters according to the number of collaborations existing for scientific production.



**Figure 16.** Country collaborative network.

At the global level, a total of five clusters are identified, each of a different size depending on the number of participants. The first cluster, in red, is made up of Belgium, Austria, Portugal, and Spain; the second cluster, in blue, also which is the largest, is made up of Italy, Germany, Ireland, Sweden, Bulgaria, and United States of America (USA). Cluster 3 consists of France, Iceland, Slovenia, and Austria, cluster 4 of the UK and Malaysia, and cluster 5 of Hungary and the Netherlands.

To create different scientific studies, France collaborated with Iceland, Ireland, Slovenia, and Austria, the Germans collaborated with Bulgaria, Ireland, Sweden, and the USA, Italy with Bulgaria and Germany, even managing to publish two articles in collaboration with Germany, and Spain with Belgium and Portugal. What is very interesting to note is that although most of the work was carried out in Romania, this country only carried out work individually or in collaboration with other researchers within the country, without any external collaborations.

### 3.5. Most Cited Works

This section analyzes the top 10 most cited documents in the field, with the aim of identifying the main research themes within the dataset and highlighting the important topics that have captured the significant interest of the scientific community in the field.

The most cited paper with a TC equal to 39 is the paper by [Romero-Martínez et al. \(2010\)](#), published in 2010 and with an average number of citations per year (TCY) of 2.44 (Table 8). This means that since 2010 and until now, this paper has been cited at least twice per year. The normalized total number of citations (NTC) is equal to two (calculated as the ratio between the TC values, 39 and 19.5, which is the average TC per article in the year 2010). The NTC indicator is calculated by dividing the TC recorded by an article and the average TC recorded by the papers that were published in that year ([Carhuallanqui-Ciocca et al., 2023](#)). In our case, this indicator shows us that the paper in question was rated 2 times better in terms of citations, making a comparison with the values recorded by the rest of the papers. The paper by [Romero-Martínez et al. \(2010\)](#) addresses two important issues related to SME financing. First, it aims to provide a description of the various European financing programs available to Spanish firms. Secondly, the paper aimed to carry out an empirical study observing the use of these programs by Spanish SMEs, with innovation as an objective. Furthermore, the paper analyzes the importance of these programs in supporting SMEs' innovation processes.

Table 8. Top 10 most cited papers globally.

No.	Paper (First Author, Year, Journal, Reference)	Number of Authors	Total Citations (TC)	TC per Year (TCY)	Normalized TC (NTC)
1	Romero-Martínez A. M., 2010, Service Industries Journal (Romero-Martínez et al., 2010)	3	39	2.44	2.00
2	Medve-Bálint G., 2020, Review of International Political Economy (Medve-Bálint & Šćepanović, 2020)	2	30	5.00	3.00
3	Zerbinati S., 2012, Local Government Studies (Zerbinati, 2012)	1	25	1.79	1.92
4	Padurean M. A., 2015, Amfiteatru Economic (Pădurean et al., 2015)	3	20	1.82	6.21
5	Turnsek M., 2020, Water (Turnsek et al., 2020)	4	20	3.33	2.00
6	Diaz-Orueta U., 2020, Health Informatics Journal (Diaz-Orueta et al., 2020)	3	17	2.83	1.70
7	Prokop V, 2021, Oeconomia Copernicana (Prokop et al., 2021)	3	17	3.40	3.00
8	Dinu M., 2020, Proceedings of the International Conference on Business Excellence (Dinu et al., 2020)	4	14	2.33	1.40
9	Bostan I., 2019, Industrial Crops and Products (Bostan et al., 2019)	5	11	1.57	3.44
10	Lane E. T., 2016, Local Economy (Thomas Lane et al., 2016)	4	8	0.80	3.11

In second place is the paper by Medve-Bálint and Šćepanović (2020), with a TC of 30, a TCY of 5, and an NTC of 3 (30 divided by 10); the paper was published in 2020. In the paper, the two authors analyze industrial policy in the market economies of Central and Eastern Europe, arguing that the EU has contributed to the recovery of policy space that was lost through integration into a single market. The authors argued that the EU supports this process through transnational industrial policy, which combines cohesion policy with competition policy. Throughout, the paper compares the use of EU funds in Poland and Romania, highlighting that in Poland efficient institutions have succeeded in achieving a balanced distribution of resources, while in Romania weak institutions have led to a high concentration of funds, mainly benefiting large firms.

In third place is the paper by Zerbinati (2012), who is the sole author and published this study in 2012, with a TC of 25, a TCY of 1.79, and an NTC of 1.91. The researcher analyzed what are the reasons that lead to the influence of participation in multilevel governance of local governments, using networks at both local and European levels. Moreover, she turned her attention to the European funding process as it relates to local governments, identifying differences between local authorities in Italy and the UK. The article also explores how entrepreneurship theory can help to explain and understand the phenomenon, analyzing the funding process at the European level (Zerbinati, 2012).

In fourth place is the article by Pădurean et al. (2015), published in 2015. The researchers started from the premise that the European Structural Funds are made to support the social and economic harmonization of EU member states. It was observed that, over time, these funds have been adapted to meet the needs of the European single market, aiming to improve infrastructure, stimulate entrepreneurship, and develop human resources. The central objective of the researchers was to assess the effects of accessing those funds

under the Regional Operational Program on tourism in the period 2007–2013 (Pădurean et al., 2015).

In fifth place is the paper by Turnsek et al. (2020), published in 2020. Starting from the idea that aquaponics has gained global attention in recent years, with an increasing number of startups in Europe focused on food production using this technology, a network of researchers and entrepreneurs was created between 2014 and 2018 to develop sustainable aquaponics. Two surveys were conducted, one at European level and one for France, highlighting the challenges facing this technology. The results showed that aquaponics is in a phase of “disillusionment”, but progress in the understanding of the processes could lead to exciting developments in the coming years (Turnsek et al., 2020).

In sixth place are Diaz-Orueta et al. (2020), who published their research during 2020. The paper discusses the impact of assistive technologies developed with European support, which have been shown to bridge the digital divide for older people and those with cognitive decline or even dementia. Although the technologies have been integrated into their lives, there are still doubts about whether they meet the needs and wishes of elderly users. Moreover, it discusses important ethical issues such as vulnerability, privacy and autonomy, and provides examples of technologies, highlighting the preferences of older people and the measures needed for their future development (Diaz-Orueta et al., 2020).

In seventh place is the work of Prokop et al. (2021). During our analysis, Prokop V. and Stejskal J. are also mentioned as collaborators on two scientific papers in Figures 10 and 11, where they appeared as two of the authors who are part of the top 10 authors according to scientific output over time. Incidentally, they are also observed in Figure 12 in the collaborative network realized at the author level. As recalled, the work of the researchers focused on the existing European and national subsidies and their impact on innovation, observing a positive impact for the European ones, while a lower impact was observed for the national ones (Prokop et al., 2021).

In eighth place is the paper by Dinu et al. (2020), published in 2020. The researchers, wanted to observe the extent to which European funds were used for rural development and agriculture in Romania in the period 2014–2020. According to previous studies, the authors noticed that Romania had received a considerable amount of money from the EU budget through the help of certain programs. The paper analyzed the number of projects that had gone through the cycle of submission, selection, and contracting until 2019. Moreover, different sub-measures were analyzed, assessing their impact on rural development and correlating the absorption rate of EU funds with economic and demographic indicators (Dinu et al., 2020).

In ninth place is the study conducted in 2019 by Bostan et al. (2019). Similar to the previous situation with the authors Prokop V. and Stejskal J., Bostan I. and Asalos N. are also encountered during our analysis in the collaborative network illustrated in Figure 12. As mentioned above, the research examined the influence of EU funds on SMEs in the Danube Delta, with a particular focus on the balance between environmental conservation and economic development. The study analyzed the impact of these funds on the competitiveness of SMEs, highlighting that EU funds have significantly contributed to increased competitiveness. However, it emphasized the need to improve access to these funds in the future (Bostan et al., 2019).

In tenth place is the paper published in 2016 by Thomas Lane et al. (2016). This paper explores how local food and drink entrepreneurship, including food tourism initiatives, can contribute to addressing economic and social challenges in rural communities in Wales. The case study investigates the impact of rural and social enterprises in delivering sustainable products with added value for the community. The context of the analysis is based on

principles of equitable development, community decision making, and partnerships, within the framework of the One Planet Wales commitment to Sustainable Development and European funding for rural development (Thomas Lane et al., 2016).

Table 9 was created to summarize the most relevant information related to the first author, the year of publication, the journal in which the paper was or is to be published, its title, and the dataset used in the analysis, especially for the most cited papers at the global level.

**Table 9.** Short summary of top 10 most cited papers globally.

No.	Paper (First Author, Year, Journal, Reference)	Title	Data	Purpose
1	Romero-Martínez A. M., 2010, Service Industries Journal (Romero-Martínez et al., 2010)	Evaluating European Union support for innovation in Spanish small and medium enterprises	Panel data, a total of 12,179 Spanish firms, leaving a final sample of 8536 firms	Description and analysis of how the European funding programs available to Spanish SMEs are used
2	Medve-Bálint G., 2020, Review of International Political Economy (Medve-Bálint & Šćepanović, 2020)	EU funds, state capacity and the development of transnational industrial policies in Europe's Eastern periphery	A dataset of individual contracts of EU-funded projects, consisting of 824 Polish and 526 Romanian firms	Analyzing how the EU has contributed to regaining policy space for Central and Eastern European member states through transnational industrial policy
3	Zerbinati S., 2012, Local Government Studies (Zerbinati, 2012)	Multi-level Governance and EU Structural Funds: An Entrepreneurial Local Government Perspective	Archive documents as well as both focused and structured interviews	Analysis of the European funding process in Italian and UK local governments, exploring the differences between them and using entrepreneurship theory to explain this phenomenon
4	Padurean M. A., 2015, Amfiteatru Economic (Pădurean et al., 2015)	Entrepreneurship in Tourism and Financing through the Regional Operational Programme	National Statistical Institute and World Travel and Tourism Council	Analysis of the effects of the European structural funds on the tourism business environment, especially in the framework of the Regional Operational Program
5	Turnsek M., 2020, Water (Turnsek et al., 2020)	Challenges of Commercial Aquaponics in Europe: Beyond the Hype	Two questionnaires, one Europe-wide (60 respondents from 24 countries) and one in France only (43 respondents)	Analysis of the development of commercial aquaponics in Europe, identifying the barriers and challenges encountered in implementing this technology
6	Diaz-Orueta U., 2020, Health Informatics Journal (Diaz-Orueta et al., 2020)	Shaping technologies for older adults with and without dementia: Reflections on ethics and preferences	The US National Bioethics Advisory Board and information gathered from numerous scholarly articles	Analyzing the relevance of privacy, vulnerability, and preserving autonomy in the development of information and communication technologies for older people
7	Prokop V., 2021, Oeconomia Copernicana (Prokop et al., 2021)	Fostering Czech firms? innovation performance through efficient cooperation	The latest data found using an innovation survey	Analysis of the influence of both national and European subsidies on business innovation and the impact of resources in the Czech Republic
8	Dinu M., 2020, Proceedings of the International Conference on Business Excellence (Dinu et al., 2020)	Accessing the European funds for agriculture and rural development in Romania for the 2014–2020 period	National Institute of Statistics—Romania and the official website of the National Rural Development Program Romania	Identification of measures where Romania has used EU funds for rural development and agriculture for the period 2014–2020
9	Bostan I., 2019, Industrial Crops and Products (Bostan et al., 2019)	The three-dimensional impact of the absorption effects of European funds on the competitiveness of the SMEs from the Danube Delta	Questionnaire and unstructured interview	Analysis of the impact of European funds on SMEs in the Danube Delta, in the context of the balance between economic development and environmental conservation
10	Lane E. T., 2016, Local Economy (Thomas Lane et al., 2016)	Exploring the potential of local food and drink entrepreneurship in rural Wales	Survey and interviews in February 2015, to be followed by a sample of 30 private enterprises	Exploring how local food and drink entrepreneurship, including food tourism, can address the economic and social challenges of rural communities in Wales

### 3.6. Most Used Words

Throughout this section, the most frequent additional keywords or the keywords at the author level, as well as groups of keywords (bigrams or trigrams), are identified at title level and abstract level, with the aim of understanding the terms that the authors emphasized during their research.

The word cloud in Figure 17 presents the additional keywords. According to this figure, it can be easily deduced that the following words occurred the most: “growth” and “performance”, both registering five occurrences each. With three occurrences are “impact”,

“policy”, and “research-and-development”, and with two occurrences each are “cohesion policy”, “development subsidies”, “enterprises”, “firms”, “governance”, “innovation”, “management”, and “model”. The rest of the words observed in the word cloud each had only one occurrence.



Figure 17. Top 50 most used words in additional keywords.

To make a comparison, Figure 18 shows the most used words when it comes to authors. This time one very prominent word is “European funds” with a total of 13 occurrences, followed by “SMEs” with 7 occurrences and “entrepreneurship” with 6 occurrences. The following words have occur twice: “European union” and “Romania”. With three occurrences each are “agriculture”, “Czech Republic”, “investments”, “rural development”, “structural funds”, and “tourism”; with two occurrences are a total number of 18 words (“business intelligence”, “cohesion policy”, “community”, “competitiveness”, “cooperation”, “e-learning”, “enterprise”, “entrepreneurs”, “erdf”, “innovation”, “policy”, “regional development”, “rural area”, “rural entrepreneurship”, “sme”, “start-up”, “sustainable development”, and “venture capital”); and with one occurrence, there are 21 words.



Figure 18. Top 50 most used words at author keyword level.

Given that our theme is related to the absorption of European funds and how they benefit the business environment, it is natural that in both Figures 17 and 18 there are terms referring to the following:

- European policies or funds: “European funds”, “structural funds”, “erdf”, “cohesion policy”, “development subsidies”, “policy”, “regional development”, or “sustainable development”;
- Enterprises: “SMEs”, “entrepreneurship”, “entrepreneurs”, “enterprise”, “start-up”, “business intelligence”, “enterprises”, “firms”, or “venture capital”;
- Agriculture and tourism, this being an area in which European funds have been frequently used: “agriculture”, “rural development”, “tourism”, “rural area”, or “rural entrepreneurship”;
- Development and innovation: “innovation”, “research-and-development”, “management”, “growth”, “performance”, or “impact”;
- Cooperation and governance: “cooperation”, “community”, “governance”, or “model”;
- Countries: “Romania” or “Czech Republic”.

In this sub-chapter, terms referring to “European funds/funding/funded” or “European union” have been removed, as the large number of occurrences of these terms is obvious.

At the abstract level, the bigram “structural funds” has been identified with 17 appearances; there are 16 appearances for “rural development”, 13 appearances for “regional development”, 9 appearances for “European level” and “medium enterprises”, 8 appearances for “funded project”, 6 appearances for “cultural institutions”, “innovation performance”, and “projects implemented”, and 5 appearances for the group “Danube Delta”. At the title level, with 6 occurrences is the group “rural development/entrepreneurship”, with 4 occurrences is “structural funds”, with 3 occurrences are “funds absorption” and “cohesion funds”, and with 2 occurrences are “European projects”, “investment projects”, “romanian rural”, “romanian SMEs”, “union funds”, and “absorption effects/process” (Table 10).

**Table 10.** Top 10 most common bigrams at abstract and title level.

Bigrams in Abstracts	Occurrences	Bigrams in Titles	Occurrences
structural funds	17	rural development/entrepreneurship	6
rural development	16	structural funds	4
regional development	13	funds absorption	3
European level	9	cohesion funds	2
medium enterprises	9	European projects	2
funded project	8	investment projects	2
cultural institutions	6	romanian rural	2
innovation performance	6	romanian smes	2
projects implemented	6	union funds	2
Danube Delta	5	absorption effects/process	2

Making a categorization of the groups of words identified at both the title and abstract level, there are those related to European funds and financing—“structural funds”, “union funds”, “funded project”, “absorption effects/process structural funds”, and “investment projects”; those related to rural development—“rural development”, “romanian rural”, and “projects implemented”; those related to entrepreneurship—“entrepreneurship”, “medium enterprises”, “romanian smes”, and “innovation performance”; and those related to institutions and European level “cultural institutions” and “European level”. These categories highlight key aspects about the use of European funds for rural development and entrepreneurship, such as the absorption of funds, the projects financed, and their effects on SMEs and communities in rural areas.

Making a grouping as in the previous cases, taking into account the trigrams obtained at both the title and abstract level, in Table 11 there are terms referring to development and

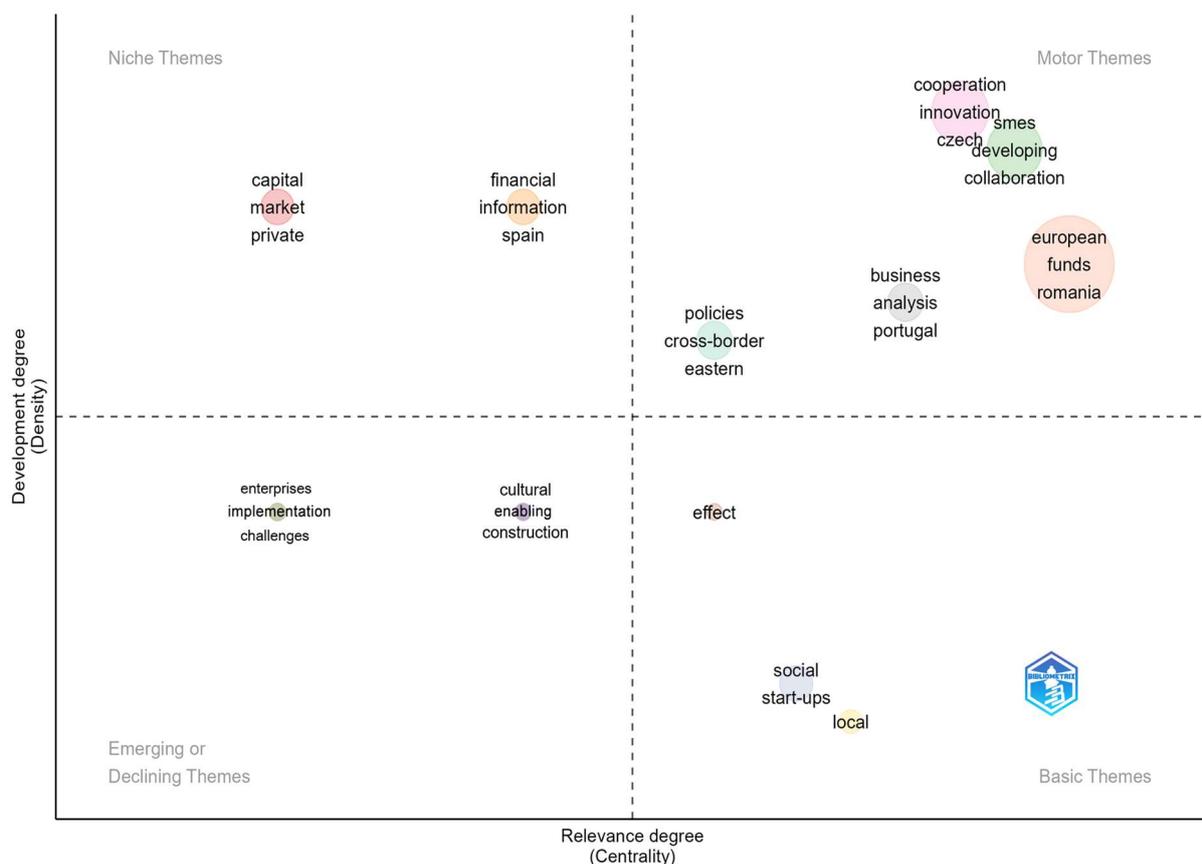
regional policy—“regional development policy”, “cohesion funds absorption”, “development fund erdf”, “direct lending funds”, and “complementary eu funds”; terms referring to programs and initiatives—“twenty leadership programme” or “activities public financing”; and terms referring to the analysis of proposals and content—“content analysis proposal”.

**Table 11.** Top 10 most common trigrams at abstract and title level.

Trigrams in Abstracts	Occurrences	Trigrams in Titles	Occurrences
firms innovation performance	4	activities public financing	1
online social networks	4	czechia funding development	1
medium enterprises smes	3	bile-biele karpaty euroregion	1
regional development policy	3	business intelligence application	1
twenty leadership programme	3	cnet optimisation solution	1
business intelligence tools	2	cohesion funds absorption	1
commercial food production	2	complementary eu funds	1
development business center	2	construction smes enabling	1
development fund erdf	2	content analysis proposal	1
direct lending funds	2	czech firms innovation	1

### 3.7. Thematic Analysis

In order to generate the thematic map in Figure 19, a total of 200 words were selected which have a minimum cluster frequency (per thousand documents) equal to 30, with a label size e 0.3 and a number of labels equal to 3. According to the literature, a thematic map has the role of dividing the selected words into centrality and density. Centrality helps us to observe the amount of work on a particular topic, while density indicates the importance that a particular topic has (Nasir et al., 2020).



**Figure 19.** Thematic map for additional keywords.

Although a total of 17 clusters are presented in Figure 19, only 12 of them are illustrated. As it is quite difficult to observe the composition of each cluster, as well as the number of occurrences for each word forming it, we decided to create in Table 12 a much clearer image for each cluster, mentioning also the color and the quadrant to which it belongs.

**Table 12.** Description of clusters formed in thematic map.

Occurrences	Word	Cluster	Color	Cluster Name	Dial
2	capital	1	red	capital	niche themes
2	market	1	red	capital	niche themes
2	private	1	red	capital	niche themes
9	smes	3	green	SMEs	motor themes
2	collaboration	3	green	SMEs	motor themes
3	developing	3	green	SMEs	motor themes
2	based	3	green	SMEs	motor themes
2	economy	3	green	SMEs	motor themes
2	programme	3	green	SMEs	motor themes
2	source	3	green	SMEs	motor themes
2	tool	3	green	SMEs	motor themes
2	financial	5	orange	financial	niche themes
2	information	5	orange	financial	niche themes
2	spain	5	orange	financial	niche themes
2	effect	6	brown	effect	basic themes
5	cooperation	7	purple	cooperation	motor themes
5	innovation	7	purple	cooperation	motor themes
3	czech	7	purple	cooperation	motor themes
2	activities	7	purple	cooperation	motor themes
2	firms	7	purple	cooperation	motor themes
2	hungary	7	purple	cooperation	motor themes
2	management	7	purple	cooperation	motor themes
2	performance	7	purple	cooperation	motor themes
2	republic	7	purple	cooperation	motor themes
2	slovak	7	purple	cooperation	motor themes
3	business	8	gray	business	motor themes
2	analysis	8	gray	business	motor themes
2	portugal	8	gray	business	motor themes
3	policies	9	light green	policies	motor themes
2	cross-border	9	light green	policies	motor themes
2	eastern	9	light green	policies	motor themes
26	European	10	pink	European	motor themes
22	funds	10	pink	European	motor themes
13	romania	10	pink	European	motor themes
12	rural	10	pink	European	motor themes
10	development	10	pink	European	motor themes
8	entrepreneurship	10	pink	European	motor themes
8	romanian	10	pink	European	motor themes
7	companies	10	pink	European	motor themes
7	projects	10	pink	European	motor themes
6	eu	10	pink	European	motor themes
6	financing	10	pink	European	motor themes
6	funding	10	pink	European	motor themes
6	structural	10	pink	European	motor themes
6	union	10	pink	European	motor themes
5	absorption	10	pink	European	motor themes
5	public	10	pink	European	motor themes
5	study	10	pink	European	motor themes
4	support	10	pink	European	motor themes

Table 12. Cont.

Occurrences	Word	Cluster	Color	Cluster Name	Dial
4	impact	10	pink	European	motor themes
4	opportunities	10	pink	European	motor themes
4	region	10	pink	European	motor themes
3	competitiveness	10	pink	European	motor themes
3	effects	10	pink	European	motor themes
3	investments	10	pink	European	motor themes
2	agriculture	10	pink	European	motor themes
2	cohesion	10	pink	European	motor themes
2	enterprise	10	pink	European	motor themes
2	entrepreneurial	10	pink	European	motor themes
2	funded	10	pink	European	motor themes
2	governance	10	pink	European	motor themes
2	investment	10	pink	European	motor themes
2	level	10	pink	European	motor themes
2	period	10	pink	European	motor themes
2	perspective	10	pink	European	motor themes
2	process	10	pink	European	motor themes
2	regional	10	pink	European	motor themes
2	role	10	pink	European	motor themes
2	tourism	10	pink	European	motor themes
3	social	11	light blue	social	basic themes
3	startups	11	light blue	social	basic themes
3	local	14	yellow	local	basic themes
2	enabling	15	dark purple	enabling	emerging or declining themes
2	cultural	15	dark purple	enabling	emerging or declining themes
2	construction	15	dark purple	enabling	emerging or declining themes
2	implementation	17	dark green	implementation	emerging or declining themes
2	enterprises	17	dark green	implementation	emerging or declining themes
2	challenges	17	dark green	implementation	emerging or declining themes

Using the data in Figure 19 and Table 12, it can be seen that in the “Motor Themes” quadrant, there are five clusters: “cooperation”, “SMEs”, “European”, “business”, and “policies”. In this quadrant are found those words that represent well-developed themes, being representative for the field under study, which is why here the cluster with the most words in its composition can be observed, “European” with 38 words, of which only “European” or “funds” have more than 20 occurrences each. In the “cooperation” cluster, the highest number of occurrences was recorded for the words “cooperation” and “innovation”; in the “SMEs” cluster, there are words like “SMEs”, “collaboration”, or “developing” with a number of occurrences between 2 and 9; in “business”, there are words like “business”, “analysis”, and “portugal”; and in “policies”, there are words like “cross-border” or “eastern”.

In the “Niche Themes”, there are words related to themes that are not so often used in the analysis. Here, two clusters are identified: “financial” and “capital”. Both consist of three words each with a total number of two occurrences. In “Basic Themes”, there are three clusters, “effect”, “social”, and “local”, which indicate words related to themes that are in a process of development such as “startups”. The last quadrant, entitled “Emerging or Declining Themes”, contains two clusters (“enabling” and “implementation”) whose composition is made up of words with two occurrences each.

The totality of the words identified in each cluster plays a very important role in terms of the use and application for EU funds, whether it is the countries that have been identified

as the most common in the research in the dataset, the policies applied in each of them, or the techniques applied.

Furthermore, for topic discovery, LDA has been performed on the extracted papers. LDA was employed as a generative probabilistic model commonly used in natural language processing (NLP) to identify latent topics within a text corpus (Delcea et al., 2024b). To improve topic detection accuracy, the textual data underwent preprocessing steps including lowercasing and punctuation removal. Given that LDA treats tokens like “SMEs” and “small and medium enterprises” as distinct terms, term normalization was also conducted to unify semantically equivalent expressions.

Also, for the LDA model, grid search was used to optimize the *alpha* and *eta* hyperparameters, aiming to strike a balance between a relatively small number of topics and high topic coherence. As a result, four topics have been extracted, for an asymmetric *alpha* and an *eta* of 0.01. The LDA model was implemented using the Gensim Python 4.3.3 library (Řehůřek & Sojka, 2010).

The identified topics, as well as the top 30 most relevant words for each topic, are depicted in Figures 20–23.

Topic 1 retains 33.3% of the tokens and provides a focus on the Romanian SMEs and funding. The keywords associated with this topic rely on “romania”, “sme”, “investment”, “grant”, “entrepreneur”, “financial”, “impact”, “market”, “structural\_fund”, and “absorption”, as depicted in Figure 20. As the main focus of the works included in this topic, one can mention the role of structural and grant programs, the economic and financial impact of these programs, and the impact of EU funds absorption.

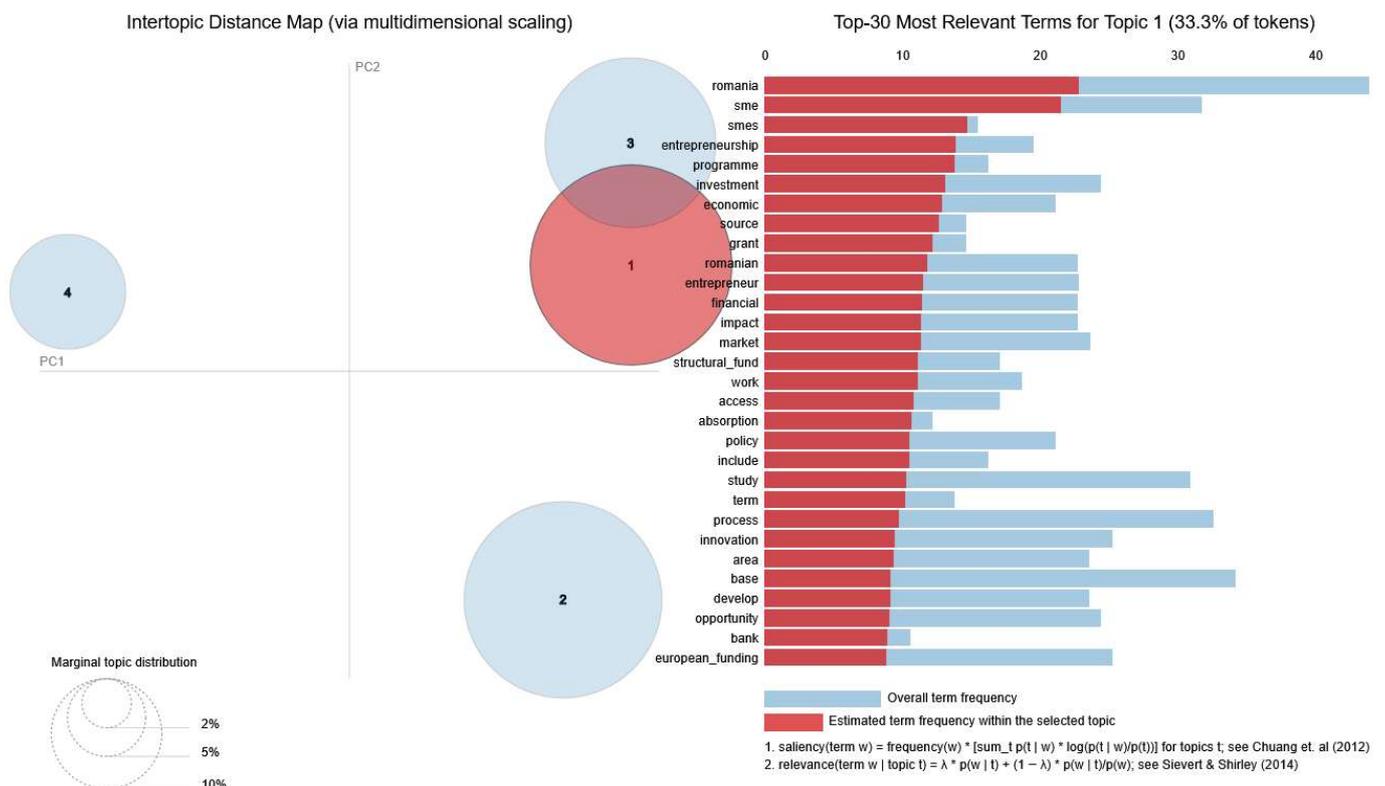


Figure 20. LDA results—Topic 1. (Chuang et al., 2012; Sievert & Shirley, 2014).

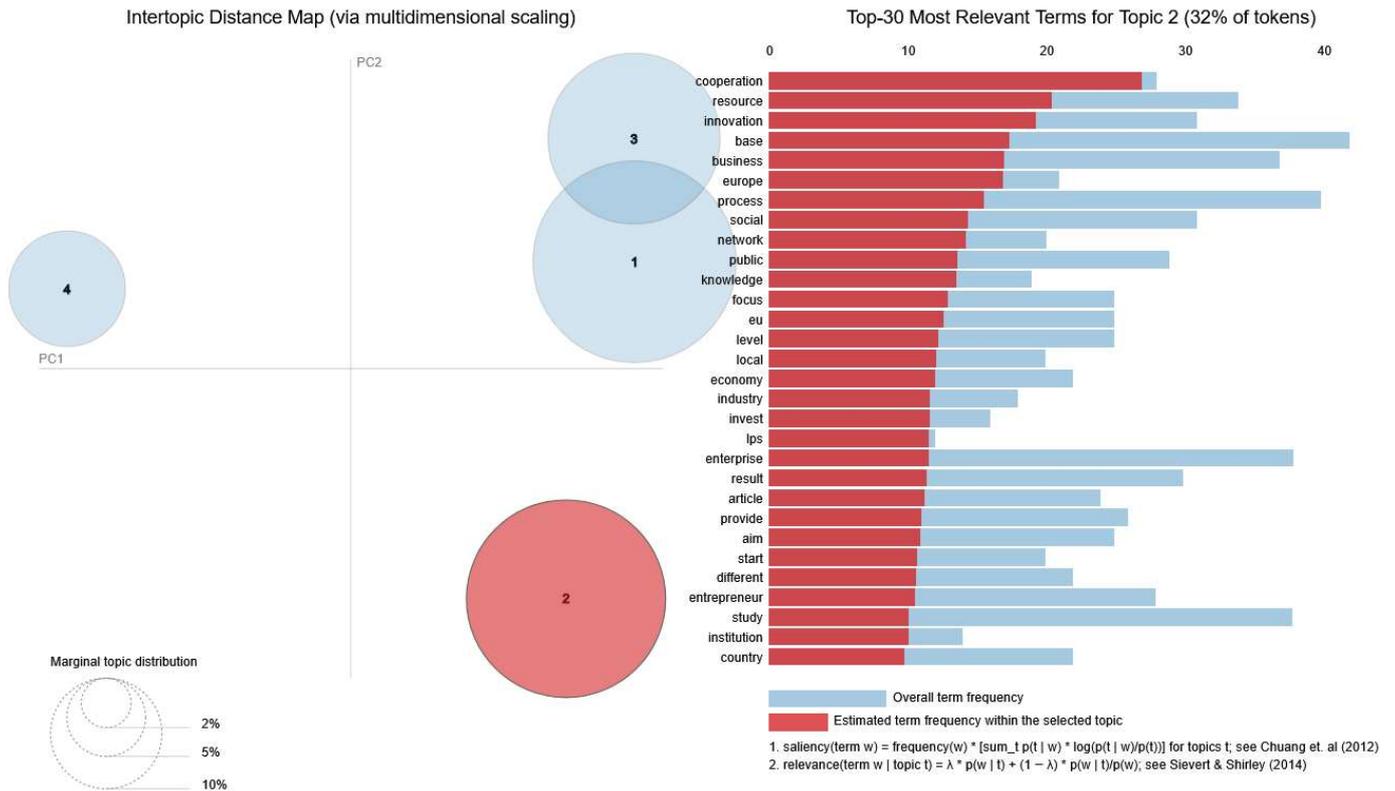


Figure 21. LDA results—Topic 2. (Chuang et al., 2012; Sievert & Shirley, 2014).

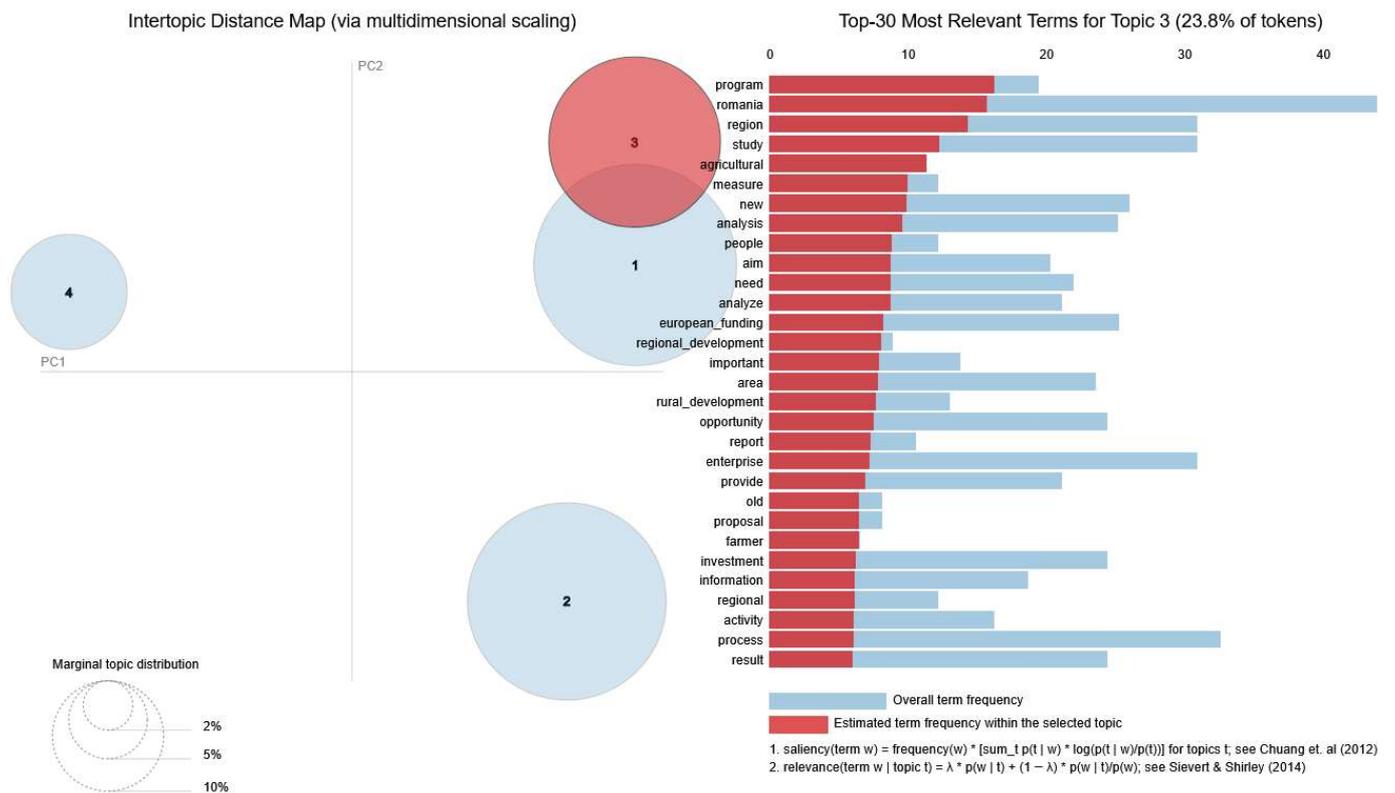


Figure 22. LDA results—Topic 3. (Chuang et al., 2012; Sievert & Shirley, 2014).

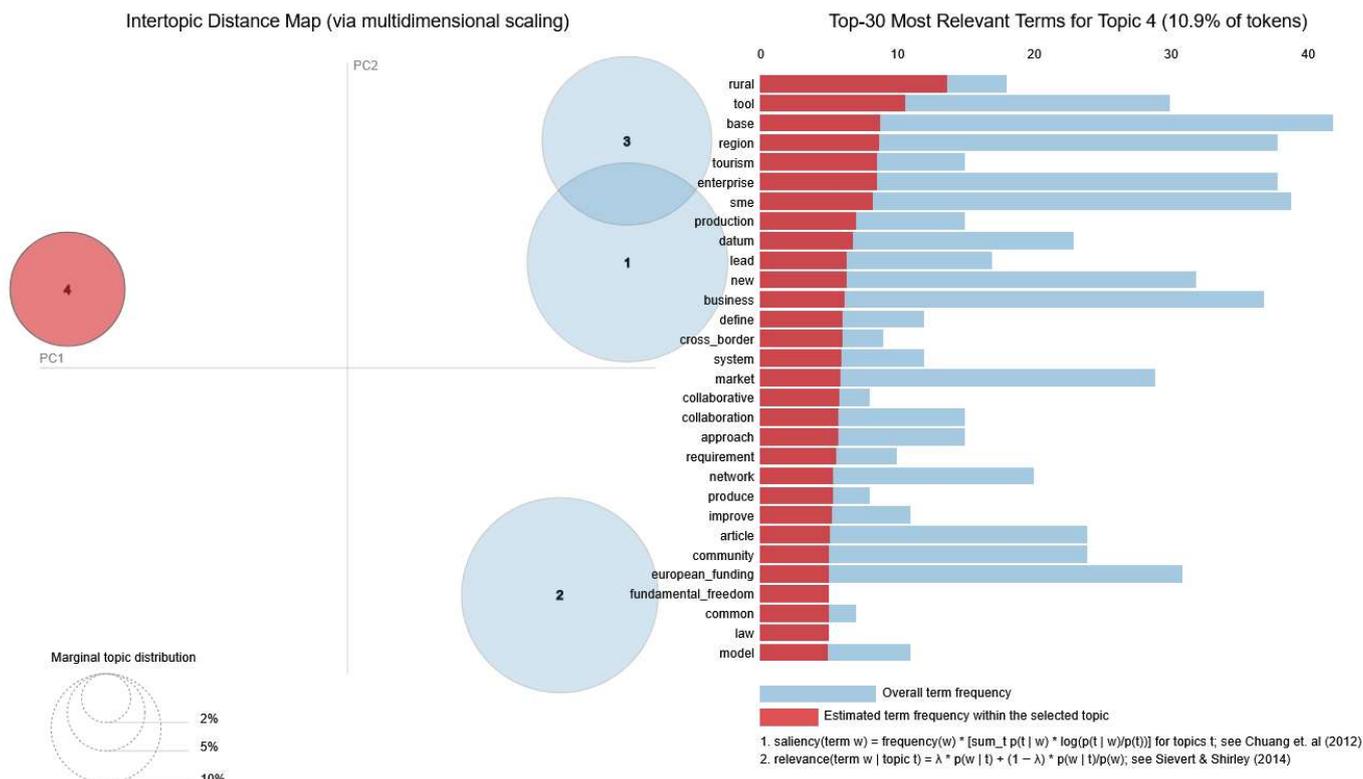


Figure 23. LDA results—Topic 4. (Chuang et al., 2012; Sievert & Shirley, 2014).

Topic 2 consists of 32% of tokens and feature a series of keywords related to “co-operation”, “resource”, “innovation”, “business”, “social”, “network”, “public”, “eu”, “economy”, “enterprise”, and “country”, putting an emphasize on elements related to innovation and cooperation in the context of the EU economy, the roles of the social and public sector, the key role played by networks and knowledge transfer, and the policies considered at both local and national levels. The most salient words associated with this topic are highlighted in Figure 21.

Another important topic given the percentage of tokens, namely 23.8%, is Topic 3, which centers around elements associated with rural and regional development. Among the most relevant terms one can mention “program”, “region”, “agricultural”, “measure”, “regional\_development”, “rural\_development”, “farmer”, “opportunity”, and “investment”, as observed in Figure 22.

The last topic identified, namely Topic 4, consists of 10.9% of tokens and retains articles dedicated to research in the area of enterprise collaboration in the rural and cross-border regions, as well as tourism seen as a driver of economic development (Figure 23). Furthermore, topics related to legal and systemic frameworks are also gathered here. The key terms associated with this topic are “rural”, “tool”, “region”, “tourism”, “enterprise”, “sme”, “production”, “system”, “collaboration”, “community”, “law”, and “model”.

Considering all of the above topics, the following coverage can be observed: *Topic 1—Entrepreneurship and EU Funding Absorption in Romania*, *Topic 2—Innovation and Cooperative Enterprise in the EU Context*, *Topic 3—Regional and Rural Development through Agricultural and EU Programs*, and *Topic 4—Collaborative Rural Enterprises and Cross-Border Development*.

As it resulted from the above discussion, as well as from Figures 20–23, it can be noticed that Topic 4 is isolated in the inter-topic distance maps, while Topic 1 and Topic 3 share some common elements related to their focus on Romanian funding and development. Overall, a strong thematic cohesion around entrepreneurship, EU structural funds, regional development, and innovation can be observed.

By comparing the results of the LDA with the thematic map depicted in Figure 19 and characterized in Table 12, it can be observed that there is a connection between the identified topics through the two analyses (thematic map and LDA). LDA Topic 1, for example, is highly connected with cluster 10 (in pink) and cluster 5 (in orange) based on the terms overlapping. Furthermore, LDA Topic 2 covers elements related to cluster 7 (in purple) and cluster 11 (in light blue) extracted in the thematic map, which refers to collaborative and innovative enterprise policies, while LDA Topic 3 aligns with the core regional development terms which can be identified in cluster 10 (in pink) and cluster 14 (in yellow) in the thematic map. Lastly, LDA Topic 4 covers elements related to cross-border cooperation and rural enterprises, with keywords common to cluster 9 (in light green), cluster 10 (in pink), and cluster 1 (in red).

Overall, all the LDA topics are connected to the themes in the thematic map, especially to themes associated with the motor themes quadrant.

In addition to the LDA and thematic map analysis, BERTopic was applied, which constructs coherent topic representations using a class-based variant of Term Frequency-Inverse Document Frequency (TF-IDF). This method has demonstrated competitive performance across several topic modeling benchmarks (Grootendorst, 2022).

The results of BERTopic are highlighted in Figure 24. As can be seen, four topics have been uncovered, from Topic 0 to Topic 3, as presented in Figure 25. For each of the four topics, a series of 10 keywords have been extracted; the top 5 keywords associated with each topic can be observed in Figure 25, as can the number of papers associated with each topic, retained in the *size* indicator.

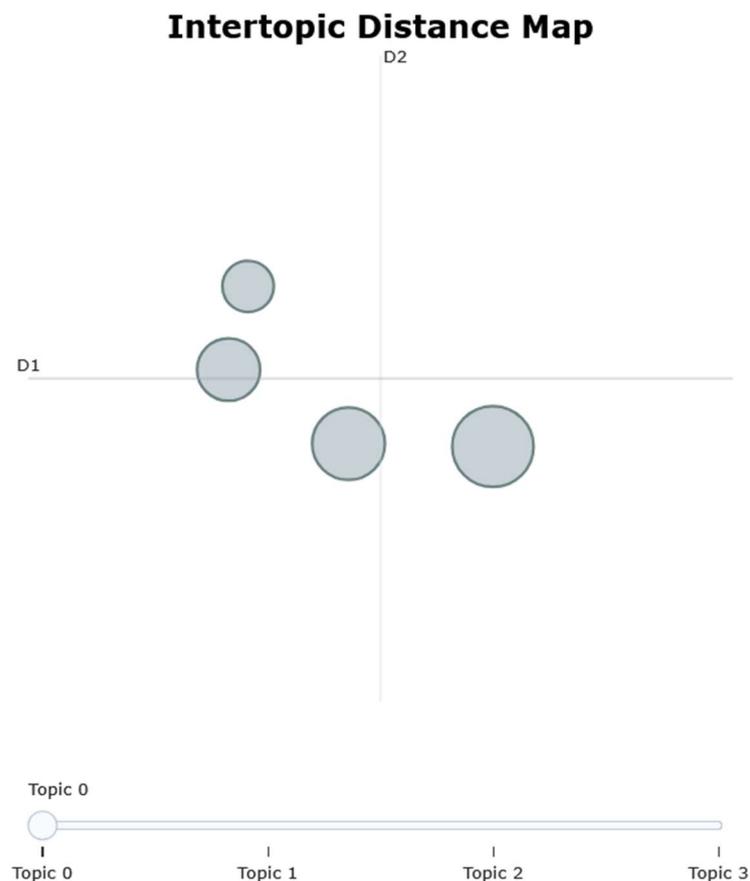
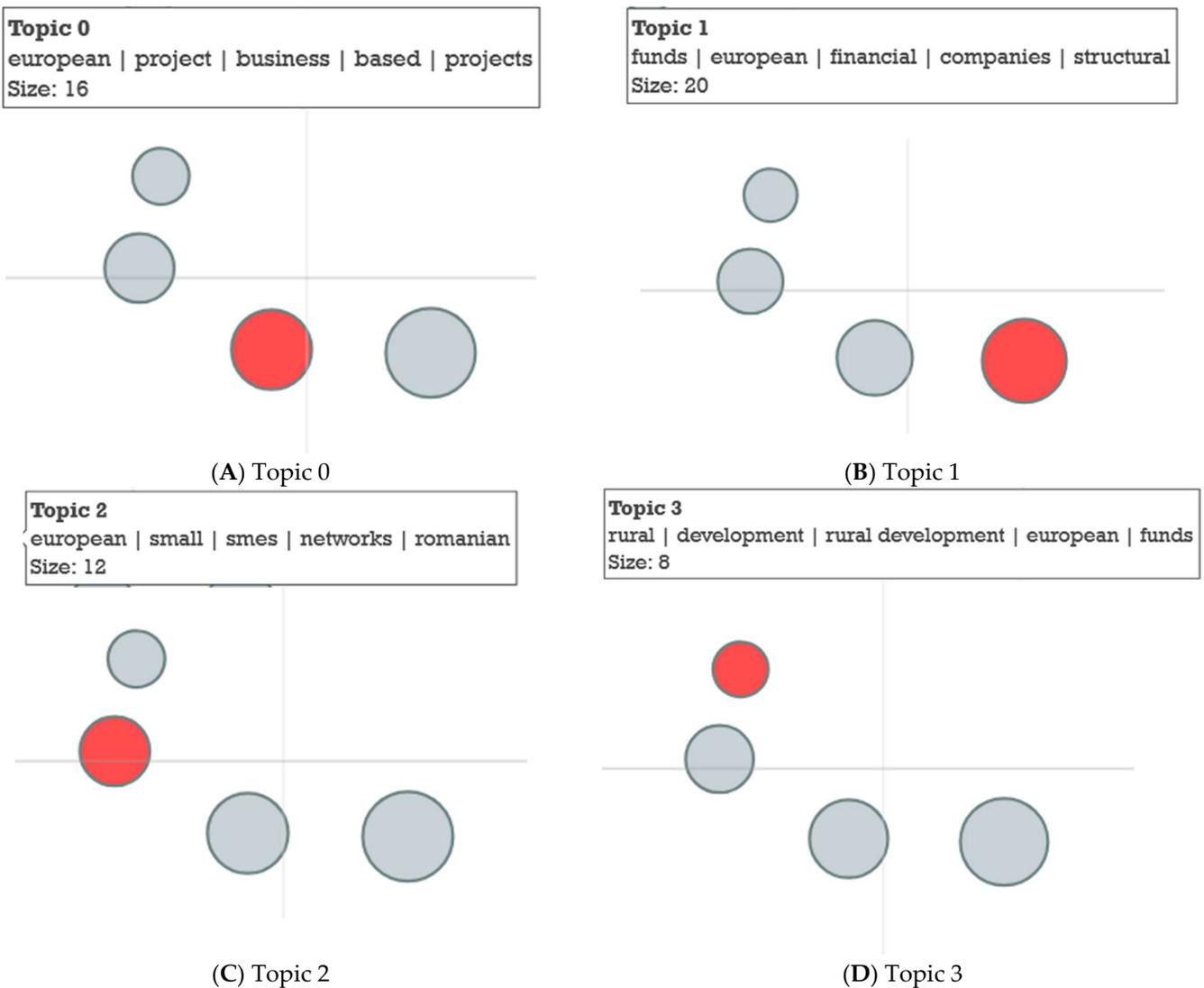


Figure 24. BERTopic results.



**Figure 25.** BERTopic composition.

Considering the topics, it can be noticed that Topic 0 is characterized by keywords such as “european”, “project”, “business”, “based”, “projects”, “information”, “data”, “smes”, “collaboration”, and “optimization”. This topic captures collaborative business projects within the European context, focusing on SME collaborations supported by EU funds.

The financial supports mechanisms provided by the EU are highlighted in the works grouped under Topic 1. This topic gathers keywords such as “funds”, “european”, “financial”, “companies”, “structural”, “european funds”, “process”, “investment”, “projects”, and “structural funds”, and puts an emphasis on structural and CF, the investment process, and the financial governance and implementation processes of EU-funded initiatives.

Topic 2 in BERTopic is characterized by words such as “european”, “small”, “smes”, “networks”, “romanian”, “regions”, “development”, “sme”, “romania”, and “innovation”, suggesting a coverage of the themes associated with Romanian and SME development within this context.

Lastly, Topic 3 gathers words such as “rural”, “development”, “rural development”, “european”, “funds”, “romania”, “entrepreneurship”, “areas”, “rural areas”, and “rural entrepreneurship”. As observed, the main emphasis goes on the rural element associated with EU support, with Romanian studies again being highlighted.

Considering the identified BERTopics, the following labels can be associated with each of them: *Topic 0—European Business Collaboration and Data-Driven Innovation*, *Topic 1—Structural Funds and Investment Mechanisms in the EU*, *Topic 2—SME Networks and Regional Innovation in Romania*, and *Topic 3—Rural Development and Entrepreneurship under EU Support*.

Further comparing the BERTopic results with the previous topics extracted through LDA analysis and theme extraction through thematic mapping, an overlap of topics and themes can be noticed.

For example, BERTopic 0 is connected with LDA Topic 2 and the thematic map cluster 7 dedicated to cooperation. BERTopic 1 matches elements from LDA Topic 1, as well as from thematic map cluster 10 through the European component. BERTopic 3 features elements from LDA Topic 1 and LDA Topic 2, as well as from thematic map clusters 3 and 10 due to the focus on both SMEs and Romania, while BERTopic 4 covers elements from LDA Topic 3 and LDA Topic 4 and clusters 10 and 14.

### 3.8. Mixed Analysis

In order to observe the existing links between countries, authors, and keywords, Figure 26 is presented below. As expected from the previous chapters, a significant contribution in terms of scientific output was made by Romania. It has a total number of 10 corresponding authors including Asalos N., Bostan I., Morosan A. A., Blidisel R. G., etc. The researchers often used in their papers words such as “cooperation”, “European funds”, “entrepreneurship”, or even “romania”. In addition to Romania, there are countries such as the Czech Republic, Spain, Germany, France, Portugal, Italy, Germany, the UK, or Malaysia. Spain has three authors involved in the scientific process, the Czech Republic has two, as does Germany, and the rest of the countries have one representative author.

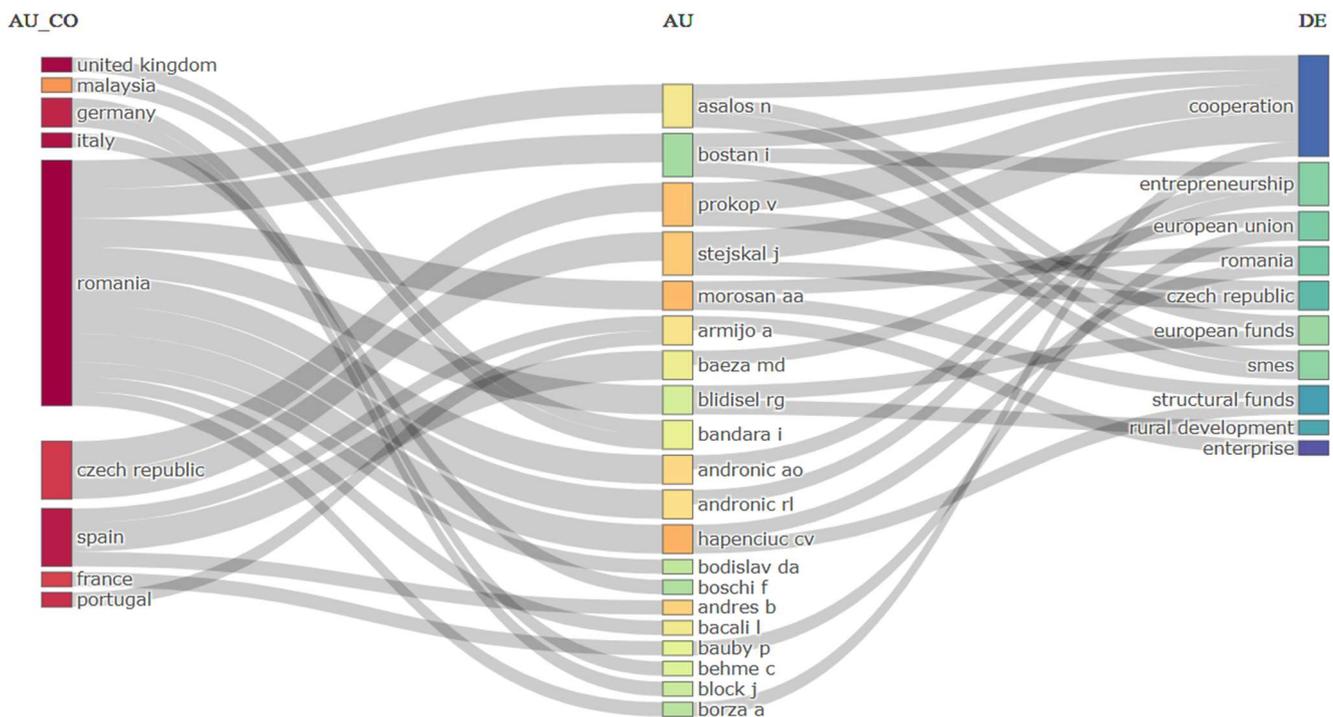


Figure 26. Three-field plot: countries (left), authors (middle), and keywords (right).

Figure 27 shows a graph similar to the previous one, only this time the universities where the authors are professors and the most common additional keywords are taken into account. The highest number of affiliated authors is found in the institution “Stefan cel Mare University of Suceava”, which includes the authors Hapenciuc C. V., Morosan A.

A., Asalos N., and Bostan I. With two affiliated authors each are “Spiru Haret University” as well as “University of Pardubice”. Among the most common additional words for the identified authors are “growth”, “performance”, “model”, “impact”, and “governance”.

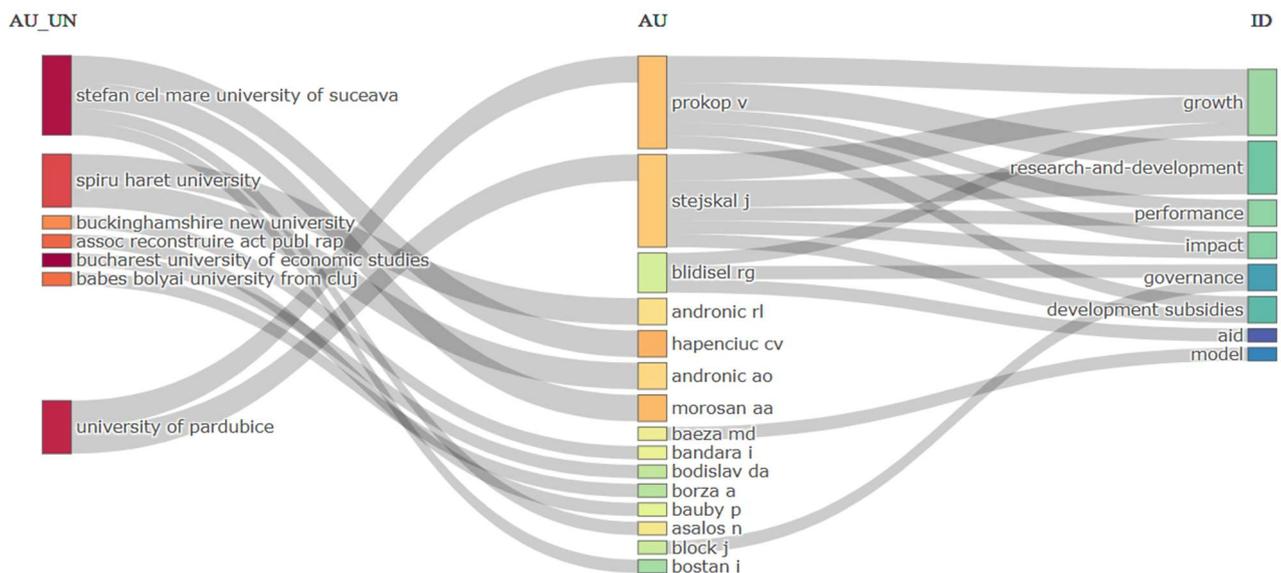


Figure 27. Three-field plot: affiliation (left), authors (middle), and additional keywords (right).

#### 4. Discussion and Limitations

The main purpose of the work carried out was to analyze papers for the period 2005–2024 which dealt with the absorption of European funds in the business environment. In terms of annual scientific output, in 2005 there was only one paper published, with a higher number of papers appearing only in the years 2011, 2015, 2012, and 2020. The sharp drop in papers after 2020 could have been influenced by the emergence of the COVID-19 pandemic. According to the researchers, it has been observed that every crisis impacts EU funds. The pandemic was a global crisis, even though the EU continued to try to fund member states to keep recovery mechanisms functional (Bańkowski et al., 2021; Pfeiffer et al., 2021; Picek, 2020; Sakkas et al., 2021). Moreover, during the COVID-19 period, many funds were directed to different emergencies to help the health and social sectors.

The most common journal among the papers was “Proceedings of the International Conference on Business Excellence”. This is the journal which presented papers at the “International Conference on Business Excellence”. According to the official website (<https://bizexcellence.ro/>, accessed on 20 March 2025), this is one of the best known conferences organized by the University of Economic Studies in Bucharest, focusing on business excellence and all the innovations that are emerging in this field. Therefore, numerous articles selected for the creation of the dataset were presented at the conference and later even published, as the use of European funds in business has been and still is one of the most controversial and developing topics.

The authors who stood out during the analysis were Hapenciu et al. (2012), who published the papers “The Performance of European Funded Projects” and “The Effects of Structural Funds Absorption on the Business Environment in the North-Eastern Region of Romania” (Moroşan et al., 2014); Prokop and Stejskal (2018) also stood out with the papers “Determinants of Innovation Activities: Public Financing and Cooperation: Case Study of Czech Republic and Hungary” and “Fostering Czech Firms? Innovation Performance Through Efficient Cooperation” (Prokop et al., 2021). The papers of the four authors looked at how firms use European funds, emphasizing the existing collaboration between entities and looking at the impact of public funds.

Among the top three most cited countries were Romania, Spain, and the UK. According to the available reports regarding the “Status of absorption for programs financed by European Funds 2021–2027, related to Cohesion Policy—20 December 2024” ([Ministerul Investițiilor și Proiectelor Europene, 2021](#)), Romania had a total effective absorption rate (both on national and regional programs) of EUR 618,222,389. In March 2023, in a press release ([Ministerul Investițiilor și Proiectelor Europene, 2023](#)), the Ministry of European Investments and Projects declared that several packages had been allocated to support the entrepreneurial sector, which targeted energy independence, equipment, furniture or specific machinery, or connection to public utilities. With a significant number of projects submitted and approved, it is only natural that academic interest in Romania should turn in this scientific direction.

Tracing the period from 2005 to 2024, an increase in publication interest in the analyzed field was observed, being higher in the period from 2015 to 2020, when scientific production registered a number of articles between 5 and 10 papers per year. As expected, the early stage of the analyzed period had a low number of papers, with a maximum of one paper published per year in the first 4 years. The peak was with the 10 papers in the year 2020, after which the output gradually decreased.

As for the authors who have distinguished themselves for their interest in this field, the following authors were encountered often in our analysis: Hapenciu C. V., Morosan A. A., Prokop V., or Stejskal J. They were able to realize different collaborations in order to publish research related to European funds. These four are the only authors in the dataset who managed to publish two articles each, with the rest publishing only one, which may suggest the complexity of the field.

The articles that stood out in the field of the use of European funds had a maximum of five authors in terms of existing collaborations, with only one paper by a single author. The highest number of TC recorded was 39 and the highest value for the indicator TC per year was 5. The data extracted were from multiple sources, using either questionnaires, interviews, panel data, or data made available by different official websites. Most analyzed the influence of EU funds, the weight of the process of accessing them, and the identification of techniques to improve the process.

A high interest among authors for publication of their research has been observed for “Proceedings of the International Conference on Business Excellence”, followed by “Scientific Papers-Series Management Economic Engineering in Agriculture and Rural Development”, “Economic and Social Development (ESD)”, “Innovation Vision 2020: from Regional Development Sustainability to Global Economic Growth, vol I-VI”, “Local Economy”, “Metalurgia International”, and “Vision 2025: Education Excellence and Management of Innovations Through Sustainable Economic Competitive Advantage”. The highest number of publications was in the “Proceedings of the International Conference on Business Excellence”, totaling seven published articles.

The universities of origin of the authors that were most frequently encountered were “Bucharest University of Economic Studies”, which also had the highest number of published papers, reaching a total of 14, followed by “Stefan cel Mare University of Suceava” with 4 published papers and the “University of Pardubice” with 3 published papers; the rest of the identified universities had two papers each: “Instituto Politecnico de Braganca”, “Valahia University of Targoviste”, “Alexandru Ioan Cuza University”, “Dunarea de Jos University Galati”, “Instituto Politecnico de Braganca”, the “National University of Science and Technology Politehnica Bucharest”, and the “University of Oradea”.

In terms of topic discovery, LDA revealed four main topics of interest, as listed here: Considering all the above topics, the following coverage can be observed: *Topic 1—Entrepreneurship and EU Funding Absorption in Romania*, *Topic 2—Innovation and Cooperative*

*Enterprise in the EU Context, Topic 3—Regional and Rural Development through Agricultural and EU Programs, and Topic 4—Collaborative Rural Enterprises and Cross-Border Development.* Meanwhile, BERTopics also identified three main topics: *Topic 0—European Business Collaboration and Data-Driven Innovation, Topic 1—Structural Funds and Investment Mechanisms in the EU, Topic 2—SME Networks and Regional Innovation in Romania, and Topic 3—Rural Development and Entrepreneurship under EU Support.* As pointed out, the identified topics can be connected, and their discovery can also be supported by the themes identified in the thematic maps. As shown, BERTopic 0 can be put in connection with LDA Topic 2 and the thematic map cluster 7 dedicated to cooperation, while BERTopic 1 matches elements from LDA Topic 1, as well as from thematic map cluster 10 through the European component. Furthermore, BERTopic 3 features elements from LDA Topic 1 and LDA Topic 2, as well as from thematic map clusters 3 and 10 due to the focus on both SMEs and Romania, while BERTopic 4 covers elements from LDA Topic 3 and LDA Topic 4 and clusters 10 and 14. As a result, the topics uncovered show that the papers included in the dataset have focused their research on determining how the EU mechanisms (funding, policies, collaboration frameworks) drive entrepreneurship, innovation, and regional/rural development, particularly in Romania and comparable EU contexts.

It should also be noted that the analysis in this chapter had some limitations. Thus, the selection of articles was made using only the WoS database, which is a database with significant content, but keeping only those articles indexed in this database can be seen as a limitation. Comparing this database with another one, for example Scopus, it was observed that WoS has approximately 13,610 journals and more than 13 million publications, whereas Scopus has around 40,385 journals and 18 million publications (Singh et al., 2021).

Based on this, the representativeness of the dataset used in the present paper is ensured by several aspects. First, WoS indexes the main journals and proceedings where research on European funds, regional development, and the business environment is published, including *Service Industries Journal, Local Economy, Amfiteatru Economic, and Industrial Crops and Products.* Second, the final dataset consists of 74 articles drawn from 60 different sources and 15 countries, indicating disciplinary and geographic diversity that reflects the actual structure of the field. Third, previous bibliometric studies addressing related topics (Alnajjar, 2025; Pricope et al., 2024; Paru et al., 2022) have also relied primarily on WoS, supporting its suitability for capturing relevant scholarship. Finally, an exploratory comparison with Scopus revealed a substantial overlap in core journals and authors, suggesting that the WoS corpus adequately represents the state of research on European funds and their impact on the business environment.

In order to support the overlap between the two databases in this particular case and to better tackle this limitation related to the use of the WoS database instead of other similar well-known databases, such as Scopus, a search has been performed in Scopus using the same search keywords and steps as presented in Figure 1 in the “Identification and Screening” steps. As a result, a dataset comprising 188 papers was extracted for 2005–2024. Among the 188 papers, 5 of them were marked as a “conference review”, “short survey”, or “note”. As none of them were found in the WoS initial extracted dataset and the type of paper does not match the purpose of the present review, for comparability, after eliminating them, a dataset comprising 183 papers extracted from Scopus was retained. Given the reduced differences between the two datasets (Scopus with 183 papers and WoS with 176 papers)—namely 7 papers, representing 3.97% of the WoS dataset—it can be stated that the differences are small and within the error range. Nevertheless, as in the initial analysis presented in Figure 1, a further step has been conducted through which the papers have been manually selected based on relevance and the 176-paper dataset has been reduced to 74 papers, retaining only 42.05% of the dataset. It is expected that the difference that

would have been observed between the different databases is considerably small. Last, the top cited papers in the WoS dataset have also been identified as the top cited papers in the Scopus database.

Incidentally, the last step in the document selection process was manual selection to ensure that the chosen topic is discussed in every paper stored in the database. This step can be mentioned as a limitation, but the necessity of this step exceeds the limitation.

## 5. Conclusions

The main objective of the analysis carried out in this paper was to highlight the impact that the use of European funds has had on the business environment, as well as the way in which this field has influenced scientific production in the period 2005–2024. This objective was achieved through the use of a bibliometric analysis, which focused on different aspects related to the papers published, their authors, their affiliations, the form of collaboration both between authors and between different countries of origin, and the identification of the most frequently used keywords or groups of words.

Based on the analysis carried out, the answers to the research questions (RQ1–RQ6) have been obtained, as discussed in the following.

Carrying out this research on the benefits and influence of the use of European funds in the business environment is important for assessing their economic impact. Through these studies, it is possible to understand how European funds contribute to increased competitiveness, sustainable development, and job creation in various sectors. The research also helps to identify both successes and challenges encountered in accessing and implementing the funds, and this information can lead to improved future policies and resource allocation strategies. Moreover, analysis of the impact of these funds can guide more efficient allocation of resources in priority areas, contributing to balanced economic and social development, and the research can highlight how European funds support innovation and entrepreneurship, providing valuable insights for adapting funding strategies and stimulating sustainable development. In conclusion, studies in this field are essential for optimizing public policies and ensuring efficient use of European resources.

The work carried out is not only a presentation of academic contributions in this field; the literature analyzed can offer a series of practical perspectives that can guide the optimization of policies on European funds and absorption mechanisms. A significant number of studies highlight significant delays caused by bureaucracy and poor management, which slow down the absorption of funds and sabotage the simplification of procedures and the creation of support for local authorities (Bauby & Similie, 2015; Dinu et al., 2020). Other contributions reflect the importance of rural development and SME support activities, considering them the main channels through which European funds are able to generate sustainable growth and reduce regional disparities (Bostan et al., 2019; Puie, 2020; Segal & Hadad, 2017; Tănăsescu, 2017). In fact, there have been several high-visibility articles showing how funds can be transformed into innovation and competitiveness by stimulating collaboration between universities and the business environment (Andronic et al., 2019; Behme, 2016). Overall, these findings, based on the existing works in the database, provide clear operational directions for decision makers and businesses: simplifying administrative procedures, supporting SMEs and rural projects, strengthening academia-industry collaboration, and prioritizing strategic areas such as the green transition and digital transformation. By basing these recommendations directly on the literature reviewed, this paper is able to offer practical guidance for improving the absorption of European funds and maximizing their contribution to the sustainable development of the business environment.

Based on the results obtained through topic modeling and thematic maps, several concrete implications can be formulated. The LDA and BERTopic analysis highlighted that

the literature focuses heavily on research topics such as SMEs, the impact of structural funds, cooperation and innovation, regional development, and the role of public policies, thus supporting the most common research directions. In terms of research, the consistent interest of some studies in topics such as administrative capacity, the promotion of innovation, and rural development suggests that future work could integrate bibliometric mapping with quasi-experimental policy evaluations in order to move beyond the descriptive nature and test existing links between European funds and business performance. From a policy perspective, the identification of persistent challenges such as bureaucracy and the uneven distribution of funds across regions, along with the importance of cooperation and knowledge networks highlighted in the thematic analysis, points to the need to prioritize standardized reporting mechanisms and open data infrastructures that allow for comparability and transparency between member states. In terms of practice and education, the high visibility of topics such as SMEs, green transition, and digitization shows the usefulness of developing thematic reading lists or training modules dedicated to fund absorption capacity and innovation management, which can be used both in academic curricula and by practitioners involved in the management of European funds.

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