Evaluating Efficiency in the Financial Sector of Southeast Europe: A Systematic Literature Review

Mirza Šikalo
School of Economics and Business, University of Sarajevo, Sarajevo, Bosnia and Herzegovina
mirza.sikalo@efsa.unsa.ba

Adna Karović
School of Economics and Business, University of Sarajevo, Sarajevo, Bosnia and Herzegovina
adna.karovic@gmail.com

Minela Nuhić Mešković
School of Economics and Business, University of Sarajevo, Sarajevo, Bosnia and Herzegovina
minela.nuhic-meskovic@efsa.unsa.ba

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Abstract

This study uses bibliometric analysis to examine research on financial sector efficiency in Southeast Europe (SEE) from 1998 to 2024. Using PRISMA methodology, we identified and analyzed articles that investigate the efficiency of the financial sector in SEE countries. Based on the reviewed literature, we explore key quantitative methods and approaches used in efficiency analysis and uncover opportunities and gaps for future research. The analysis reveals methodological choices, regional challenges, and differences in data availability among countries. Alongside practical suggestions, such as supporting data-sharing initiatives and encouraging methodological diversification, the study highlights the importance of recent data, interdisciplinary collaboration, and advanced mathematical techniques. These findings enhance our understanding of financial efficiency and

offer researchers and policymakers recommendations for improving the stability, resilience, and integration of Southeast Europe's financial systems.

Keywords: financial sector, efficiency, Southeast Europe, bibliometric analysis, PRISMA

JEL classification: G21, G22

1 Introduction

The financial sector serves as a pillar of modern economies. Its comprehensive role as an intermediary, reflected in capital collection and allocation, market liquidity support, risk management facilitation, and contributions to regulation and economic stability, positions it as a catalyst for growth and development. Recognizing these functions, maintaining an efficient and stable financial sector has become both a challenge and a priority for governments and economic communities worldwide. This is particularly relevant for SEE countries, which face unique circumstances such as post-conflict recovery, political instability, economic transition to market-based systems, and integration processes with the European Union and NATO.

Given the key role of financial sector efficiency in maintaining macroeconomic stability and fostering economic development, this study aims to identify key methods, trends, as well as potential opportunities and gaps for further research using a bibliometric approach and an analysis of previous research.

Efficiency is commonly defined as the ability to maximize outputs relative to a given set of inputs or to minimize inputs while maintaining a specific level of output (Mykhailenko, 2018). A comprehensive understanding of financial system efficiency provides policymakers with the analytical foundation to design regulatory frameworks that enhance economic stability and sustainability (Fotova Čiković & Cvetkoska, 2022). At the same time, it offers financial institutions valuable insights for improving operational performance and strengthening

resilience to market shocks (Nasim et al., 2023). Technological advancements and the development of big data analytics enable more precise and detailed efficiency assessments (Khezrimotlagh & Zhu, 2020), facilitating informed decision-making and supporting long-term economic development. The academic community has also increasingly begun to recognize the importance of financial sector efficiency, as evidenced by the growing volume of related research publications.

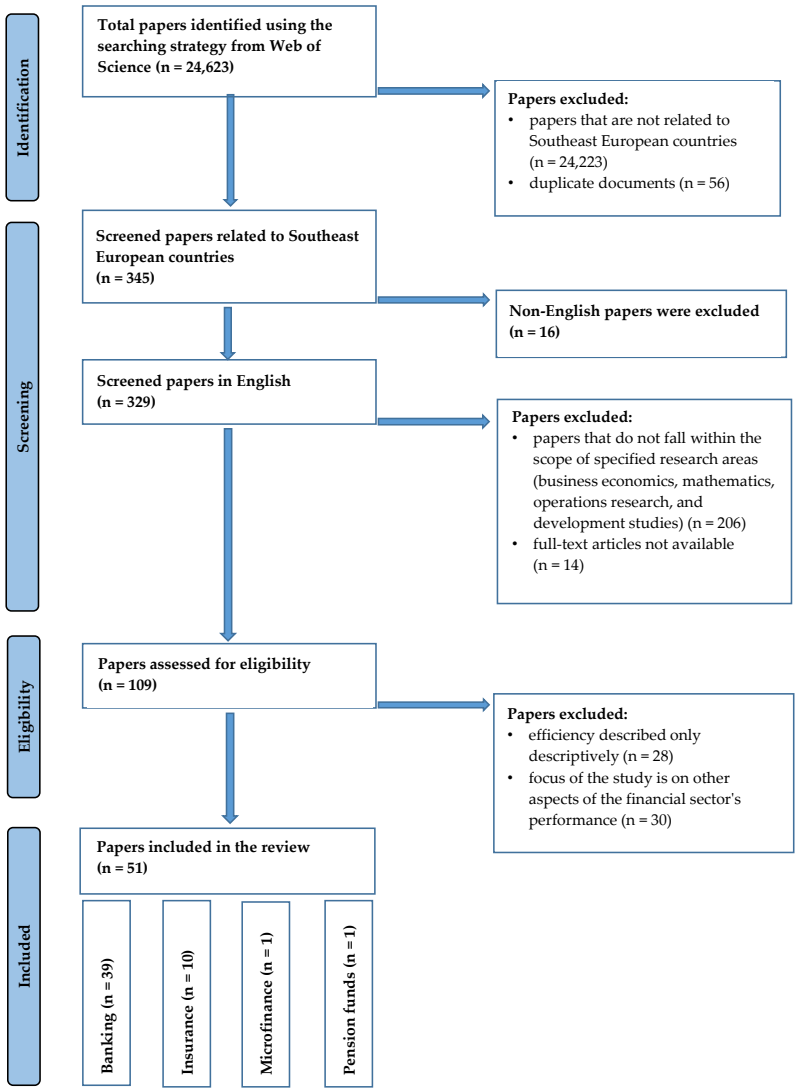
This literature review, through bibliometric analysis and methodical, critical appraisal of the literature, using PRISMA methodology, identifies research gaps and synthesizes trends, providing insight into opportunities and challenges for improving the efficiency of financial systems in SEE countries.

2 Data and Methods

This study utilizes the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology. The main search for articles was conducted in the Clarivate Web of Science (WoS) database, which is esteemed for its comprehensive disciplinary coverage and the reliability of its high-quality data (Ghorbani, 2024). Research papers were retrieved at the end of 2024, covering the period from 1998 to 2024. To establish a comprehensive and representative database of scientific papers, we defined a string using the following keywords: "efficiency of financial industry," "productivity of financial industry," "technical efficiency," "overall efficiency," and "scale efficiency." These keywords were selected based on a thorough review of search terms from six previously published literature reviews (Ahmad et al., 2020).

The search process was iterative (Figure 1). In the first stage, we filtered for papers in English. Next, the search was limited to studies referencing SEE countries (Bosnia and Herzegovina, Croatia, Serbia, Montenegro, North Macedonia, Kosovo, Albania, Bulgaria, and Romania). Finally, we refined the results by focusing on research areas such as business economics, mathematics, operations research, and development studies, excluding irrelevant fields such as energy, ecology, and agriculture.

Figure 1: *PRISMA Flow Diagram of This Study*



Source: Authors' illustration.

Given the financial sector's complexity, many studies focused on specific segments, such as banking, insurance, pension funds, and investment funds. To include these, we repeated the search using keywords tailored to these sub-segments (e.g., replacing "financial" with "banking" or "insurance"). After merging and de-duplicating results from 11 search algorithms, a total of 109 papers were identified. A detailed qualitative review reduced this to 51 papers, excluding studies outside the research focus (e.g., descriptive efficiency studies or those unrelated to SEE). Of these, 50 were journal articles, and one was a proceedings paper, highlighting the preference for journal publications in this research area.

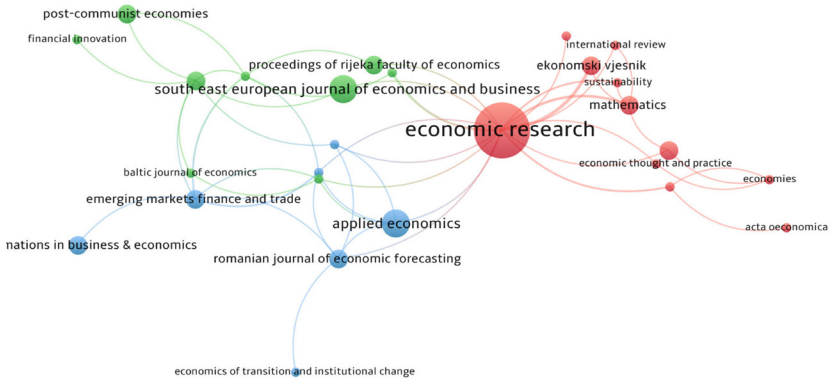
3 Bibliometric Analysis Findings

3.1 Journal Analysis and Citation Network Mapping

The scientific articles from our analysis were published in 32 different journals, with *Economic Research* contributing the largest share, accounting for 12 percent of all papers. *Applied Economics* and *The South East European Journal of Economics and Business* each published three papers, making up 5 percent of the total number. The citation map illustrates mutual citations among these papers (Figure 2).

In total, the papers are grouped into three clusters. The first cluster, marked in red, predominantly focuses on the transition of European economies to a market structure, with an emphasis on the financial sector's role in development. Journals in this cluster typically publish papers addressing economic theory, entrepreneurship, finance, and their practical applications. The second cluster, marked in blue, emphasizes economic modeling, forecasting, digitalization, and technological innovations. Research in this group frequently employs advanced methodologies, such as ARIMA, VAR, DEA, and blockchain analysis, investigating the impact of new technologies on the efficiency of financial institutions and markets in developing economies. The third cluster, marked in green, centers on the effects of the transition from planned to market economies in SEE, along with analyses of banking sector efficiency and microfinance.

Figure 2: *VOSviewer's Map of Scientific Journals*



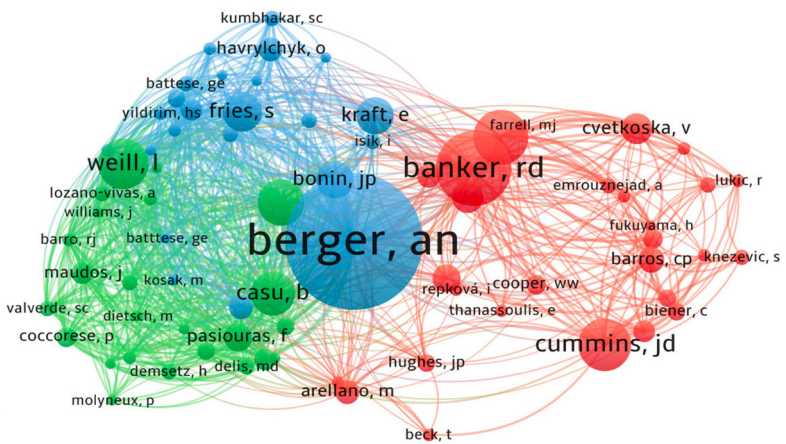
Source: Authors' illustration.

An analysis of journal rankings reveals that a significant portion of the papers was published in Q2 (35 percent) and Q3 (25 percent) journals, which are characterized by medium to high impact factors. It is noteworthy that publications in Q1 journals, representing the highest tier, are less frequent, indicating potential opportunities for future positioning in the most prestigious outlets.

The exploration of co-citation patterns provides deeper insight into the intellectual foundations of research on financial sector efficiency in SEE. The analysis highlights key researchers who have shaped this field. A total of 60 highly cited authors were identified, and their connections were mapped through a co-citation network (Figure 3). The authors are grouped into three main clusters, each representing distinct thematic and methodological approaches. The red cluster consists of authors who have made significant contributions to methodologies such as data envelopment analysis (DEA) and stochastic frontier analysis (SFA), essential for evaluating financial sector efficiency. Foundational works such as Banker et al. (1984) and Charnes et al. (1978) have shaped the application of DEA in assessing performance, particularly in heterogeneous regions like SEE. For studies on insurance sector efficiency in SEE, J. David Cummins' research on European

insurance markets from 2006 and 2013 provided key insights into efficiency and market convergence, cited in 24 of the 51 papers analyzed (Cummins & Rubio-Misas, 2022; Cummins et al., 2017; Cummins & Weiss, 2009; Cummins & Rubio-Misas, 2006). The blue cluster highlights authors focusing on financial sector efficiency in transitional economies. Allen N. Berger, frequently cited in this context, made significant contributions, including exploring market power and privatization's impact on financial institutions (Berger et al., 2017; Berger & Bouwman, 2013; Berger et al., 2005; Berger & Humphrey, 1997; Berger & Mester, 1997; Berger, 1995). His findings on the relationship between market concentration, profitability, and efficiency are critical for understanding financial systems in SEE. The green cluster includes researchers examining the effects of financial liberalization and integration on bank performance.

***Figure 3**: VOSviewer's Map of Co-Citations*



Source: Authors' illustration.

Laurent Weill's research from 2003 and 2010, cited in 23 of the 51 papers, analyzed the impact of foreign ownership on bank efficiency (Weill, 2003). He demonstrated that foreign banks often introduce better managerial practices and

technologies, leading to higher efficiency. Additionally, the author explored the effects of privatization, concluding that privatized banks tend to be more efficient due to better management and a stronger focus on profitability (Karas et al., 2010). His findings helped researchers in SEE understand the drivers behind efficiency differences. Similarly, Andrieș and Căpraru (2012) provided a comprehensive analysis of competition and efficiency within EU banking systems, employing advanced methods such as DEA and SFA to assess regulatory and managerial impacts.

On the other hand, the analysis of co-authorship in financial sector efficiency research in SEE reveals a low-density network, largely confined within individual countries, with such limited connections that the visual representation of the network would be meaningless.

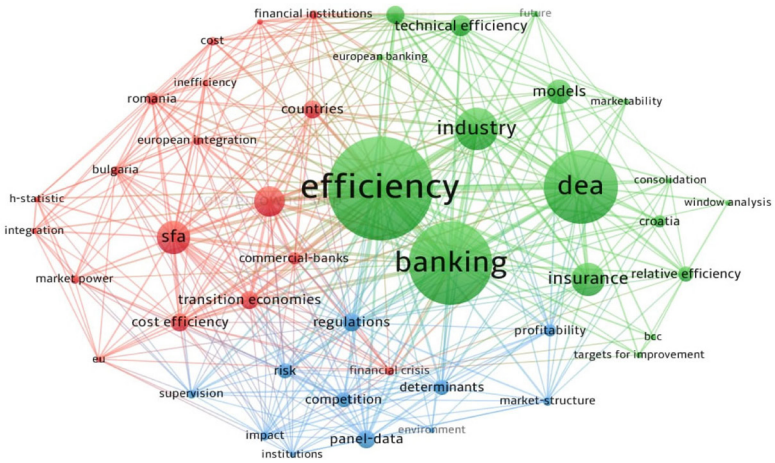
3.2 Key Themes and Temporal, Institutional, and Geographical Distribution of Research

Key observations can also be confirmed through the presented keyword map, where the size of the circle indicates the frequency of the word's occurrence in research papers. The central link is the term "efficiency," which is the focus of this analysis. Following it in frequency are the terms "banking," suggesting the bank-centered financial system in SEE, "DEA" as the dominant technique for measuring efficiency, "insurance companies" as significant market participants alongside banks, and "SFA" as the second most frequently used method.

To clarify these connections, the keywords are grouped into three clusters, marked in red, blue, and green (Figure 4). The keywords in the green cluster, which have the highest frequency, highlight the core characteristics of efficiency measurement in SEE's financial sector. These include the primary focus on the banking industry, secondary attention to the insurance sector, and the dominance of the DEA method. Using the DEA method, a large number of efficient units were identified, partly due to the consolidation of small domestic banks by large

foreign banks, which led to market unification. The red-cluster keywords indicate that, most often, states, financial institutions, and commercial banks were used as units of efficiency analysis. The second most common method for measuring financial sector efficiency in SEE is SFA, which has been applied to samples including, besides SEE countries, Romania, Bulgaria, and the EU. The blue cluster highlights elements examined in the second phase of the analysis, which concern the modeling of efficiency. To account for double variation in the data, between the observed decision-making units (DMUs) and over time, researchers used various forms of regression models based on panel data. The main focus was on identifying representative efficiency determinants and appropriately treating the business environment and specific regulations governing the DMUs under study. A particular observation was noted for some studies—while efficiency was calculated in the first phase, the second phase did not address the determinants of the identified efficiency. Instead, efficiency was used as an exploratory variable in assessing the profitability of the units under examination.

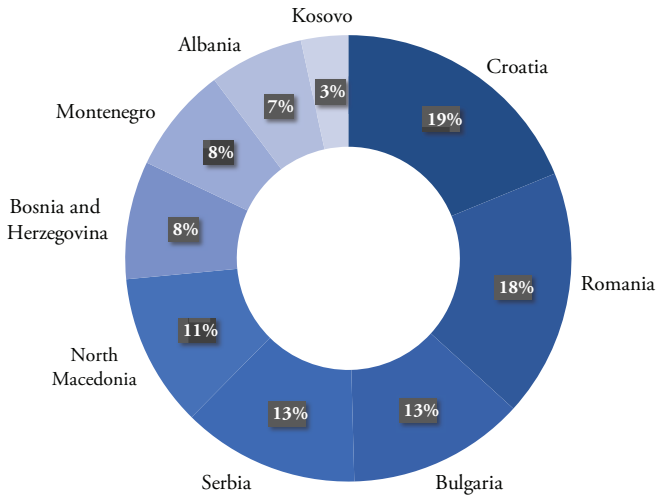
Figure 4: *VOSviewer's Map of Keywords*



Source: Authors' illustration.

The analysis also reveals the dominance of bank efficiency analysis in published papers. This dominance of banks is due to the historical and economic context. During the socialist period, banks played a key role in economic policy, and the bank-centered model persisted even after the transition to market economies.

Figure 5: *Participation of Individual Countries From the Region in Efficiency Analysis*



Source: Authors' illustration.

Each SEE country has specific economic characteristics, regulatory frameworks, and institutional structures that significantly affect the efficiency of its financial sector. The number of publications from each country reflects the particular issues or aspects of the financial sector that have been recognized and explored, providing insight into research priorities and challenges faced by individual countries. Based on Figure 5, it can be concluded that Croatia and Romania are the most frequently studied countries in the analysis of financial sector efficiency in SEE. As countries that have successfully undergone Euro-Atlantic integration, Croatia and Romania are often viewed as regional leaders. Analyzing their financial systems, economic reforms, and EU alignment offers valuable insights to other countries

in the region facing similar challenges. Furthermore, both countries have well-developed research infrastructures and adequate data availability, which facilitate the analysis of their financial systems.

Croatia and Romania are followed by Bulgaria and Serbia, whose economies are characterized by macroeconomic issues such as public debt and inflation, directly impacting the efficiency of their financial sectors and attracting the attention of researchers. Proportionally, Kosovo, Albania, Montenegro, and Bosnia and Herzegovina are the least represented in research within SEE, reflecting their lower levels of economic development and data availability.

The region's financial sector efficiency is most commonly examined in conjunction with Hungary (6), Slovenia (5), all EU countries (4), the Czech Republic (3), Poland (2), Greece (1), Moldova (1), and Turkey (1), among the studies that have been undertaken. These nations' close vicinity to SEE implies that their economic circumstances, demographic traits, and historical backgrounds are comparable, offering a solid basis for comparative studies. The analysis's findings, however, may be impacted by the disparities in these nations' technical preparedness, financial infrastructure, and economic growth compared to SEE nations. For instance, Koivu (2004) found that CEE countries adopted financial reforms at a faster pace, which contributed to greater financial sector efficiency and economic growth acceleration. To guarantee a legitimate and methodologically sound analysis, it is crucial to take these distinctions into account, as they could result in variances in market efficiency.

An examination of research articles published between 1998 and 2024 shows a noticeable rise in interest in the financial sector's efficiency over time. The effectiveness of the financial sector in SEE was the subject of just two research publications in the Web of Science database prior to the 2008 global financial crisis. At the time, established economies and big marketplaces received much of the emphasis in global economic studies, while the SEE region was not a priority. Due to a lack of funding and weakened research capabilities, SEE nations also had difficulties gathering and publishing data (Medve-Bálint, 2018). Because of

this, there was little interest in examining the financial sector's efficiency; instead, resources and attention were mostly directed toward the difficulties of transition and basic economic changes. During the global financial crisis (2008–2010), researchers began investigating the weaknesses and vulnerabilities of the financial system, exploring recovery and stabilization strategies employed by different countries in the region. This shift in focus resulted in 15 scientific articles (29 percent of those analyzed in this study) dedicated to the efficiency of the financial systems in SEE from the beginning of the crisis in 2008 until 2014.

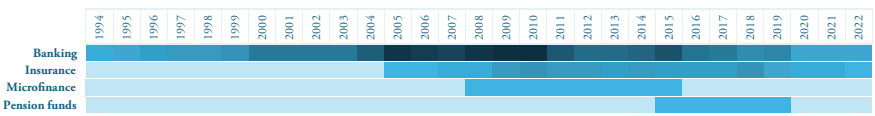
From 2014 onwards, globalization and the increasing interconnectedness of financial markets made the analysis of financial system efficiency more relevant than ever. Regions such as SEE became significant for global investors, and understanding local financial systems became crucial for making informed investment decisions. Consequently, both domestic and international researchers continued to show growing interest in the efficiency of the financial system in SEE. Between 2015 and 2024, 67 percent of the scientific papers included in this analysis were published, with 40 percent (20 papers in absolute terms) published after the onset of the COVID-19 pandemic. The COVID-19 pandemic brought about numerous regulatory changes to stabilize financial markets, creating space for research on the effectiveness of these interventions. The digital transformation and rapid development of financial technologies during the pandemic also became important research topics, as financial institutions had to adapt to new conditions. Ultimately, enhanced international cooperation during the pandemic facilitated the exchange of knowledge and experiences, enriching research on the efficiency of the financial sector in SEE with new insights and perspectives.

When it comes to the time frame considered in the efficiency analysis, only a small number of authors have analyzed the efficiency of financial institutions in SEE within a single year (Pervan et al., 2021; Bošković & Krstić, 2020; Armeanu et al., 2014). Most researchers focused on multi-year samples, as these allowed for the identification of trends and patterns in efficiency behavior that are not visible in a single year. The most commonly used sample length was four years. The average sample length in the analyzed papers was somewhat higher

(6.5 years). Pavić Kramarić et al. (2022), Zeqiraj et al. (2020), Davidovic et al. (2019), Radojicic et al. (2018), and Dima et al. (2014) used samples longer than 10 years in their analyses.

Cumulatively, the efficiency of the financial sector in SEE has been analyzed from 1994 to 2022. The largest number of studies focused on measuring the efficiency of financial institutions in the years following the global economic crisis of 2009 and 2010. Since the crisis originated in the banking sector, and the financial systems of SEE are characterized by bank-centricity, most authors focused on analyzing the efficiency of the banking sector. Due to the limited availability of data and lower research interest, data on the efficiency of insurance companies in some SEE countries have only been available since 2005 (Jurčević & Žaja, 2013). For microfinance organizations, the data are available from 2008 (Efendić & Hadžiahmetović, 2019), and for mandatory pension funds from 2015 (Draženović et al., 2019). Given the small number of available studies, the efficiency of microfinance institutions has not been analyzed in the last nine years (2016–2024), and the efficiency of mandatory pension funds has not been analyzed in the last five years (2020–2024). Up to the time of writing this study (beginning of 2025), no studies have been found that address the efficiency of the financial system in SEE for the years 2023 and 2024. In order to continuously monitor the efficiency of financial institutions in SEE, the suggestion for future studies is that they should consider more recent data, particularly for periods that include the COVID-19 pandemic and its post-pandemic phase. Figure 6 presents a heat map illustrating the distribution across industries as described above.

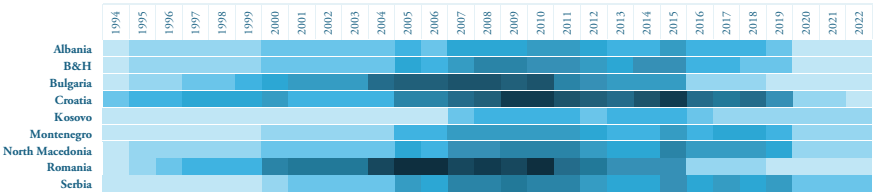
Figure 6: *Heat Map for Financial Industry*



Source: Authors' illustration.

Figure 7 shows the number of studies analyzing efficiency by country over the years. Regarding individual countries in the region, the greatest research interest has been noted for Romania, Croatia, and Bulgaria. The focus of researchers analyzing the efficiency of Croatia's financial sector has been on efficiency behavior after the global economic crisis of 2009 and 2010, as well as efficiency behavior in the first years following the EU accession (2014 and 2015). Romania and Bulgaria became full EU members in 2007, and shortly after, the global economic crisis began. Therefore, the greatest research interest in the efficiency of these countries' financial systems has been related to the period 2007–2010. It is important to note that significant research efforts in the field of financial sector efficiency analysis in Romania were also made before EU accession (2004, 2005, 2006), and were aimed at better understanding the financial system and preparing it for adaptation to EU norms.

Figure 7: *Heat Map for Selected Countries*



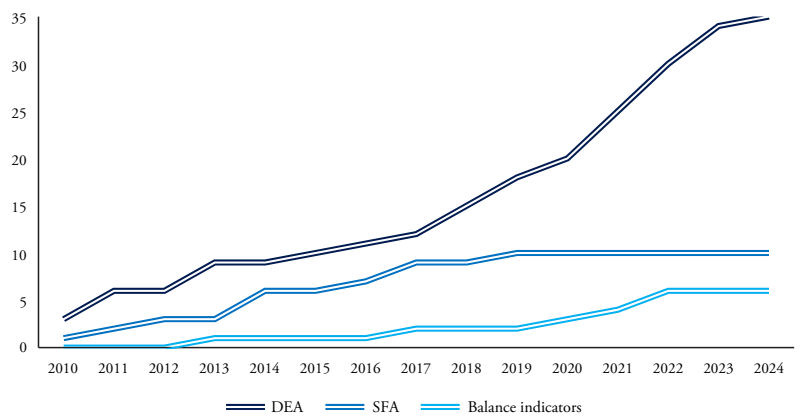
Source: Authors' illustration.

For most SEE countries, data on the efficiency of the financial system have been available since 1994, with the exceptions being Serbia, Montenegro, and Kosovo, for which data have been available since 2000 and 2007, respectively. For Romania, Bulgaria, Bosnia and Herzegovina, and Albania, the measurement of the efficiency of any segment of the financial sector has not been conducted since 2019 or 2020. Therefore, researchers are advised to fill these research gaps.

3.3 Measurement Methods Used in Financial Efficiency Analysis

The most commonly used method for measuring financial system efficiency in SEE is DEA, present in 59 percent of analyzed studies, followed by SFA, used in one-third of the cases. Figure 8 provides a cumulative overview of the efficiency measurement methods used over time. Although equating efficiency with balance sheet indicators is considered a simplified approach globally, it is still present in SEE studies, accounting for 13 percent of the analyzed works. This is due to the simplicity, clarity, and data availability of balance sheet indicators, which can be easily understood even by those with limited financial knowledge. Previous studies, such as those by Kuchler (2013) and Koetter et al. (2006), confirmed a positive correlation between efficiency rankings based on balance sheet indicators and the DEA method in Denmark and Germany's banking systems, encouraging the use of such simplified methods in SEE. Other methods, such as cost function, FAHP, PCA, I-distance, Lerner index, and Z-score, make up 9 percent of the analyzed studies. These are used in single studies, highlighting the diversity of approaches.

Figure 8: *Cumulative Overview of the Efficiency Measurement Methods Used Over Time*



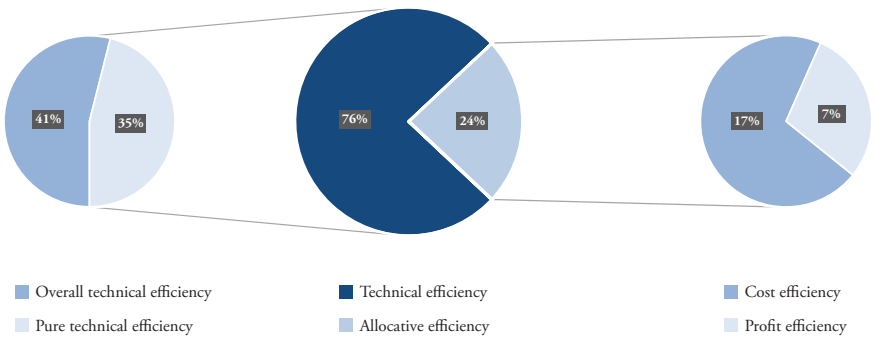
Source: Authors' illustration.

When analyzing the applied efficiency measurement methods across SEE countries, it is evident that researchers use the SFA method more frequently when Romania and Bulgaria are included in the sample. Given the differences in the levels of economic and financial sector development among Romania, Bulgaria, and other SEE countries, as well as their political climate and history, the DEA model's assumption of homogeneity among observed units appears to be unmet. Therefore, in 7 out of 11 studies that apply sophisticated efficiency evaluation methods and include Romania and Bulgaria in the sample, the authors applied the SFA method. In such circumstances, SFA can provide more reliable results, as it allows for distinguishing the effects of random factors from actual inefficiency and does not require homogeneity within the group whose efficiency is being assessed.

Following the 2008–2010 global financial crisis, both SFA and DEA were used alternately to assess financial sector efficiency in SEE. However, due to the complexity and data quality requirements of SFA, DEA became the preferred method, especially after the COVID-19 pandemic. Despite DEA's sensitivity to data changes, SFA remains valuable for its ability to account for stochastic errors, providing more reliable results during periods of economic instability. Future research should address this gap by analyzing the efficiency of SEE's financial sector during the COVID and post-COVID periods using the SFA method and comparing the results with those obtained from DEA.

Since the business activities of any institution involve a large number of processes, it is necessary to ensure the efficiency of each of these processes to optimize overall efficiency. In the financial sector, overall efficiency depends on the efficiency within operational processes—technical efficiency (Farrell, 1957)—and the efficiency of resource utilization to maximize economic outcomes—allocative efficiency (Leibenstein, 1966; Farrell, 1957). Since maximizing economic outcomes can be achieved by minimizing costs or maximizing profits for a given level of resources, allocative efficiency is divided into cost efficiency and profit efficiency (Berger & Mester, 1997).

Figure 9: *Analytical Overview of Efficiency Measures Usage*



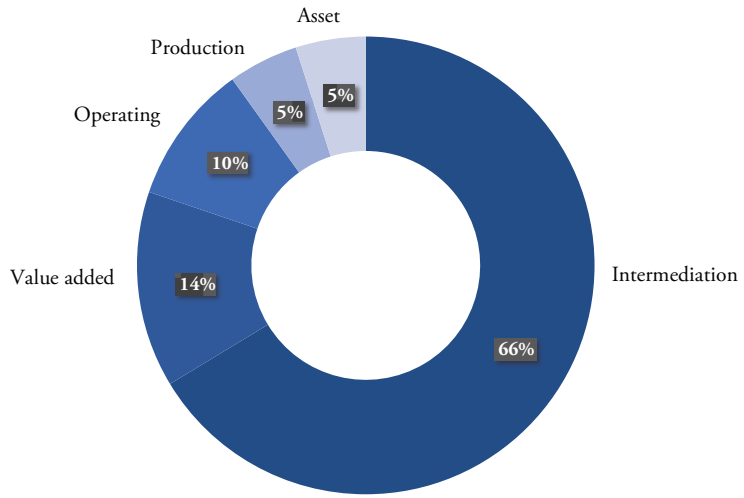
Source: Authors' illustration.

The focus of authors analyzing the efficiency of financial systems in SEE has been on technical efficiency (Figure 9). Of the 76 percent of papers focused on technical efficiency, 41 percent examined overall technical efficiency, which includes pure technical efficiency and scale efficiency, while 35 percent focused solely on pure technical efficiency. Pure technical efficiency indicates how well a financial institution utilizes its resources regardless of the scale of operations, while scale efficiency measures how efficiently the institution operates relative to its size or business volume. By analyzing both components, one can gain a more detailed understanding of where inefficiencies occur and create a more complete picture. For instance, if pure technical efficiency is high but scale efficiency is low, it may indicate that the institution is efficient in utilizing its resources but is not operating at an optimal size. Allocative efficiency was considered in 24 percent of the papers in our analysis, with 17 percent focusing on cost minimization (cost efficiency) and 7 percent on profit maximization (profit efficiency).

Through parallel analysis of the type of efficiency measured and the methodology used to assess it, it was found that non-parametric approaches (DEA) are widely used to assess technical efficiency, whereas parametric approaches (SFA) are used to assess cost and profit efficiency. Given that the DEA method predominates in

measuring the efficiency of the financial sector in SEE, overall technical efficiency is the one primarily measured. Traditional efficiency measurement techniques also focus on assessing overall technical efficiency. One of the key reasons for this is the validity of results, as previous research has confirmed a high correlation between efficiency rankings based on traditional techniques and the DEA method, and a low correlation with rankings based on the SFA method (Kuchler, 2013; Koetter et al., 2006).

Figure 10: *Distribution of Approaches for Input-Output Combination*



Source: Authors' illustration.

Although it is often overlooked, selecting the appropriate inputs and outputs in efficiency analysis is a crucial step of efficiency analysis, as it directly influences performance measurement and the decision-making process. Researchers must clearly understand the inputs, outputs, and sample they choose for the analysis. In the literature on financial sector efficiency, there is no consensus on the ideal set of inputs and outputs (Berger & Humphrey, 1997). Thus, approaches to selecting inputs and outputs vary based on the study's goals, the functions

performed by banks, and the available data. Efficiency is typically analyzed using various approaches, each adapted to reflect the specific characteristics of the financial institutions in question. Five main approaches have been identified in the literature: the production approach, the intermediation approach, the value-added approach, the asset approach, and the operating approach (Figure 10).

The intermediation approach is most commonly used in the analysis of the financial sector of SEE, representing 66 percent of the studies. Following it are the value-added approach (14 percent) and the operating approach (10 percent). In global literature, it is common to apply more than one approach to demonstrate variations in results (Sharma et al., 2013). However, in studies from SEE, only one such study was identified. Učkar and Petrović (2022) conducted an efficiency analysis of insurance companies in Croatia using both the operating and intermediation approaches. They found that the intermediation approach yielded lower efficiency scores and exhibited greater volatility over time compared to the operating approach.

Since efficiency is analyzed across specific segments such as banking, insurance companies, and microfinance institutions, each requiring tailored approaches for selecting relevant inputs and outputs, Table 1 below summarizes the common inputs and outputs used in studies of financial sector efficiency, highlighting the diversity of measures employed across various segments.

For a more accurate evaluation of cost efficiency, researchers who use the SFA approach frequently incorporate input costs. Analyzing the costs of inputs, such as labor, capital, and assets, gives us a better understanding of how they affect institutional efficiency. Andrieș and Ursu (2016), for instance, used labor, fixed assets, and the total amount borrowed as inputs, whereas input prices covered the cost of labor, finances, and physical capital. In a similar vein, Andrieș and Căpraru (2012) employed the same input price categories in their value-added approach, using financial capital, fixed assets, and labor expenses as inputs. Some studies have also included other factors, such as securities, which support risk management, liquidity, and income diversification. To provide a more

comprehensive understanding of banking performance, Ahmeti et al. (2022), Učkar and Petrović (2022), and Andrieș et al. (2018) expanded their research by including securities as outputs. When evaluating financial stability under complicated market conditions, securities are essential for providing steady income and enhancing adaptation to macroeconomic shifts. Studies such as the one by Andrieș et al. (2018) have added off-balance-sheet items such as letters of credit and guarantees, which provide a more thorough picture of banks' overall responsibilities and risks. This method implies that these components should be added to future efficiency analyses.

Table 1: *Most Commonly Used Inputs and Outputs*

	Banks	**Insurance companies**	**Microfinance**	**Mandatory pension funds**
INPUTS	Assets/Fixed assets	Capital	Total assets	Entry fees
	Capital	Equity	Number of employees	Net pension contributions
	Deposits	Claims incurred		
	Operational expenses	Net operating expenses		
	Material expenses	Investment costs		
	Interest expenses	Personnel expenses		
	Non-interest expenses	Number of employees		
	Personnel expenses			
	Number of employees			
OUTPUTS	Borrowed funds	Earned premiums	Gross loan portfolio	Values of MPF units of account
	Total loans	Investment income	Financial revenue	Net assets
	Securities	Total investments		
	Net revenues			
	Investment assets			
	Interest revenues			
	Non-interest revenues			

Source: Authors' illustration.

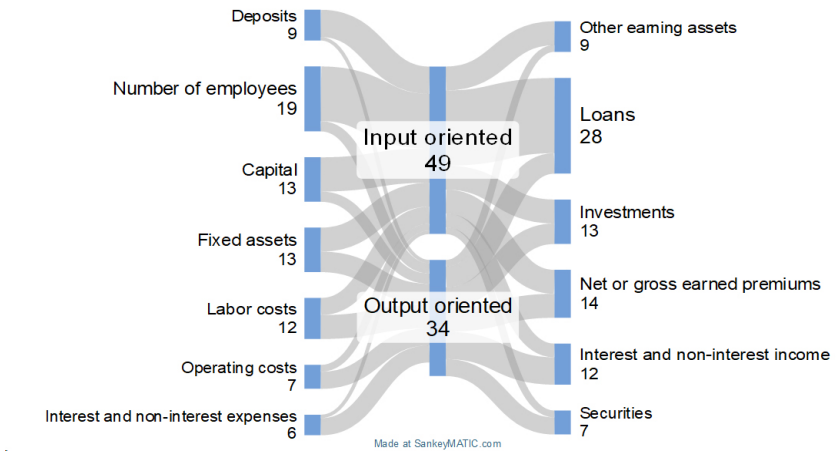
On the other hand, as the study by Sahiti and Sahiti (2021) shows, the DEA approach occasionally uses ratios as inputs and outputs. Ratios, such as the ratio of total loans to total assets or the ratio of deposit reserves to total deposits, help compare the performance of different banks by incorporating liquidity, profitability, and solvency into the analysis. Although there is no consensus in the literature on the exact number of inputs and outputs to use, it is generally recommended that the decision be based on the number of DMUs whose efficiency is assessed (Cooper et al., 2006, Chapter 9; Banker et al., 1984).

In the analysis of the financial sector in SEE, authors commonly used three indicators for inputs and two for outputs. A common informal rule suggests that the number of observations should be 3 to 5 times greater than the number of variables (Cooper et al., 2006, Chapter 9). In most studies analyzing the efficiency of the financial sector in SEE, the ratio of DMUs to input and output variables was greater than 3, averaging around 7 DMUs per input or output. In the six studies where this rule was not followed, two analyzed the entire population of banks in Kosovo (Ahmeti et al., 2022; Sahiti & Sahiti, 2021), two focused on Balkan countries with available data (Milenković et al., 2022; Horvat et al., 2022), one studied all microfinance institutions in Bosnia and Herzegovina (Efendić & Hadžiahmetović, 2019), and one examined Serbian insurance companies with data from the 2009–2011 period (Knežević et al., 2015).

Also, based on their characteristics and research objectives, researchers should select the DEA model orientation and the type of returns. Input-oriented models focus on minimizing inputs, while output-oriented models aim to maximize outputs with given resources. The choice of orientation depends on the analysis goals and the specifics of the industry. Input-oriented models are better suited for cost control, while output-oriented models focus on growth and performance improvement. In the analyses of the financial sector in SEE, both types of models are used almost equally, with a slight preference for output-oriented models, as regulatory frameworks in SEE often impose strict requirements regarding resource management institutions' focus on growth and development.

However, a review of the literature considered in this study reveals that researchers did not give much attention to model orientation. In a significant number of papers (16 percent), the applied orientation was not clearly stated, making it difficult to interpret the results. Therefore, it is recommended that future research provide more detailed explanations for the choice of model orientation and conduct comparative analyses of results from both orientations to ensure greater reliability and usefulness of the findings. The Sankey diagram (Figure 11) provides a clear illustration of the relationship between the selected inputs and outputs, with inputs on one side, outputs on the other, and the orientation of the DEA model in the center.

Figure 11: *Sankey Diagram for the Most Commonly Used Inputs and Outputs, and DEA Model Orientation*



Source: Authors' illustration.

On the other hand, when it comes to returns to scale, the two most widely used DEA models are the CCR model (Charnes et al., 1978) and the BCC model (Banker et al., 1984). The CCR model assumes constant returns to scale (CRS), implying that input changes lead to proportional changes in outputs.

In contrast, the BCC model introduces variable returns to scale (VRS), allowing for increasing or decreasing returns and thus enabling a more flexible representation of production technology. Given the nature of the financial sector in Southeast Europe, which includes institutions of various sizes and operational conditions, the BCC model has been predominantly applied in empirical studies (Cvetkoska et al., 2021). This preference reflects the realistic assumption that not all units operate at an optimal scale. A smaller number of authors (Učkar & Petrović, 2022; Jurčević & Žaja, 2013) applied both models and conducted comparative analyses. Their findings indicate that the stricter assumptions of the CCR model typically lead to identifying fewer efficient units and result in lower average efficiency scores compared to the BCC model. The distinction between these models is crucial, as it affects the interpretation of efficiency scores and the derived policy implications. Although the detailed mathematical formulation of these models has been omitted in this review for brevity, their conceptual distinction remains important for understanding methodological choices in the literature.

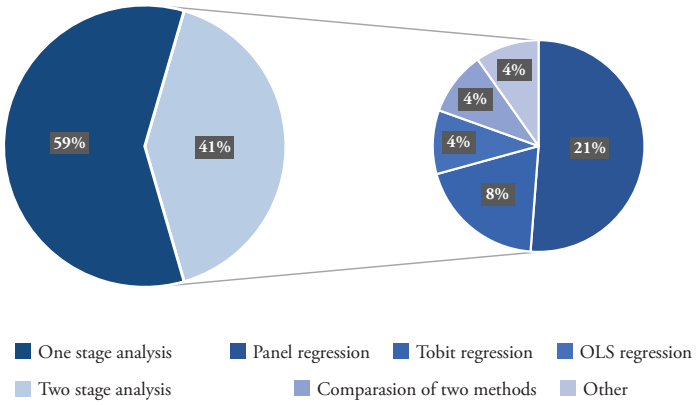
3.4 Exploring the Drivers of Efficiency: A Second-Stage Analysis

A two-phase technique is commonly employed in studies on the financial sector's efficiency since it can yield a more thorough analysis and accurate findings. Technical efficiency is usually analyzed in the initial phase using quantitative techniques, most frequently DEA and SFA. These methods allow researchers to assess how efficiently financial institutions use their resources in providing financial services. The second phase focuses on identifying the factors that influence the inefficiencies detected. This is typically achieved through regression analysis or other statistical techniques to explore how various internal and external factors, such as regulation, market conditions, or institutional characteristics, impact efficiency (Cvetkoska & Savić, 2017).

An analysis of the studies on the efficiency of financial markets in SEE countries shows that 30 out of 51 studies employed a two-phase approach (Figure 12). However, in 13 percent of these studies (4 out of 30), the second phase of analysis

deviated from the standard approach, with authors conducting additional efficiency measurements using alternative methods. Some studies also employed discriminant and cluster analysis to group financial institutions based on similarities in their characteristics and performance.

Figure 12: *Frequency of Conducting the Second Phase in Efficiency Analysis and the Most Commonly Used Methods*



Source: Authors' illustration.

Regarding the methods used to assess the determinants of efficiency, among the remaining 26 studies, the most commonly used methods were panel regression (15 studies), tobit regression (6 studies), and OLS regression (3 studies). Within panel regression, researchers chose between panel OLS models (fixed and random effects) and dynamic GMM panel models. Other methods, such as truncated regression, two-stage quantile regression, cluster, or discriminant analysis, are rare in these studies.

Regarding the variables used in the second phase of efficiency analysis, researchers' approaches varied. The largest group of researchers (19 out of 26) focused on determinants identified in the first phase (e.g., Andries et al., 2013; Tochkov

& Nenovsky, 2011). Another group (5 out of 26) used the calculated efficiency as a predictor of factors such as institutional liquidity, stability, profitability, market share, and national economic growth (e.g., Ahmeti et al., 2022; Zeqiraj et al., 2020). A third group (3 out of 26) considered both efficiency and profitability as dependent variables in their analysis (e.g., Gržeta et al., 2023; Botrić & Slijepčević, 2008). In 19 out of 26 papers that analyzed the determinants of financial sector efficiency in SEE countries, only one relates to the insurance industry and one to pension funds. Since this is too small a number of studies to generalize conclusions for the financial sector, in this part, we focused the analysis on the banking sector, for which a larger number of studies are available. The variables considered in efficiency analyses can be grouped into four key categories:

- bank-specific variables, which encompass characteristics that directly affect the operational efficiency of financial institutions (e.g., liquidity, profitability, capital adequacy, leverage, size)
- industry-specific variables, which highlight the existing market concentration and changes such as technological innovations that alter business approaches
- macroeconomic indicators, such as inflation and GDP growth rate, which provide a broader context for understanding efficiency in relation to the economic environment
- regulatory variables, which include specific legislative and political factors shaping the operating conditions of financial institutions

The majority of the variables used pertain to operational financial indicators, classified as bank-specific variables, and the general business environment of banks (e.g., regulatory changes, political stability, monetary independence, EU membership), which are measured using indices or dummy variables within the regulatory indicators.

4 Discussion

The bibliometric analysis of financial sector efficiency in Southeast Europe (SEE) reveals a fragmented research landscape with notable gaps and future opportunities. While existing studies have advanced our understanding, a more holistic and inclusive approach is needed to reflect the diverse economic and institutional realities of the region.

A key issue identified is the uneven geographic focus. Countries such as Croatia and Romania have received considerable scholarly attention, whereas others, such as Bosnia and Herzegovina, Kosovo, and Montenegro, remain largely underexplored. This imbalance limits our understanding of region-specific challenges and hinders the development of tailored policy solutions. Research from underrepresented nations could offer crucial insights into localized inefficiencies and development barriers. Moreover, there is a lack of comparative cross-country studies. Most existing research concentrates on individual nations, restricting the generalizability of findings and weakening their policy relevance. Comparative studies could illuminate broader regional trends, enabling policymakers to draw lessons from shared experiences.

Another gap is the overemphasis on the banking sector. While banks are central to SEE's financial systems, this narrow focus sidelines other vital sectors, such as credit unions, insurance, pension funds, and microfinance institutions. Understanding the efficiency of non-bank financial institutions is essential, especially in emerging economies where these sectors play an increasingly important role.

Methodologically, traditional efficiency measurement tools, primarily financial ratios and data envelopment analysis (DEA), continue to dominate. Stochastic frontier analysis (SFA), though less frequently used in SEE, offers important advantages for assessing financial institutions in transitional economies. Unlike DEA, SFA separates inefficiency from statistical noise, allowing for a more realistic estimation of efficiency in environments characterized by volatility, incomplete data, and institutional heterogeneity—conditions common in many

SEE countries. Moreover, SFA models can incorporate contextual variables such as regulation, market structure, or macroeconomic conditions, which are often beyond institutions' control but crucial for interpreting performance. Despite these advantages, DEA has been used more extensively in the literature, primarily due to its non-parametric nature, lower data requirements, and flexibility in small samples. However, SFA and DEA should be seen as complementary rather than competing approaches. A more balanced use of both could yield more robust and policy-relevant insights, especially in environments where external factors play a significant role in shaping institutional efficiency. To improve reliability, future research should consider a more balanced application of both DEA and SFA, depending on the context and research objectives. Incorporating SFA in particular can add value in settings characterized by volatility, data limitations, or strong external influences. Another concern is the insufficient attention given to selecting relevant input and output variables in efficiency studies. Relying heavily on precedents without adjusting to local conditions may lead to misleading results. More thoughtful selection—potentially including non-financial factors such as regulation, management quality, and technological adoption—would enhance the relevance and applicability of findings. Additionally, distinguishing between financial and operational efficiency can offer more granular insights.

Current literature also tends to stop at efficiency measurement without exploring broader implications. Rarely do studies link their findings to policy, economic growth, or financial inclusion. Future research should integrate results into wider economic and regulatory contexts, providing actionable guidance for policymakers and practitioners. Longitudinal studies using multi-year data are also scarce. These could uncover how financial institutions evolve in response to changing economic conditions, offering insights into long-term strategic adjustments. For example, examining institutional responses to the pandemic could inform future crisis preparedness.

The quality and availability of financial data present another major barrier, especially in countries with little or no recent research. Outdated or incomplete

data undermines the accuracy of efficiency assessments. Researchers should work with financial institutions, regulators, and statistical agencies to close data gaps and ensure access to reliable, current datasets.

Encouraging international collaboration is crucial. Most research is nationally siloed, limiting opportunities for knowledge exchange and methodological innovation. Collaborative efforts with foreign experts could introduce new perspectives and elevate research quality, creating more comprehensive analyses of SEE's financial systems.

Finally, it is essential to examine how global disruptions, especially the COVID-19 pandemic, have impacted financial efficiency. Unlike past financial crises, the pandemic introduced unique challenges, including digital acceleration, changing consumer behavior, and regulatory shifts. Studying institutional resilience under such conditions could offer valuable lessons for enhancing stability and adaptability.

To maximize the impact of future research, scholars should adopt innovative methodologies and explore emerging topics such as digital transformation and regulatory evolution. Publishing in high-impact journals and aligning research outputs with global academic standards will also boost visibility and influence.

This review's findings carry significant implications for economic policymakers and financial regulators in Southeast Europe. First, addressing the geographic imbalance in existing research can help national financial authorities benchmark their institutions against regional peers. For underrepresented countries, supporting data collection initiatives and encouraging academic collaboration can lead to more informed decision-making. Second, broadening the scope of efficiency analysis beyond the banking sector may help uncover inefficiencies in emerging financial segments such as microfinance or pension funds—sectors often crucial for financial inclusion. Policymakers should incentivize research that incorporates sector-specific performance metrics and aligns with national development strategies. Additionally, incorporating SFA and models that integrate

environmental and institutional variables could yield insights into the regulatory effectiveness and resilience of financial systems, especially in post-crisis settings. Finally, building a regional framework for comparative efficiency monitoring, possibly under the coordination of central banks or financial supervisory authorities, could foster transparency and mutual learning.

In conclusion, despite significant progress in understanding financial efficiency in SEE, much work remains to be done. By expanding research coverage, improving data, embracing advanced methodologies, and fostering global cooperation, future studies can provide deeper insights. These contributions will not only enrich academic discourse but also support evidence-based policymaking and regulatory design, thereby enhancing the efficiency, resilience, and inclusiveness of SEE's financial systems in practice.

5 Conclusions

Understanding the SEE financial sector's role in the area's stability and economic growth is greatly aided by this analysis of its efficiency. Key trends in scientific literature were found using a systematic bibliometric approach. These trends included the dominance of the banking industry, the frequent use of the DEA method to measure technical efficiency, and increased interest in efficiency after significant economic crises, such as the COVID-19 pandemic and the 2008 financial crisis. The research highlighted the uneven representation of various sectors, with insurance companies, pension funds, and other institutions largely absent from the central focus of studies.

This study synthesizes data and insights that provide a clearer understanding of the challenges facing the sector while offering a foundation for improving both scientific approaches and practical recommendations for policymakers. Key limitations include the lack of data for specific countries and sectors, as well as the limited scope of interdisciplinary research.

Future research should focus on a more detailed analysis of less-explored sectors, such as microfinance and insurance companies, and conduct comparative studies using different efficiency measurement methods. Particular attention should be given to the impact of digital transformation, regulatory reforms, and post-pandemic challenges. Intensifying international collaboration and knowledge exchange could greatly contribute to developing innovative solutions and a more comprehensive understanding of the financial sector's efficiency.

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