Kompartemen : Jurnal Ilmiah Akuntansi

Vol. 23 No. 1 (2025)

ISSN/e-ISSN: 1693-1084/2579-8928

Journal homepage: https://jurnalnasional.ump.ac.id/index.php/kompartemen/

Bibliometric Analysis on the Development of Capital Structure Research in Manufacturing Firms

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Keywords: capital structure, bibliometric analysis, manufacturing sector, trade off theory, pecking order theory

Citation:
Fadila, A., Raharja, S. (2025). Bibliometric Analysis on the Development of Capital Structure Research in Manufacturing Firms. Kompartemen: Jurnal Ilmiah Akuntansi, 25(2), 156 – 172

ABSTRACT

The manufacturing industry is characterized by its capital-intensive nature and complex production cycles, making capital structure decisions critical for ensuring financial efficiency and business sustainability. This study aims to map the development of literature on capital structure in the manufacturing sector using a bibliometric approach. The analysis was conducted on 226 articles from the Scopus database covering the period from 2000 to 2024, with the aid of the Biblioshiny application on the RStudio platform. The study explores publication trends, institutional affiliations, international collaborations, and thematic structures based on keyword co-occurrence networks. The results indicate a significant increase in publications since 2015, driven by rising global economic uncertainty, technological adoption, and the need for adaptive funding strategies. India and Indonesia emerged as leading contributors, although most publications were domestic in nature and lacked international collaboration. The keyword co-occurrence network revealed two major clusters: internal firm factors such as size and profitability, and external factors including leverage, debt, and macroeconomic risk. The keyword "finance" functions as a bridge between the two clusters, indicating the integration of operational and financial strategies. These findings support the continued relevance of the trade-off theory and the pecking order theory as primary conceptual frameworks.

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INTRODUCTION

The manufacturing industry holds a strategic role in the global economy, particularly amid growing economic uncertainty and increasing competitive pressures. This sector plays a vital role in both national and international economic development. In many developing countries, manufacturing contributes more than 20 percent to gross domestic product and serves as a key driver of exports and employment (World Bank, 2024). As a result, the sector is expected to implement optimal financial efficiency to maintain competitiveness and long-term viability. One crucial component of corporate financial strategy is capital structure, defined as the policy of determining the proportion of long-term funding through a combination of debt and equity. An effective capital structure contributes to financial stability, enhances firm value, and minimizes bankruptcy risk (Myers, 2001). In the context of manufacturing, where large investments in fixed assets and working capital are necessary, financing decisions become highly critical. These decisions are closely tied to substantial investments in machinery, technology, and human capital. Poor management of capital structure can harm financial performance and reduce investor confidence.

As business complexity continues to evolve globally, manufacturing firms face increasingly dynamic external challenges. Macroeconomic instability, global financial crises, and shifts in trade policy are external factors that influence corporate financing strategies. One recent development is the heightened uncertainty surrounding tariffs and cross-border economic tensions, especially between the United States and its trade partners. Cutter, (2025) reported that tariff uncertainty prompted American manufacturers to delay capital spending and reduce leverage to maintain financial flexibility. This illustrates that capital structure decisions are not solely driven by internal factors but are also highly responsive to external pressures and the fluctuating global policy landscape.

In addition to tariff-related issues, other global dynamics such as the surge in benchmark interest rates since 2022 have significantly affected capital structure decisions. For example, the Federal Reserve's rate hikes have raised debt costs and encouraged firms in developing economies to reassess their capital structures to avoid liquidity strain (International Monetary Fund, 2023). Furthermore, rising geopolitical risks, such as the Russia-Ukraine conflict and disruptions in global supply chains, have led to increased raw material import costs, which in turn impact capital formation and financial resilience among manufacturing firms in developing countries (UNCTAD, 2024). These trends demonstrate that capital structure is influenced by global forces and cannot be viewed solely from an internal perspective. Consequently, the selection of an appropriate capital structure has become more complex and requires both conceptual and empirical understanding.

Recent studies have highlighted the importance of capital structure in the manufacturing sector from both conceptual and non-causal perspectives. Salinger, (2022) mapped key capital structure determinants among United States manufacturers, including size, growth, business risk, asset structure, and dividend policy. Meanwhile, Mensah, (2021) emphasized the significance of corporate life cycles in shaping the optimal mix of debt and equity, urging managers to interpret trade off and pecking order theories within contextual frameworks. A study in Malaysia's manufacturing sector indicated that capital structure is heavily influenced by external conditions such as currency volatility and economic crises, further emphasizing the need for a macroeconomic lens in financing decisions (Ali et al., 2018). Several literature reviews further underscore the value of conceptual approaches in capital structure analysis. Pandey & Singh, (2015) identified eleven key determinants across various international and sectoral studies, including firm size, business risk, and asset tangibility. Kumar et al., (2017), through a meta-analysis of 167 studies over 40 years, concluded that the pecking order theory is the most dominant both empirically and theoretically, especially in emerging markets. In the context of other developing economies, Fatima & Yasmin, (2022) suggested that classical capital structure theories should be adapted to incorporate macroeconomic variables. Findings from Indonesia by Mardani et al., (2023) revealed that firm size, profitability, and growth opportunities were the most influential factors, although their relationships with existing theories were not always consistent. Boateng et al., (2022) noted that capital structure research remains limited at the sectoral level, particularly in manufacturing, and is mostly dominated by firm-level quantitative approaches.

The growing complexity of the global economy has driven greater academic interest in capital structure as a multidimensional issue. Since the early 2000s, the volume and complexity of research in this area have increased significantly, particularly after the adoption of International Financial Reporting Standards which emphasize transparency and accountability in financial reporting (Ball, 2006). These standards have encouraged firms to disclose more information, including long-term financing strategies.

The Asian financial crisis of 1997 to 1998 also led to a shift in corporate approaches, especially in Asia, as firms began to exercise greater caution in using debt and prioritized financial sustainability (Claessens et al., 2000). This transition marked a move from the dominance of the trade-off theory to the pecking order theory, which argues that firms prefer to use internal funds first to avoid investor

misinterpretation due to information asymmetry and adverse market responses (Myers & Majluf, 1984; Frank & Goyal, 2003). There is a growing consensus that capital structure decisions are shaped by a mix of internal company conditions, industry characteristics, and external factors such as economic policy and access to funding (Ahmed Sheikh & Wang, 2011; Hunjra et al., 2020). As such, a contextual understanding of capital structure is essential, particularly for sectors such as manufacturing that require significant investment in fixed assets and working capital.

Although a significant body of research exists on capital structure, much of it remains general and has not focused specifically on the manufacturing sector. Tolani & Pandya, (2024) conducted a bibliometric analysis using Scopus data to map the general development of capital structure theory but did not explore its application in manufacturing, where capital needs differ. The cross-sectoral nature of most studies leaves room for more targeted research that aligns with sector-specific realities. Mahmoud et al., (2023) provided a general overview of capital structure research trends over the past decade but did not examine differences across industries, even though the manufacturing sector demands large-scale long-term funding. Similarly, Nasiri et al., (2025) studied capital structure in start-ups, focusing on equity and venture capital financing, without exploring the unique financing dynamics in capital-intensive industries like manufacturing. Therefore, this study seeks to fill that gap through a bibliometric analysis of capital structure literature in the manufacturing sector using Scopus data.

This study also extends its scope by incorporating recent international references to strengthen the bibliometric findings. Panchal & Chand, (2023) and Salinger, (2022) examined internal and external factors influencing capital structure in India and the United States, while Channar et al., (2015) contributed insights from small and medium enterprises and sectoral variations, which are useful for understanding topic diversity in keyword co-occurrence analysis. By combining bibliometric analysis with conceptual insights from prior studies, this research is expected to provide a comprehensive overview of the development of capital structure knowledge in the global and sectoral context of manufacturing.

The primary aim of this research is to contribute scientifically through the application of a bibliometric approach specifically focused on the manufacturing sector. By analyzing data from the Scopus database covering 2000 to 2024 using the Biblioshiny application in RStudio, this study seeks to map publication trends, the most productive institutional affiliations, international collaborations, and thematic structures through keyword co-occurrence networks. The emphasis on manufacturing adds a unique dimension to the capital structure literature by taking into account the specific characteristics of the industry, including its demand for large investments in fixed assets and working capital and its sensitivity to global economic pressures. Based on this background, the following research questions are proposed:

RQ_1: What are the trends and distribution of academic publications on capital structure in the manufacturing sector from 2000 to 2024?

RQ_2: What is the direction of capital structure research development in the manufacturing sector in terms of thematic focus and global scientific collaboration?

LITERATURE REVIEW

Trade-off Theory

The trade-off theory explains that firms balance the benefits of using debt, such as tax savings, against the financial risks it brings, including bankruptcy costs. This theory suggests that there is an optimal point in the capital structure where the total cost of capital is minimized and the value of the firm is maximized (Myers & Majluf, 1984). It not only addresses tax benefits but also reflects a structural

balancing process between debt and equity components to achieve the optimal capital mix. In the manufacturing context, capital structure decisions involve weighing leverage for fixed asset expansion against the risk of interest burdens that may disrupt operational cash flow. Thus, trade-off occur across dimensions of liquidity, stability, and strategic flexibility.

Manufacturing firms that require long-term investment and hold significant fixed assets often use debt as a source of financing because it can be secured by those assets. However, risks from production failure or volatility in raw material prices force firms to be cautious in avoiding excessive interest burdens. Therefore, the trade-off between tax advantages and financial risk is highly relevant in capital structure decisions within this sector.

Pecking Order Theory

The pecking order theory posits that firms prefer to use internal funds before seeking external financing, following a hierarchy: retained earnings, debt, and finally equity. This preference is driven by the desire to avoid information asymmetry and issuance costs. In manufacturing firms, which frequently face income uncertainty and long business cycles, this theory explains the tendency to retain internal control and avoid negative signals from issuing new shares. As a result, funding decisions are more reactive to cash flow needs rather than strategic restructuring of capital (Myers & Majluf, 1984; Shyam-Sunder & C. Myers, 1999).

Capital Structure in Manufacturing Firms

Capital structure refers to the composition of debt and equity used by companies to finance their operations and long-term investments. In manufacturing firms, capital structure is a strategic element due to the industry's capital-intensive nature, particularly in acquiring fixed assets such as machinery, production equipment, and supporting infrastructure. These firms tend to operate with long production cycles, large inventory volumes, and high working capital needs. This situation leads to a substantial reliance on external financing, especially to maintain liquidity and ensure the continuity of production processes. On the other hand, firms must manage the financial risks that arise from excessive debt use, such as default risks and high interest burdens.

Two primary theories are commonly used to explain capital structure behavior in the manufacturing sector, namely the trade-off theory and the pecking order theory. The trade-off theory asserts that firms seek a balance between the benefits of using debt, such as tax savings, and the associated financial costs, like bankruptcy potential. In manufacturing, the presence of fixed assets that can serve as collateral often encourages firms to take on debt up to a certain threshold (Frank & Goyal, 2003). Meanwhile, the pecking order theory suggests that firms prefer internal financing (retained earnings), then debt, and lastly equity. This strategy aims to avoid information asymmetry and negative signals from issuing new shares. Many manufacturing firms follow this principle because income volatility and market uncertainty make financial decisions more cautious (Myers & Majluf, 1984; Shyam-Sunder & C. Myers, 1999).

Other factors influencing capital structure in the manufacturing sector include profitability, firm size, liquidity, asset growth, and macroeconomic conditions. Research by (Rajan & Zingales, 1995) shows that firms with high profitability and strong access to internal funds tend to have lower debt levels. Therefore, capital structure in manufacturing firms is shaped by a combination of theoretical considerations, industry characteristics, and managerial judgment in managing financial risks and achieving efficiency.

METHOD

Research Design

This study employs a descriptive quantitative approach through bibliometric analysis, aimed at mapping the development of literature on capital structure in the context of manufacturing firms. This approach was selected because it provides a comprehensive overview of academic publication trends, the most productive authors, inter-institutional collaborations, and dominant themes that have emerged over a specific time periods. The study is exploratory and systematic, in line with its goal to identify scholarly dynamics and future research directions related to capital structure in the manufacturing industry.

Sample Selection and Data Source

The data for this study were obtained from the Scopus database, one of the most comprehensive international repositories of scientific literature. The sample was selected using the keywords “capital structure” and “manufacturing,” and filtered based on the publication year between 2000 and 2024. This time span was chosen to reflect recent developments and long-term trends in the study of capital structure in the manufacturing sector. Furthermore, only documents categorized as scholarly articles, published in English, and classified under the subject areas of business, management, and accounting, as well as economics, econometrics and finance, were included in the analysis. To present the selection process in a concise and systematic manner, a PRISMA diagram (Figure 1.) was used, illustrating the flow from initial identification to the final number of articles analyzed.

Data Collection Instrument

Data collection and processing were conducted using RStudio and the biblioshiny application, which enables comprehensive and interactive bibliometric analysis. This tool supports data visualization in the form of publication trend graphs, author collaboration network maps, keyword frequency charts, and impact metrics such as the H-index and citation counts. All documents analyzed are officially indexed in Scopus, thereby ensuring the validity of the data.

Data Analysis

This study applies descriptive bibliometric analysis to identify patterns and developments in research related to capital structure in manufacturing firms. The analysis focuses on several key indicators, such as the number of publications per year, the journals most frequently publishing on this topic, and author productivity based on article count and citation impact. Additionally, frequently used keywords and the relationships between research topics were also analyzed. To ensure a systematic and transparent data selection process, a PRISMA diagram was employed. This approach helps provide a comprehensive understanding of the trajectory of research development and highlights future research opportunities in the field of capital structure within the manufacturing sector.

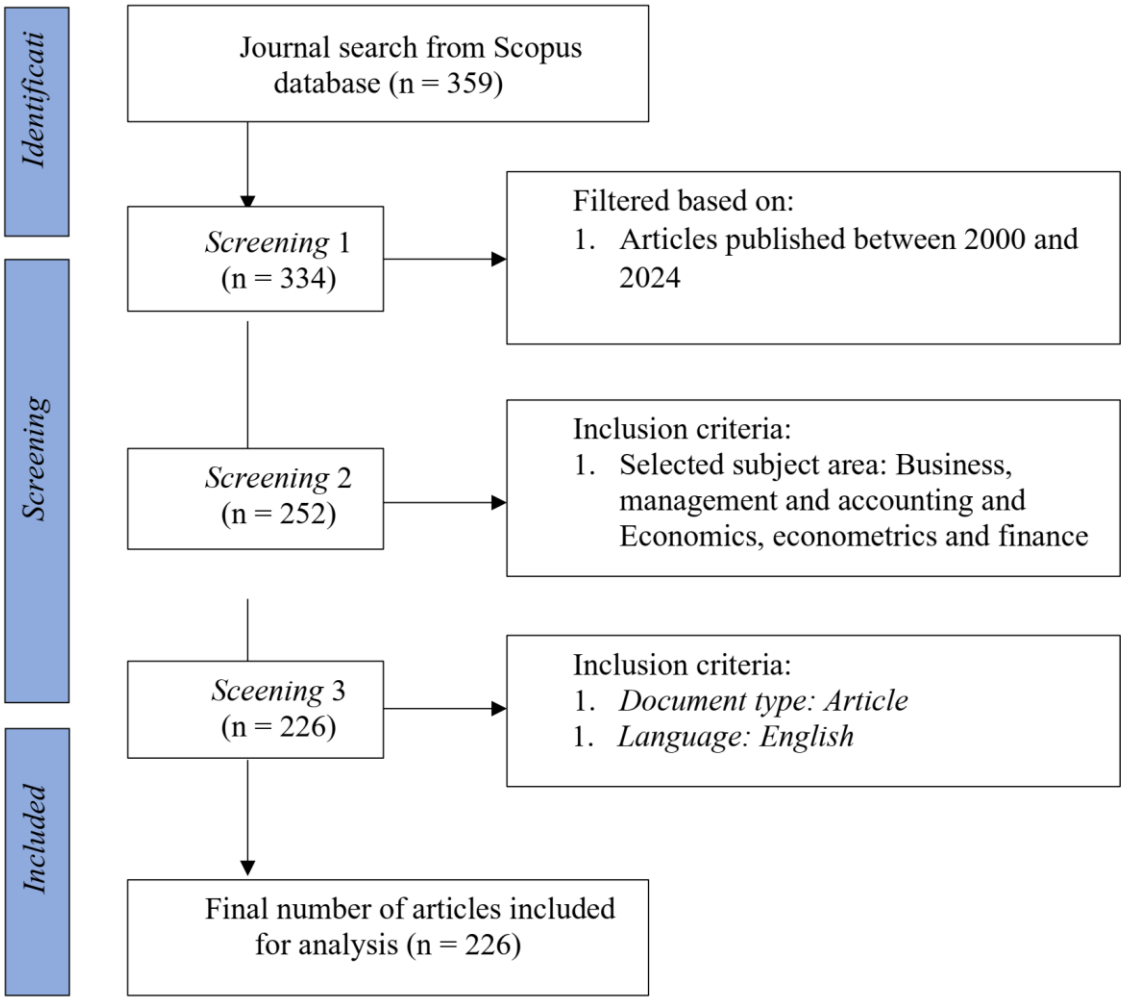

Fig. 1. PRISMA Flow Diagram

RESULT

Bibliometric analysis is a method used to understand the progression of research by observing publication patterns, researcher collaborations, and emerging themes within a particular field. In this study, the method was applied to analyze the dynamics of capital structure research in the manufacturing sector during the period from 2000 to 2024. This approach made it possible to observe the growth in the number of publications, the primary focus of the topics discussed, and the collaboration patterns among researchers. A summary of the analysis results is presented in the table above, offering a general overview of the current state of research and serving as a foundation for the development of future studies.

Table 1. provides a comprehensive overview of the characteristics and development of capital structure research in the manufacturing sector from 2000 to 2024. During this period, a total of 226 documents were published across 151 sources, with an annual growth rate of 14.54 percent, indicating a significant increase in interest in this field. The average age of the documents is 7.23 years, and each document received an average of 17.91 citations, reflecting the relevance and influence of the research. In terms of content, there were 606 author keywords and 134 additional keywords generated automatically, illustrating the diversity of topics addressed. A total of 516 authors contributed to this body of work, with an average of 2.53 authors per document, indicating a tendency toward collaborative research.

International collaboration accounted for 18.58 percent, highlighting the involvement of researchers from various countries. All documents were published as scientific articles, affirming that the research findings were formally disseminated and can be cited as academic references. Overall, the table demonstrates a positive trend in the volume, quality, and collaborative efforts of capital structure research in the manufacturing sector over the past two decades

Tabel 1. Main information

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	2000:2024
Sources (Journals, Books, etc)	151
Documents	226
Annual Growth Rate %	14.54
Document Average Age	7.23
Average citations per doc	17.91
References	10105
DOCUMENT CONTENTS	
Keywords Plus (ID)	134
Author's Keywords (DE)	606
AUTHORS	
Authors	516
Authors of single-authored docs	47
AUTHORS COLLABORATION	
Single-authored docs	49
Co-Authors per Doc	2.53
International co-authorships %	18.58
DOCUMENT TYPES	
article	226

Publication per Year

The number of publications per year is an important indicator in assessing the development of a research field. Through bibliometric analysis, this trend helps to map the growth of knowledge, shifts in scientific focus, and academic responses to strategic issues. An increase in publications reflects growing scientific attention, the socio-economic relevance of the topic, or the emergence of innovations that stimulate new research. Conversely, a decline in publications may indicate decreasing interest or the presence of methodological challenges. Figure 1. illustrates the annual publication dynamics related to capital structure in manufacturing companies.

Based on the analysis of the annual publication trends on capital structure in manufacturing companies (Figure 1), there has been a significant increase during the period from 2000 to 2024. In the early years of the decade, the number of publications was still limited, with an average of only one to four documents per year. However, this trend began to change significantly starting in 2015, marked by a consistent growth in the number of published documents. The peak of publication occurred in 2023 with a total of 30 documents, representing approximately 20.4 percent of the overall 226 documents analyzed. In 2024, there was a slight decrease to 26 documents, or around 17.7 percent, yet this still indicates a high level of research activity.

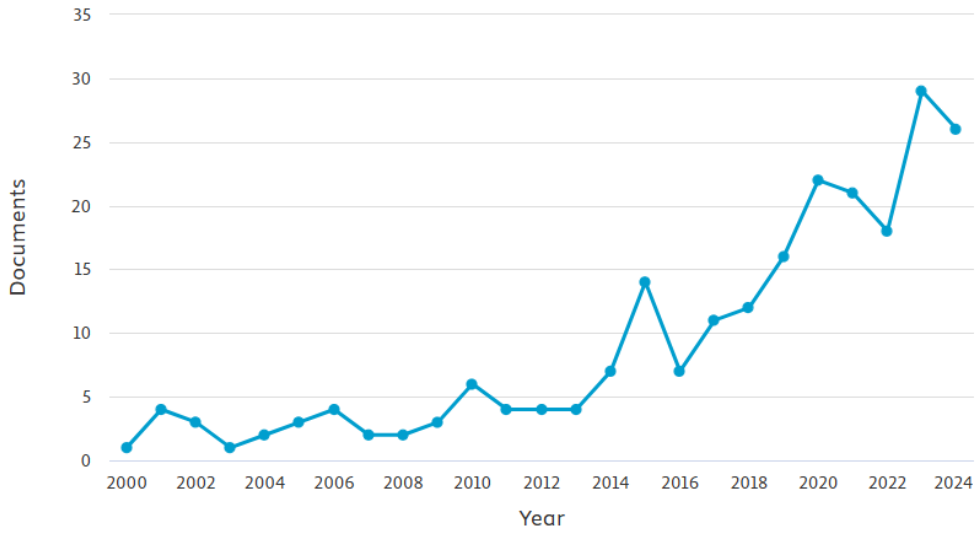

Fig. 2. Publication per Year

Document by Affiliation

Affiliation analysis in bibliometric studies aims to identify the institutions that are most actively contributing to scientific publications on a particular topic. This information helps to map leading research centers and illustrates the distribution and strength of academic networks. In addition to reflecting productivity, affiliation data also highlight the strategic role of an institution in shaping the direction and development of scientific knowledge. The following figure presents the distribution of documents by institutional affiliation, showing each institution's contribution to the total number of publications on capital structure in manufacturing companies.

Based on institutional affiliation data (Figure 2.), it is evident that publication contributions in this research area are widely distributed across the globe, reflecting the involvement of various universities and research institutions from different countries. The institution with the highest number of publications is the Indian Institute of Management Mumbai, with seven documents, followed by Technická univerzita vo Zvolene with four documents. Meanwhile, several other institutions such as Universidade da Beira Interior, Indian Institute of Technology Kharagpur, and Universitas Brawijaya each contributed three documents. This distribution indicates that not only institutions from developed countries, but also those from developing nations such as Indonesia and Malaysia, are actively contributing to the advancement of literature on the topic under study. Therefore, the affiliation data reflect both geographical diversity and a high level of cross-institutional collaboration within this field of research.

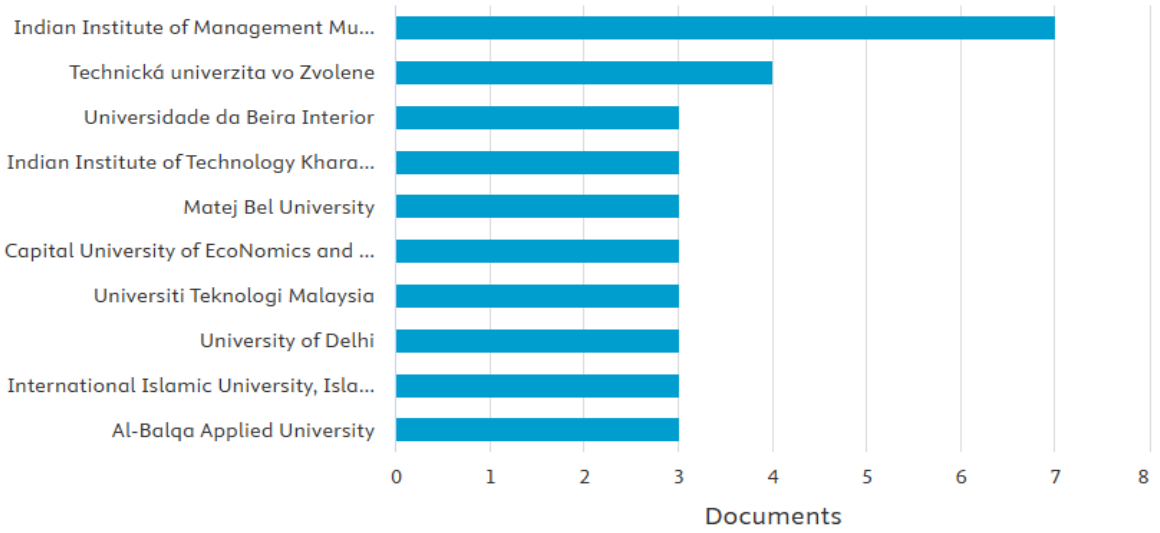

Fig. 3. Document by Affiliation

Most Relevant Sources

Most relevant sources aim to identify the most productive and frequently cited scientific journals within the research field. This result provides an overview of the direction of literature trends and highlights the primary sources that dominate scientific publications related to the topic under study. Figure 4 is the result of the most relevant sources analysis in this research.

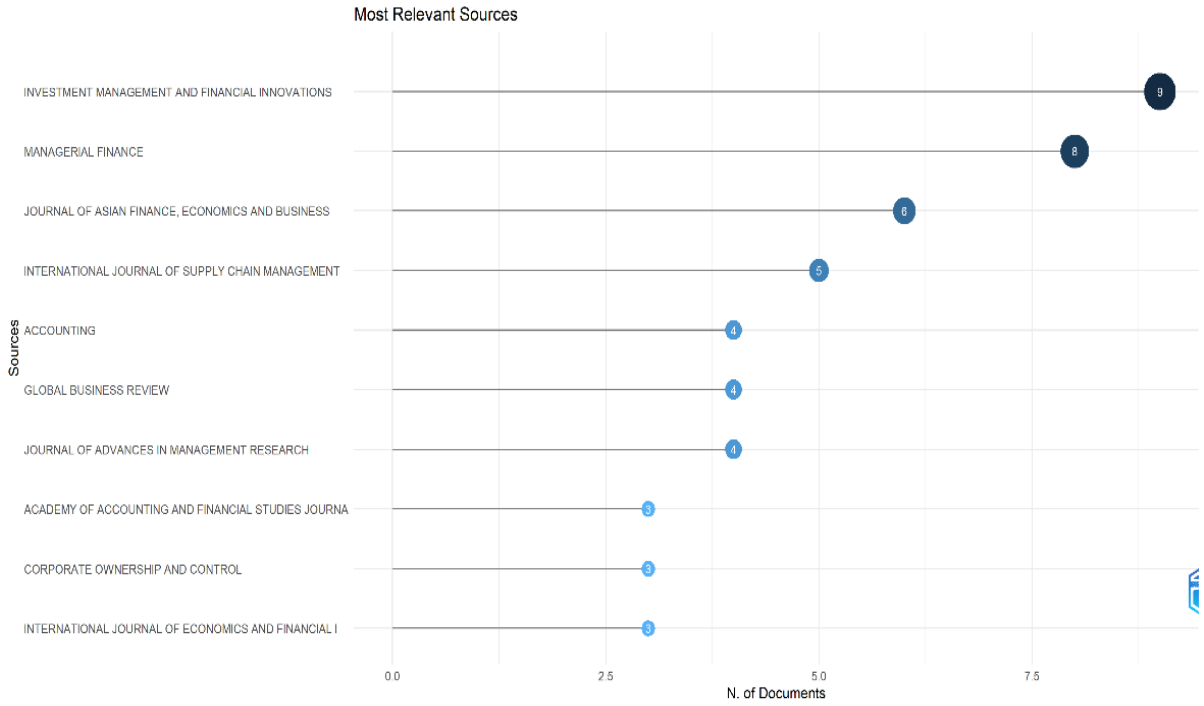

Fig. 4. Most relevant sources

The analysis of the most relevant sources reveals that the Journal Investment Management and Financial Innovations lead with nine articles related to capital structure research in the manufacturing sector. The second position is held by Managerial Finance with eight articles, followed by the Journal of Asian Finance, Economics and Business with six articles. In addition, other journals such as the International Journal of Supply Chain Management, Accounting, and Global Business Review also make significant contributions, each with four to five articles. These journals serve as key sources in scientific publications that explore various aspects of finance, funding, and management within the manufacturing context.

Documents by Authors

The analysis of documents by author aims to identify the most productive authors in this research field, both individually and collaboratively. This data illustrates the contributions of leading authors as well as their academic influence on the topic under investigation. Figure 5. presents the results of the document analysis by author in this study.

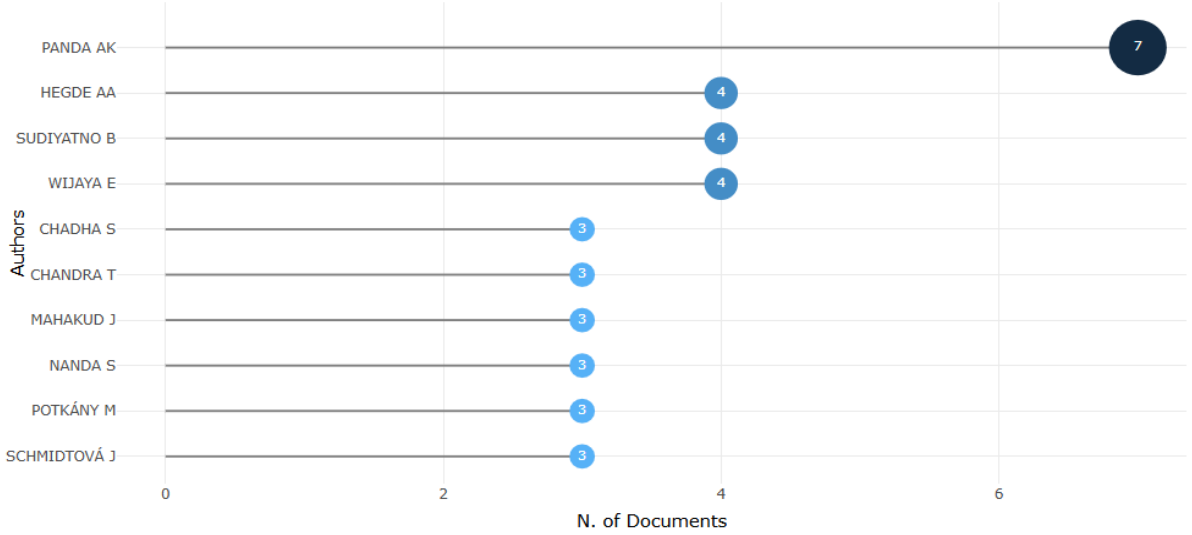

Fig. 5. Documents by Author

Figure 5 displays the list of the ten most productive authors in research on capital structure within the manufacturing sector. The author with the highest number of publications is Panda Ak, with a total of seven documents. Following him are Hegde Aa, Sudiyatno B, and Wijaya E, each with four documents. In addition, there are seven other authors, including Chadha S, Chandra T, Mahakud J, Nanda S, Potkány M, and Schmidtová J, each of whom contributed to three documents.

Documents by Country

The analysis of documents by country aims to identify the contribution of each country to the production of scientific publications on the topic of capital structure in manufacturing companies. Through this approach, it is possible to map the extent to which specific countries are involved in advancing research, both individually and through international collaboration. In addition to revealing geographic dominance, this analysis also reflects the global distribution of scientific activity. Figure 6. presents the distribution of scientific publications based on the countries of affiliation of the authors involved in this study.

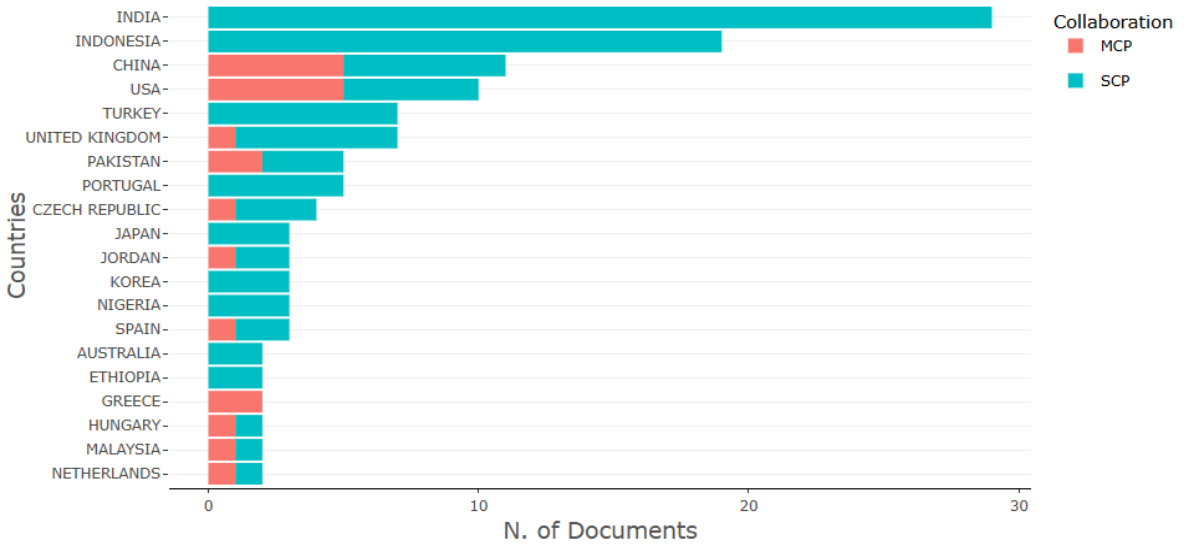

Fig. 6. Documents by Country

Figure 6 illustrates the distribution of research documents on capital structure in the manufacturing sector based on the authors' countries. India ranks as the country with the highest number of publications, with a total of 29 documents, all of which were produced nationally without international collaboration, making them 100 percent Single Country Publications (SCP). Indonesia holds the second position with 19 documents, all of which are also Single Country Publications (SCP). China and the United States produced 14 and 11 documents respectively, with Multiple Country Publications (MCP) accounting for 50 percent of China's output and approximately 36 percent of that of the United States. Other countries such as Türkiye, England and Japan also contribute, generally publishing at the national level.

Keyword Co-occurrence Network Analysis

Keyword co-occurrence network analysis is a bibliometric method used to explore the conceptual relationships among topics within a research field. By identifying keywords that frequently appear together in the same documents, this analysis provides insights into the thematic structure, major trends, and dominant research focuses. The network formed by the relationships among keywords also helps reveal the integration between subtopics and potential directions for future research. Figure 7. presents a visualization of the keyword co-occurrence network, showing the connections between concepts that frequently appear together in the analyzed literature.

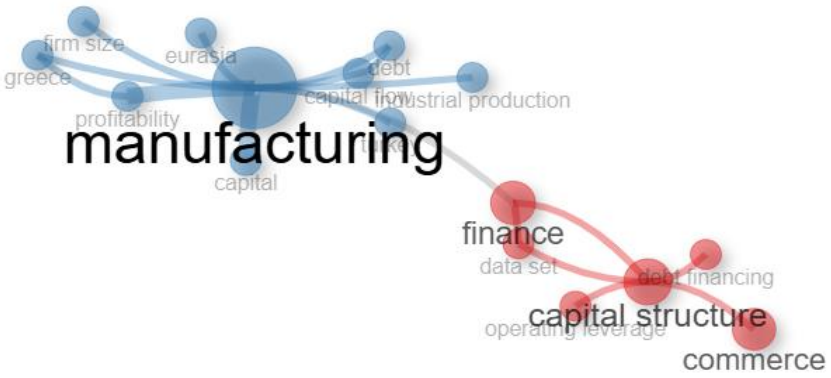

Fig. 7. Keyword co-occurrence network analysis

The keyword co-occurrence network figure reveals two main clusters in the research on capital structure within the manufacturing sector. The first cluster is centered around the keyword “manufacturing,” which is associated with terms such as firm size, profitability, and capital flow. The second cluster is led by the keyword “capital structure,” which is linked to finance, debt financing, and operating leverage. The term “finance” appears to serve as a bridge connecting the two clusters.

Country Collaboration World Map

The country collaboration map is a visual tool in bibliometric analysis used to map scientific cooperation among countries. Through this visualization, it is possible to identify countries that are actively building cross-border research networks and to assess the extent to which collaborative contributions play a role in the global dissemination of knowledge. This map not only shows the intensity of publications from each country but also reveals patterns of connectivity and the dominant directions of international collaboration within the research field. Figure 8. presents a visualization of the collaboration map based on the affiliations of authors involved in scientific publications on the research topic.

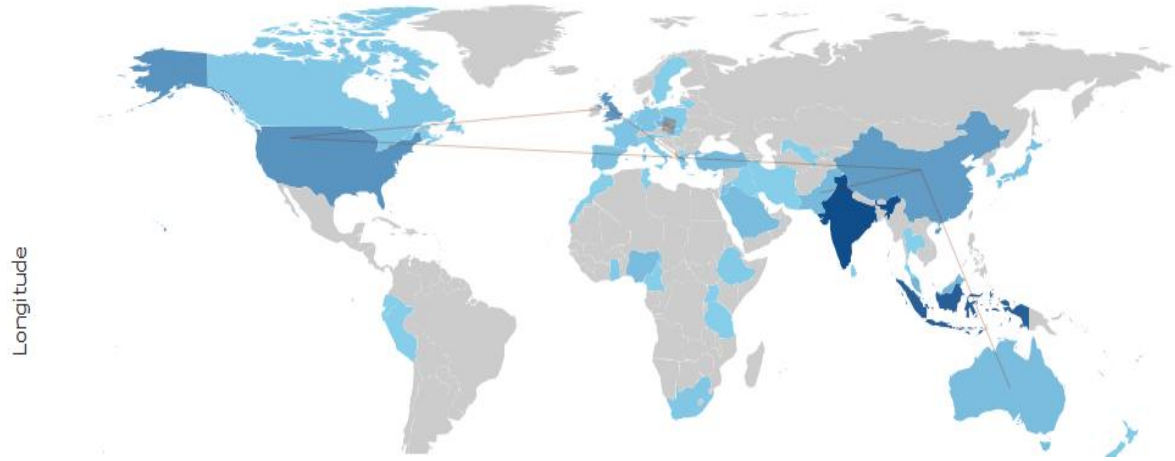

Fig. 8. Country Collaboration World Map

Figure 8. presents an initial visualization of the analysis results, while Table 2 provides more detailed information to support the quantitative interpretation of the data.

Table 2. Country Collaboration World Map

From	To	Frequency
AUSTRALIA	CANADA	1
BELGIUM	SWEDEN	1
CHINA	AUSTRALIA	2
CHINA	MALAYSIA	1
CHINA	PAKISTAN	2
CHINA	PERU	1
CHINA	PORTUGAL	1
CHINA	UNITED KINGDOM	1
FRANCE	BELGIUM	1
FRANCE	NETHERLANDS	1

The data on international collaboration reflect the intensity of scientific relationships based on the number of joint publications between authors from different countries. For example, the collaboration between China and Australia resulted in two publications, indicating a relatively strong partnership between the two in the context of the research topic. China also established collaborations with several other countries, including Pakistan (two publications), and one publication each with Malaysia, Peru, Portugal, and the United Kingdom. Additionally, collaborative ties are observed between France and Belgium, France, and the Netherlands, as well as Belgium and Sweden, each with one publication. These connections reflect patterns of cross-country academic interaction that contribute to the enrichment of global knowledge.

Thematic Map

The thematic map is a visual tool in bibliometric analysis that serves to map research themes based on their level of relevance (centrality) and development (density). This visualization helps to identify dominant, emerging, niche, or declining topics within the literature. Figure 9. presents the thematic map results of capital structure research in the manufacturing sector, generated using the Biblioshiny application.

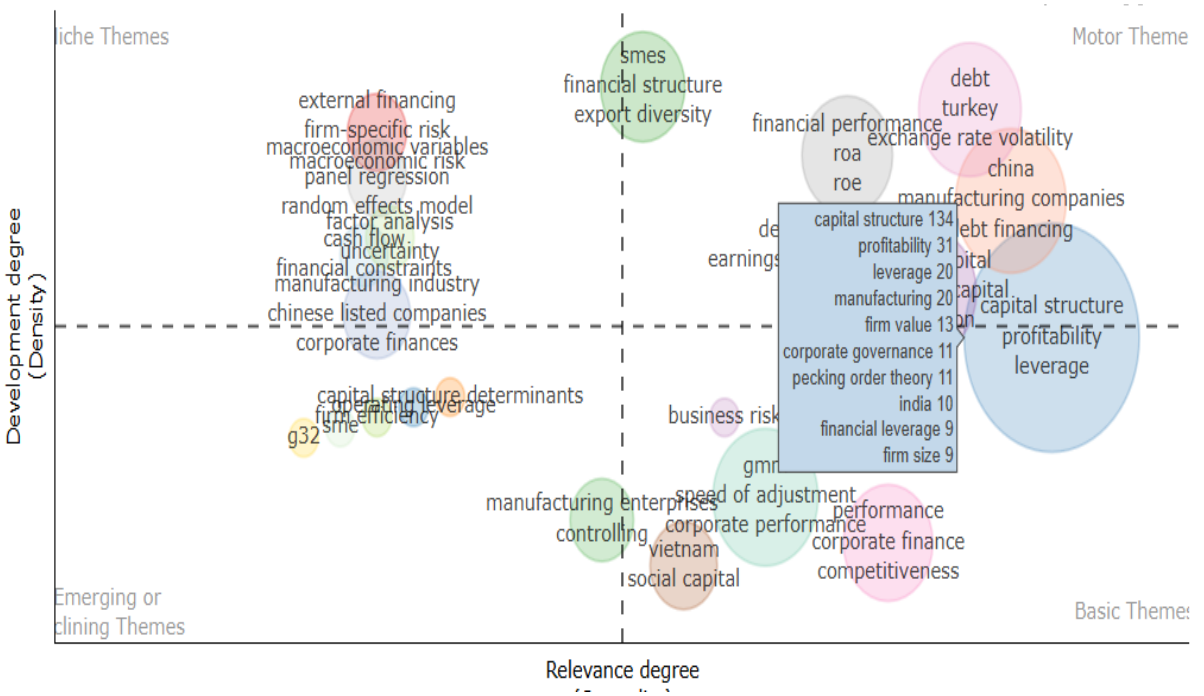

Fig. 9. Thematic Map

The results of the thematic map analysis (Figure 9.) on capital structure research in the manufacturing sector show that most themes are positioned in the basic themes quadrant, such as capital structure, profitability, and leverage. These themes exhibit a high level of relevance in the literature but remain relatively underdeveloped, indicating a dominance of fundamental topics that have not yet been deeply explored. Meanwhile, several themes such as financial performance, exchange rate volatility, and debt financing fall within the motor themes quadrant, signifying that these topics are not only relevant but are also rapidly evolving and have become key directions in research. On the other hand, themes such as macroeconomic variables, company-specific risks, and external financing are in the special theme quadrant, which reflects specialized topics that are less connected to the central themes. Additionally, themes like firm efficiency and manufacturing enterprise are placed in the emerging or declining themes quadrant, indicating that these topics are either underdeveloped or beginning to lose relevance. Overall,

the findings suggest that although fundamental themes have been widely discussed, there remains considerable room for deeper and more integrative research, especially by exploring new topics that are contextual and aligned with the current dynamics of the manufacturing industry

DISCUSSION

Based on the bibliometric analysis, the publication trend shows a significant increase, particularly after 2010, with its peak occurring between 2020 and 2023. This rise indicates that the issue of capital structure in the manufacturing sector has received growing attention in the academic community. The increase can be linked to rising global uncertainty, such as economic crises, the COVID-19 pandemic, and the acceleration of technology adoption in manufacturing processes. In this context, the need for an optimal capital structure has become increasingly critical to maintain competitiveness and ensure corporate sustainability. This finding is in line with the trade-off theory, which emphasizes the importance of balancing the tax benefits of debt against the costs of financial distress. When external risks increase, firms must adjust their capital structure to optimize firm value while minimizing potential financial risks.

In terms of author and institutional contributions, the analysis reveals that most scientific works originate from authors in Asia, particularly India, Malaysia, and China. Scholars such as A. K. Panda ranked at the top in terms of publication count, while the institution with the highest number of publications was the Indian Institute of Management Mumbai. A. K. Panda, affiliated with an academic institution in India, has been actively publishing research related to capital structure in the manufacturing sector. This phenomenon reflects that capital structure remains a crucial issue in developing countries undergoing industrial growth. These institutions also serve as central nodes in the global research network, although cross-country collaboration remains relatively limited and tends to be regional in nature. This limitation implies a potential to enrich theory through the exchange of perspectives across contexts, particularly in the implementation of trade-off and pecking order theories, which may differ across countries due to institutional, regulatory, and cultural factors.

Geographically, the countries with the highest contributions to publications are India, China, and the United States. The country collaboration map analysis indicates that international research cooperation tends to occur within homogeneous regional blocs, such as among Asian or European countries. Intercontinental collaboration remains relatively rare, even though the challenges and dynamics of the manufacturing sector are highly diverse and globally interconnected. Therefore, greater encouragement is needed for cross-regional research collaboration to broaden perspectives and enhance the relevance of research findings. In this context, integrating trade-off and pecking order theories becomes important by adapting them to the influence of institutional environments and macroeconomic conditions in various countries.

In terms of publication channels, leading journals such as the International Journal of Economics and Financial Issues, the Journal of Financial Economics, and Accounting and Finance have become primary platforms for disseminating knowledge on capital structure. The dominance of these journals suggests that research in this field tends to emphasize quantitative and model-based approaches, including trade-off and pecking order models. The pecking order theory posits that firms tend to prefer internal financing before resorting to debt or external equity, a pattern that is reflected in many empirical studies published in these journals. In addition, there is growing interest in more contextual approaches, including the influence of government policy, macroeconomic conditions, and ESG factors. This development signals a paradigm shift in capital structure research from traditional models toward more interdisciplinary approaches that better accommodate the complexity of contemporary economic realities.

The analysis of the most cited documents shows that classical literature remains the primary reference. Articles such as Rajan and Zingales (1995) and Frank and Goyal (2003) are still widely cited, indicating the continued relevance of theoretical frameworks such as the trade-off theory and pecking order theory. However, some recent articles have begun linking capital structure with energy efficiency, digitalization, and sustainability performance, suggesting a diversification of research topics in the capital structure field. Therefore, classical theories continue to serve as foundational frameworks, but their applications are increasingly being adapted to reflect the evolving dynamics of industries and investor expectations, which emphasize sustainability and operational efficiency.

The keyword co-occurrence network analysis identified several dominant terms such as capital structure, firm performance, profitability, leverage, and debt ratio. These keywords form two primary clusters: the first is related to internal corporate indicators such as leverage, profitability, and firm size; the second pertains to external factors such as economic volatility, financial crises, and market growth. Both the pecking order and trade-off theories are relevant in explaining how firms respond to internal and external pressures when designing their financing policies. The interaction between internal and external factors is key in formulating adaptive and resilient financing strategies.

Trend topic analysis reveals a shift in focus from classical themes to more modern and contextual issues. Since 2015, topics such as corporate governance, green finance, and ESG disclosure have emerged, reflecting increased attention to sustainability and corporate governance issues. This indicates that capital structure is now being viewed not only from the perspective of cost efficiency but also in terms of its implications for reputation and long-term corporate sustainability. Although these topics are not the main focus of the trade-off or pecking order theories, their emergence highlights the importance of expanding theoretical frameworks to explain financing decisions under social and environmental pressures.

The thematic map results show that topics such as capital structure, firm performance, and leverage fall within the basic themes quadrant. These themes are important and serve as the foundation for capital structure research, but they still require deeper theoretical and methodological development to remain relevant in current contexts. Meanwhile, topics such as exchange rate volatility, financial performance, and macroeconomic factors fall under the motor themes quadrant, indicating both centrality and high development. These themes are closely related to the trade-off theory approach because macroeconomic fluctuations affect the cost of debt and capital structure decisions. In practical terms, these topics provide critical direction for developing financial risk management strategies in unstable macroeconomic environments. Some topics, such as firm efficiency, cost of capital, and manufacturing enterprises, are positioned in the emerging or declining themes quadrant. This suggests that these themes are in a transitional phase, with the potential either to evolve into major future research areas or to fade. In the context of Industry 4.0 and digital transformation, issues related to efficiency and the adaptability of manufacturing firms to technological change are becoming increasingly relevant. Therefore, further exploration using trade-off and pecking order theory can enhance understanding of how companies adjust their capital structures in response to technological and sustainability challenges.

Overall, this bibliometric analysis reveals that the study of capital structure in the manufacturing sector has evolved from a focus on financing efficiency toward a broader understanding of the role of capital structure in corporate sustainability, business resilience, and competitiveness. Future research trends are likely to embrace multidisciplinary approaches that integrate classical theories with technology, sustainability, and global market behavior. Moreover, increasing cross-country collaboration and the use of big data analytics can enhance the relevance and impact of research in addressing the increasingly complex and dynamic challenges of the manufacturing industry. Therefore, there is a need for updates

in theoretical frameworks as well as more comprehensive integration of financial and non-financial data, so that capital structure research can contribute strategically to sustainable economic development.

CONCLUSION

This study maps the development of capital structure literature in the manufacturing sector from 2000 to 2024 using a bibliometric analysis based on Scopus data. The results indicate a significant increase in publications since 2015, reflecting growing attention to financing strategies amid global dynamics. India and Indonesia are the leading contributors, although international collaboration remains limited. The thematic analysis reveals two main clusters: internal factors such as profitability and firm size, and financial strategies in response to external pressures. The keyword "finance" serves as a bridge between these clusters, highlighting the integration of operational conditions and financing decisions. This is consistent with the trade off theory and the pecking order theory, which emphasize the importance of balancing financial risk with internal financing preferences. The findings also indicate a shift in focus from classical topics toward contextual issues such as macroeconomic volatility and sustainability. This study underscores the importance of sectoral and contextual approaches in understanding capital structure in the manufacturing industry and provides a foundation for a more adaptive and multidisciplinary future research agenda. Future research is encouraged to broaden the data sources by integrating other databases such as Web of Science and Google Scholar to enhance the comprehensiveness and representativeness of the analysis. It is also recommended to apply advanced bibliometric techniques like cocitation analysis or thematic evolution to explore theoretical development and scientific collaboration more deeply. Moreover, focusing on specific manufacturing subsectors and incorporating external factors such as macroeconomic conditions or global events would offer a more nuanced understanding of capital structure strategies.

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