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Mapping the Scholarly Landscape of Oil and Gas Investment Studies Using Scopus Data

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Abstract: Oil and gas investment projects are characterized by high capital intensity, extended development horizons, and substantial exposure to economic, regulatory, and geopolitical uncertainty. While scholarly interest in this field has increased over time, existing studies remain fragmented, and a consolidated overview of research evolution and thematic structure is still limited. This study conducts a bibliometric investigation to map the development of academic research on oil and gas investment using publications indexed in the Scopus database. A total of 118 documents published between 1953 and 2025 across 92 sources were analyzed. Bibliometric techniques were applied using Bibliometrix in RStudio and VOSviewer to examine publication dynamics, citation patterns, influential contributors, collaboration networks, and thematic relationships based on keyword co-occurrence analysis. The findings reveal a marked growth in research output after 2010, reflecting increased attention to investment risk, price volatility, and strategic decision-making in the oil and gas sector. Research output is concentrated within a relatively small group of journals, authors, and institutions, with the United States and China emerging as leading contributors. Core research themes are dominated by investment-related studies in the gas and oil and gas industries, strongly linked to risk assessment and uncertainty analysis. However, international collaboration and sustainability-oriented perspectives remain limited. This study provides a structured synthesis of existing research and identifies opportunities for future studies emphasizing dynamic modeling, sustainability integration, and cross-country comparative analysis.

Keywords*: Oil and Gas Investment; Petroleum Project Investment; Energy Project Finance; Bibliometric Analysis; VOSviewer; Bibliometrix; Keyword Co-occurrence; Research Trends.*

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I. INTRODUCTION

The oil and gas industry continues to play a pivotal role in the global energy system and remains one of the most capital-intensive sectors worldwide. Its contribution to energy supply, fiscal revenues, and industrial development has positioned oil and gas investment as a strategic concern for governments, corporations, and academic researchers alike. Across upstream, midstream, and downstream segments, large-scale petroleum projects sustain economic activity in both exporting and importing countries (Mota et al., 2024). These investments are typically characterized by substantial upfront capital requirements, extended development timelines, and limited flexibility once capital is committed. As a result, investment outcomes are highly sensitive to fluctuations in commodity prices, regulatory changes, geopolitical instability, and evolving sustainability expectations. Beyond macroeconomic and institutional uncertainties (IEA, 2022; World Bank, 2023; Ernst & Young, 2019; Fattouh & Sen, 2016; Stevens, 2008), oil and gas investment decisions are also strongly influenced by subsurface technical risks and reservoir performance uncertainties. Accurate production forecasting, reserve estimation, and decline behavior analysis play a critical role in determining project viability, cash flow sustainability, and investment risk exposure. Empirical evidence from reservoir-level studies demonstrates that production decline analysis provides essential inputs for evaluating remaining reserves and long-term production potential, thereby supporting more informed investment and development planning in upstream petroleum projects (Mota & Otávia, 2021). These technical considerations complement financial and policy analyses by linking engineering performance with strategic investment decision-making (Mota, 2024; Mota et al., 2020). In parallel with these structural challenges, academic research on oil and gas

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investment has expanded considerably over recent decades. Early studies largely emphasized financial appraisal metrics such as capital budgeting, return on investment, and risk quantification. More recent contributions, however, have broadened the analytical scope to include energy transition financing, carbon-related risk, environmental, social, and governance (ESG) criteria, as well as the growing role of digital technologies in investment evaluation and project management (Sorrell et al., 2009; Mohn & Osmundsen, 2011; Wüstenhagen & Menichetti, 2012; Gatzert & Kosub, 2016; Bjerkan & Seter, 2019; Sovacool et al., 2020). Despite this diversification of research themes, the literature remains fragmented across disciplines, making it difficult to obtain a coherent understanding of how the field has evolved and which topics dominate scholarly attention.

Bibliometric analysis offers a systematic and quantitative approach to addressing this challenge by enabling the mapping of publication patterns, influential contributions, collaboration structures, and thematic developments within a research domain (Zupic & Čater, 2015; Aria & Cuccurullo, 2017; Donthu et al., 2021; van Eck & Waltman, 2014). By applying bibliometric techniques to peer-reviewed publications indexed in the Scopus database, this study examines the evolution of oil and gas investment research across multiple disciplines, including energy economics, petroleum engineering, finance, environmental studies, and public policy (Gulen, 1998; Ghafourian & Bagheri, 2021; Overland, 2019). The analyzed body of literature reflects both theoretical advances and empirical investigations shaped by diverse regional and institutional contexts.

The specific objectives of this study are fourfold: first, to identify the most productive and influential authors, institutions, and countries in oil and gas investment research; second, to analyze collaboration patterns and citation networks within the field; third, to detect dominant and emerging research themes through keyword co-occurrence analysis; and fourth, to visualize the temporal evolution of research trends from the early 2000s to 2025. In addition, this study evaluates how oil and gas investment research has responded to major external shocks, including oil price collapses, financial crises, geopolitical disruptions, climate policy developments, and global decarbonization initiatives (Paltsev, 2016; Fæhn et al., 2017; Gracceva et al., 2013; van de Graaf & Sovacool, 2020). Preliminary observations from the Scopus dataset indicate notable surges in research output following the 2008 global financial crisis, the 2014 oil price downturn, and the COVID-19 pandemic, suggesting that periods of heightened uncertainty have stimulated scholarly interest in investment resilience, risk management, and scenario-based analysis (IEA, 2009; Awerbuch & Berger, 2003; Baumeister & Kilian, 2016; Fattouh et al., 2020; Mohaddes & Raissi, 2017).

Case-based studies focusing on countries such as Brazil, China, Kazakhstan, Nigeria, and the United Kingdom further highlight the geopolitical and institutional diversity of oil and gas investment environments (Victor et al., 2012; Overland, 2010; Jaffe & Soligo, 2007). At the same time, growing scholarly attention has been directed toward foreign direct investment (FDI), public-private partnership (PPP) arrangements, sovereign wealth fund (SWF) participation, and regulatory risk mitigation strategies in upstream and integrated petroleum projects (Bortolotti et al., 2010; Megginson & Fotak, 2015; Gelb & Grasmann, 2010; Truman, 2008).

By consolidating and analyzing this dispersed body of research, the present study offers a structured, data-driven overview of the academic discourse on oil and gas investment projects. The findings provide value to multiple stakeholder groups. For researchers, the study clarifies intellectual linkages, influential works, and underexplored research gaps (Börner et al., 2003; Donthu et al., 2021). For policymakers, it delivers insights relevant to investment governance, risk management, and international cooperation in the energy sector (Stevens, 2008; Goldthau & Sovacool, 2012). For industry practitioners and investors, it highlights prevailing analytical approaches and emerging considerations for capital allocation under conditions of heightened uncertainty (IEA, 2022; PwC, 2018; Deloitte, 2021). Overall, this bibliometric investigation not only traces the historical development of oil and gas investment research but also establishes a foundation for future studies in an era increasingly shaped by sustainability imperatives, energy transition objectives, and the reorientation of capital toward low-carbon infrastructure (OECD, 2017; Grubler et al., 2018; UNEP, 2021).

II. LITERATURE REVIEW

- *Theoretical Foundations and Economic Justification of Oil and Gas Investment*

Investment decision-making in oil and gas projects is traditionally grounded in financial valuation theories that emphasize capital allocation under uncertainty. Conventional approaches such as net present value (NPV), internal rate of return (IRR), and capital budgeting have long served as core tools for assessing project feasibility. However, the structural characteristics of petroleum projects-namely long development cycles, irreversible capital commitments, and exposure to volatile commodity markets have highlighted the limitations of static valuation methods (Copeland & Antikarov, 2001; Dixit & Pindyck, 1994). Consequently, scholars increasingly advocate for dynamic valuation frameworks capable of capturing uncertainty and managerial flexibility. Real options analysis has emerged as a prominent approach in this context, offering a framework to evaluate strategic investment choices such as postponement, scale adjustment, or project abandonment in response to changing market conditions (Trigeorgis, 1996; Smit & Trigeorgis, 2004; Saldanha et al., 2023). Applications of this approach in offshore petroleum development and unconventional resource projects demonstrate its effectiveness in incorporating flexibility into investment appraisal (Laughton, 1998; Dias, 2004). Beyond market uncertainty, regulatory and policy-related risks have also been shown to significantly influence investment attractiveness. Empirical evidence suggests that unstable fiscal regimes, environmental regulations, and policy inconsistency can deter capital deployment or delay final investment decisions (Kellas, 2010; Bjerkan & Seter, 2019). From a broader economic perspective, oil and gas investments contribute to national income generation, industrial upgrading, and technological learning. In several resource-rich

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economies, upstream petroleum development has been leveraged to promote local content, workforce development, and technology transfer (Pereira et al., 2011; Aladeitan, 2013). Nonetheless, critics argue that heavy reliance on hydrocarbon revenues can amplify macroeconomic volatility, particularly in rent-dependent economies where public investment efficiency is undermined by fiscal concentration and revenue cyclicality (Auty, 2001; Collier et al., 2010).

- *Risk Dimensions and Uncertainty in Oil and Gas Investment*

Uncertainty constitutes a central feature of oil and gas investment decisions and arises from multiple interrelated sources, including price fluctuations, geological complexity, political instability, regulatory change, and environmental constraints. To address these challenges, prior studies frequently employ probabilistic modeling techniques, sensitivity analysis, and scenario-based evaluation to assess how variations in key parameters affect project profitability and risk exposure (Bailey et al., 2004; Emhjellen & Alaouze, 2003). The concept of the investment climate has gained prominence as an integrative framework encompassing institutional quality, legal certainty, governance effectiveness, and transparency in fiscal arrangements (Henisz, 2002; World Bank, 2015). In many developing petroleum-producing countries, elevated perceptions of political and regulatory risk have been shown to weaken foreign direct investment (FDI) inflows, despite favorable geological potential (Obeng-Odoom, 2014; Yergin, 2012). Factors such as contract enforcement concerns, social opposition to extractive activities, and political instability further shape investor behavior (Boschini et al., 2007; Stevens, 2008).

To mitigate these risks, policy-oriented studies emphasize the role of bilateral investment treaties, international arbitration mechanisms, and regulatory transparency in enhancing investor confidence (OECD, 2010; Gaukrodger, 2012). More recently, climate-related uncertainty has become a critical consideration in oil and gas investment analysis. The implementation of carbon pricing schemes, emissions regulations, and mandatory climate disclosures introduces long-term transition risks for capital-intensive fossil fuel assets (Grubler et al., 2018; van de Graaf & Sovacool, 2020; Adityawarman et al., 2025). As a result, environmental, social, and governance (ESG) criteria are increasingly incorporated into investment screening processes, prompting firms to reassess portfolio resilience under energy transition scenarios (IEA, 2021; Gatzert & Kosub, 2016).

- *Country-Level Investment Strategies and Empirical Evidence*

Country-specific analyses provide valuable insights into how institutional arrangements and policy frameworks shape oil and gas investment outcomes. In Brazil, spatial and sectoral analyses reveal that investment activity has been closely aligned with pre-salt resource development and state-supported infrastructure expansion (Françoso et al., 2019). In the Chinese context, regional disparities in investment attractiveness have been linked to government intervention, pricing mechanisms, and targeted incentives designed to mobilize private capital in natural gas development (Wang, 2016).

Kazakhstan's experience illustrates the strategic use of local content requirements and joint ventures with international oil companies to strengthen domestic capabilities in upstream operations (Shalbolova et al., 2024). Similarly, Ghana's post-discovery investment surge following the Jubilee field highlights both the opportunities and constraints associated with rapid sectoral expansion, particularly in terms of local capacity and community engagement (Ackah & Adu, 2014). In contrast, the United Kingdom represents a mature petroleum province where investment decisions are increasingly shaped by declining production, cost pressures, and stringent environmental regulations (Bryan, 2022). Collectively, these cases demonstrate that geological endowment alone is insufficient; stable institutions, credible policy frameworks, and socio-environmental governance play decisive roles in determining long-term investment sustainability.

- *Financial Evaluation Methods and Modeling Approaches*

Financial evaluation remains a cornerstone of oil and gas investment analysis. Discounted cash flow (DCF) methods, sensitivity testing, and scenario analysis continue to be widely applied due to their simplicity and transparency (Brealey et al., 2011). However, the scale and irreversibility of petroleum investments have motivated the development of more integrated modeling frameworks that combine market simulation, real options valuation, and portfolio optimization (Kettunen et al., 2006; Fernandes et al., 2014).

Although the internal rate of return (IRR) remains popular in practice, its limitations-particularly the assumption of constant reinvestment rates have prompted researchers to complement it with probabilistic tools. Monte Carlo simulation and decision-tree models are increasingly employed to represent multiple development pathways and risk scenarios throughout the project lifecycle (Brandão & Saraiva, 2008). Advances in computational methods have further expanded analytical capabilities, with machine learning techniques being applied to oil price forecasting and data-driven investment assessment (Cunha et al., 2020; Zhang et al., 2022). In parallel, the rise of sustainable finance has encouraged the incorporation of environmental externalities, social impacts, and life cycle assessment (LCA) into project evaluation, signaling a transition toward more holistic and multidimensional investment frameworks (Narsilio & Zarrella, 2021).

III. METHODOLOGY

- *Research Design*

This research adopts a quantitative bibliometric approach to examine the development, thematic orientation, and publication dynamics of scholarly work on oil and gas investment projects. Bibliometric methods are widely applied to systematically analyze large volumes of academic literature by revealing knowledge structures, influential contributions, and evolving research patterns, particularly in interdisciplinary domains such as energy finance, petroleum

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economics, and infrastructure investment (Zupic & Čater, 2015; Aria & Cuccurullo, 2017; Donthu et al., 2021). Compared with traditional narrative reviews, bibliometric analysis offers a more objective and replicable framework for synthesizing existing knowledge and identifying underexplored or emerging research areas (Broadus, 1987; Moral-Muñoz et al., 2020). The research design follows three sequential stages: data acquisition, data refinement, and bibliometric mapping and performance analysis. This structure enables the identification of the intellectual foundations of oil and gas investment research, including thematic groupings, leading authors and institutions, core publication outlets, keyword interaction patterns, and longitudinal publication trends within the Scopus-indexed literature. The suitability of this methodological framework has been demonstrated in prior bibliometric studies on energy transition and oil market analysis, supporting its applicability to the present research context (Azadi et al., 2020; Liu et al., 2022).

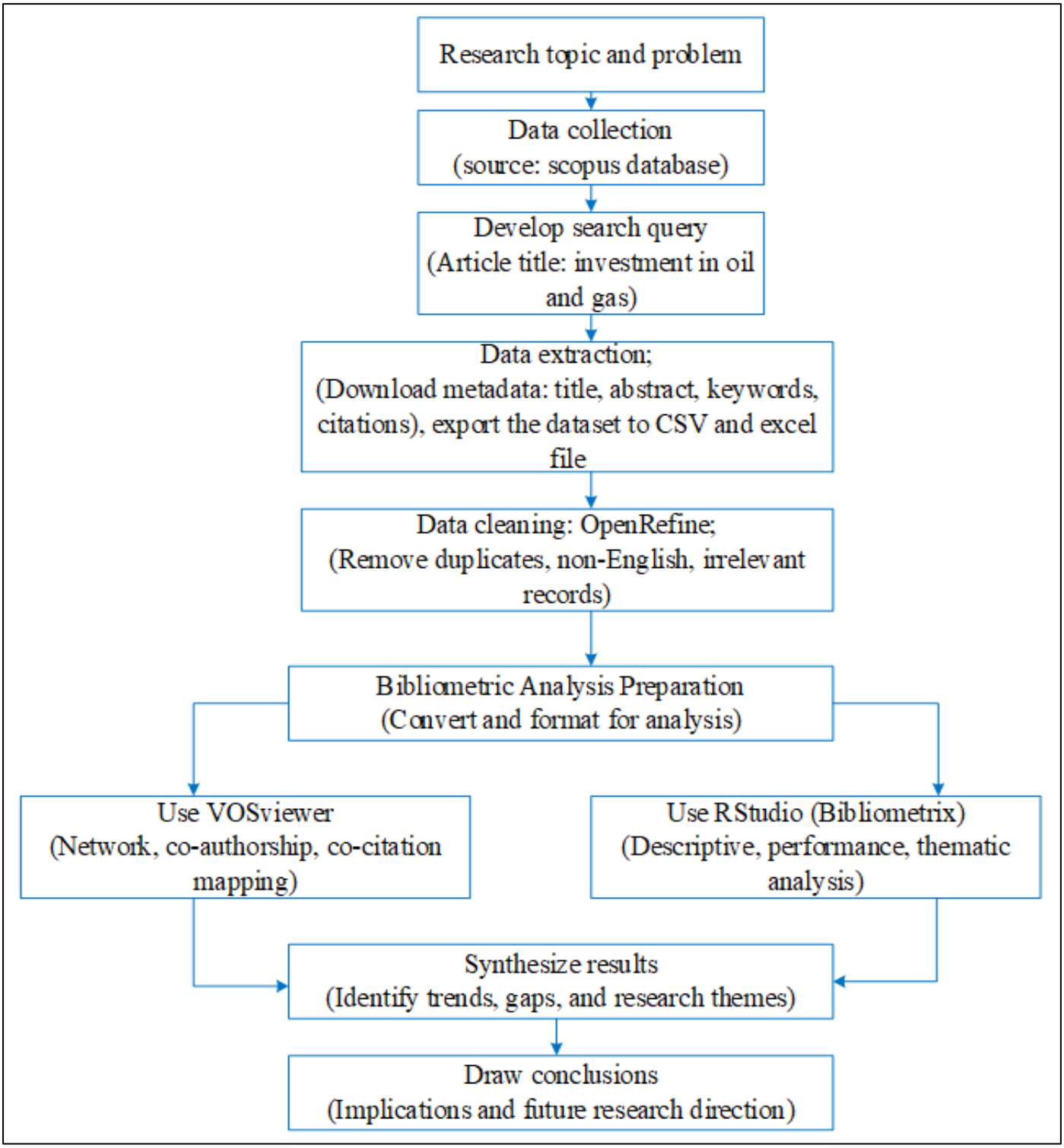

Fig 1 Research Flow (Mota et al., 2026).

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➢ *Data Collection*

Bibliographic data were retrieved from the Scopus database, which is recognized for its extensive and high-quality indexing of peer-reviewed publications across engineering, energy studies, economics, and the social sciences. Owing to its broad disciplinary coverage and standardized metadata structure, Scopus is frequently employed as a primary source for bibliometric investigations (Falagas et al., 2008; Mongeon & Paul-Hus, 2016). The data collection process was conducted in May 2025 using a set of keyword combinations aligned with the study's focus, including terms related to oil and gas investment, project financing, exploration and production activities, foreign direct investment, and real options analysis. The inclusion criteria were defined as follows: (1) publications issued between 2000 and 2025; (2) document types limited to journal articles, review papers, and conference proceedings; (3) subject areas encompassing energy, economics, engineering, business, and environmental sciences; and (4) English-language publications only. The initial search returned 143 records, which were exported in spreadsheet format with complete bibliographic metadata, including titles, authorship, institutional affiliations, abstracts, keywords, source titles, citation counts, and reference lists. The selected time horizon captures both early investment-related studies and more recent research influenced by sustainability concerns and energy transition discourse (IEA, 2023; Sovacool et al., 2020).

➢ *Data Cleaning and Preprocessing*

Prior to analysis, the dataset underwent a systematic refinement process to improve accuracy and analytical consistency. Duplicate entries were removed, while variations in author names and institutional affiliations were standardized to avoid fragmentation in productivity and collaboration analyses. Keyword normalization was performed by merging synonymous or closely related terms, and records deemed irrelevant based on abstract screening were excluded. Data preprocessing is a critical step in bibliometric research, as inconsistencies in metadata can distort network structures and thematic interpretations (Aria & Cuccurullo, 2017; Kokol & Blažun Vošner, 2018). In cases where bibliographic information was incomplete, missing fields such as publication year or keywords were manually verified through DOI-based cross-checking in Scopus. Following this process, the refined dataset consisted of approximately 125 unique publications spanning diverse geographical contexts and methodological approaches, ensuring both representativeness and relevance of the analyzed corpus (Gaviria-Marin et al., 2019).

➢ *Analytical Tools and Techniques*

The bibliometric analysis was carried out using a complementary software framework consisting of Bibliometrix (implemented in RStudio) and VOSviewer. This combined approach allows for rigorous statistical analysis alongside advanced visualization of bibliometric networks (Aria & Cuccurullo, 2017; van Eck & Waltman, 2010). Bibliometrix was employed to conduct descriptive performance analysis, including assessments of annual publication output, citation dynamics, and the most influential authors, documents, and sources (Donthu et al., 2021; Adityawarman et al., 2025). It was also used to perform co-citation and bibliographic coupling analyses to explore intellectual linkages among publications and authors (Kessler, 1963; Small, 1973). In addition, three-field plots and thematic evolution analyses based on Multiple Correspondence Analysis (MCA) were generated to examine changes in research focus over time (Cobo et al., 2011). VOSviewer complemented these analyses by providing high-resolution visual representations of keyword co-occurrence networks, co-authorship structures, and citation relationships. Density and overlay visualizations were used to identify dominant research areas and to capture the temporal evolution of themes within the literature (Chen, 2006; van Eck & Waltman, 2014). Analytical thresholds, such as minimum keyword frequency or author productivity levels, were adjusted iteratively to balance the identification of influential contributors with emerging research clusters. The integration of multiple analytical tools follows established best practices in contemporary bibliometric research (Zhu et al., 2021; Guleria et al., 2022).

➢ *Limitations and Delimitations*

Although Scopus offers extensive international coverage, it does not fully capture gray literature, policy documents, or non-English publications, which may be relevant in certain regional or institutional settings (Archambault et al., 2009). Furthermore, citation-based indicators are inherently time-dependent, often favoring older publications while underrepresenting recently published but potentially impactful studies (Tahamtan et al., 2016; Waltman, 2016). The deliberate focus on English-language, peer-reviewed sources implies that localized technical reports or unpublished industry studies-particularly those produced by national oil companies or government agencies are excluded. Despite these constraints, the adopted methodology ensures analytical rigor, transparency, and cross-study comparability, making the findings suitable for international academic and policy-oriented discussions (Mingers & Leydesdorff, 2015; González-Alcaide et al., 2017).

IV. RESULTS AND DISCUSSION

➢ *Overview of the Bibliometric Dataset*

The bibliometric dataset analyzed in this study was retrieved from the Scopus database using a set of keywords related to oil and gas investment, petroleum project financing, and energy project finance. The final corpus consists of 118 publications published between 1953 and 2025, drawn from 92 academic sources. This dataset represents a broad temporal span that captures both early conceptual discussions and more recent research shaped by market volatility and energy transition considerations. The descriptive indicators summarized in Figure 2 provide an overview of the dataset characteristics, including publication volume, source diversity, authorship patterns, and citation performance. Collectively, these indicators suggest that research on oil and gas investment has developed gradually over several decades before gaining stronger academic momentum in the last fifteen years.

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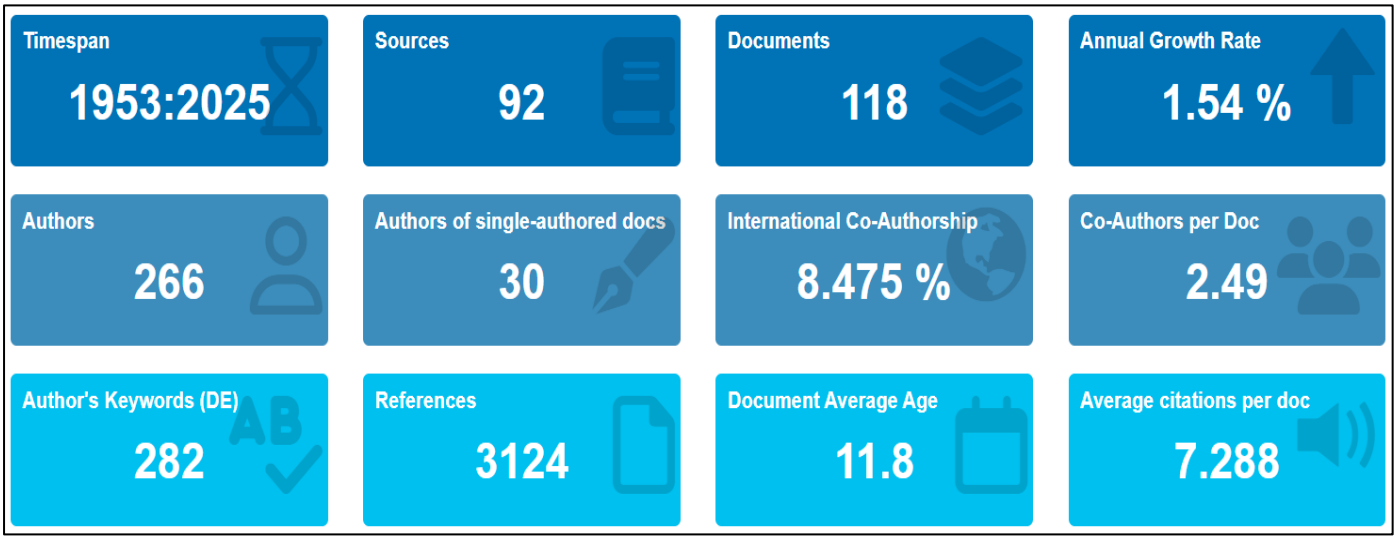

Fig 2 Main Bibliometric Information of Oil and Gas Investment Research (1953–2025).

➢ *Temporal Evolution of Publications and Citations*

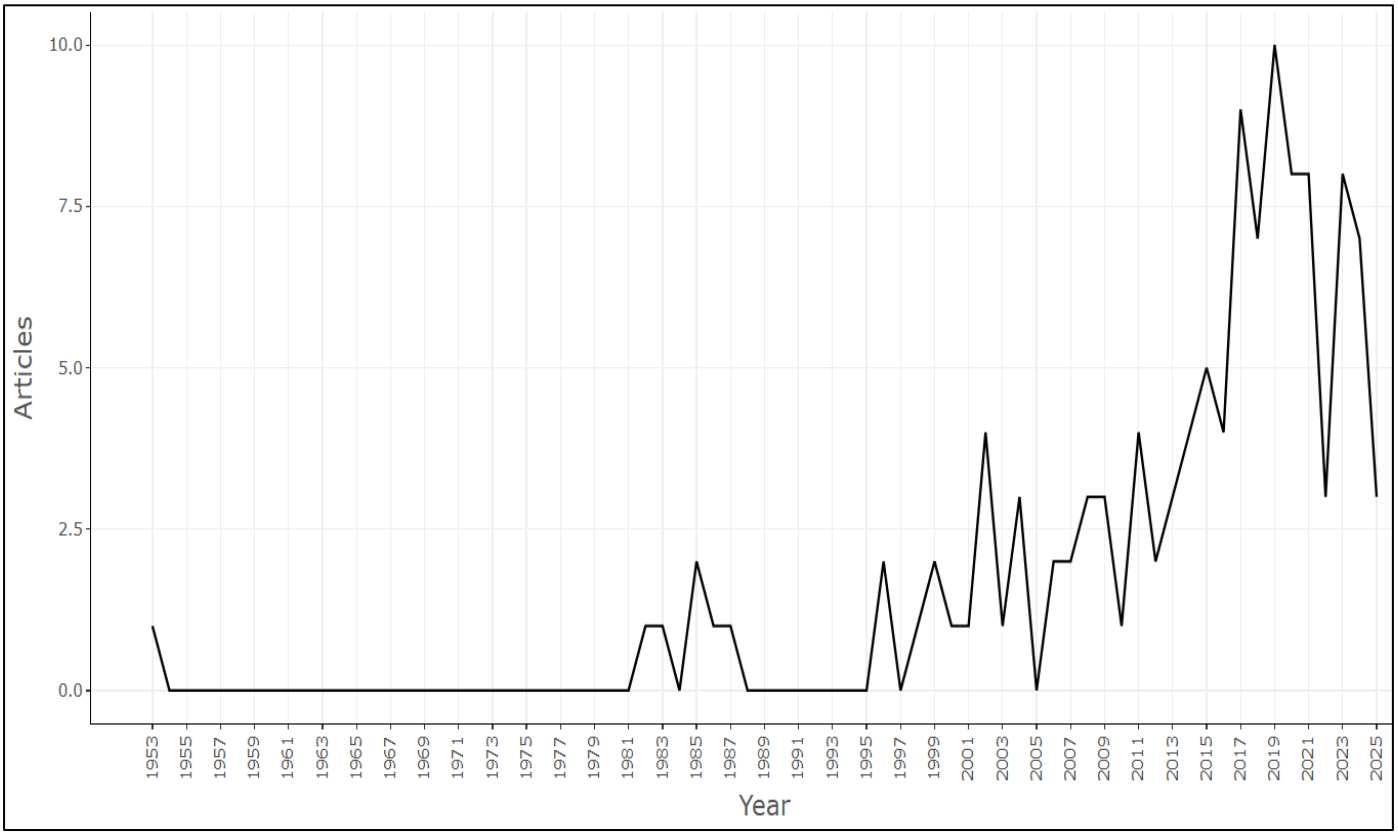

Fig 3 Annual Scientific Production.

The annual publication trend displayed in Figure 3 reveals a clear long-term growth trajectory in oil and gas investment research. Scholarly output remained minimal from the 1950s through the late 1970s, reflecting limited academic focus on investment-specific issues during the early development of the petroleum industry. A gradual increase becomes visible during the 1980s, coinciding with heightened awareness of oil price instability and capital risk following major energy crises. From the mid-1990s onward, publication activity stabilizes at a modest level, before accelerating sharply after 2010. This surge reflects expanding research attention toward project finance, investment decision-making, risk assessment, and uncertainty management in increasingly volatile energy markets. Although minor fluctuations and a slight decline are observed in the most recent years, the overall pattern indicates that oil and gas investment research has transitioned into a mature and policy-relevant field, particularly within the broader context of energy transition debates.

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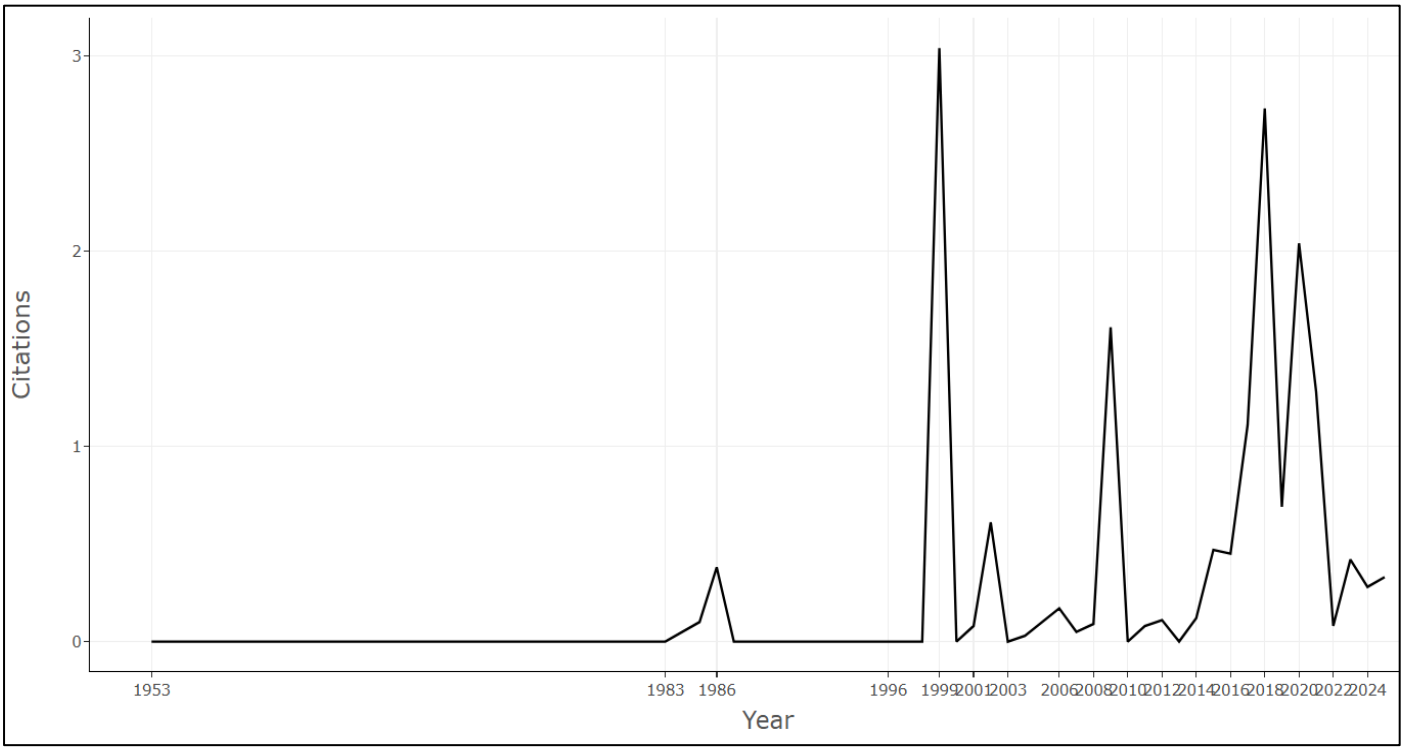

Fig 4 Average Citations Per Year.

Citation dynamics, illustrated in Figure 4, further support this interpretation. Prior to the 1980s, citation activity is largely absent, suggesting limited scholarly impact during the formative stage of the field. Isolated citation peaks appear from the late 1980s and intensify in the late 1990s, corresponding to the publication of seminal works. After 2000, citation frequency increases markedly, with repeated peaks in the late 2010s, indicating growing academic recognition of investment-focused studies addressing financial risk, uncertainty, and market behavior.

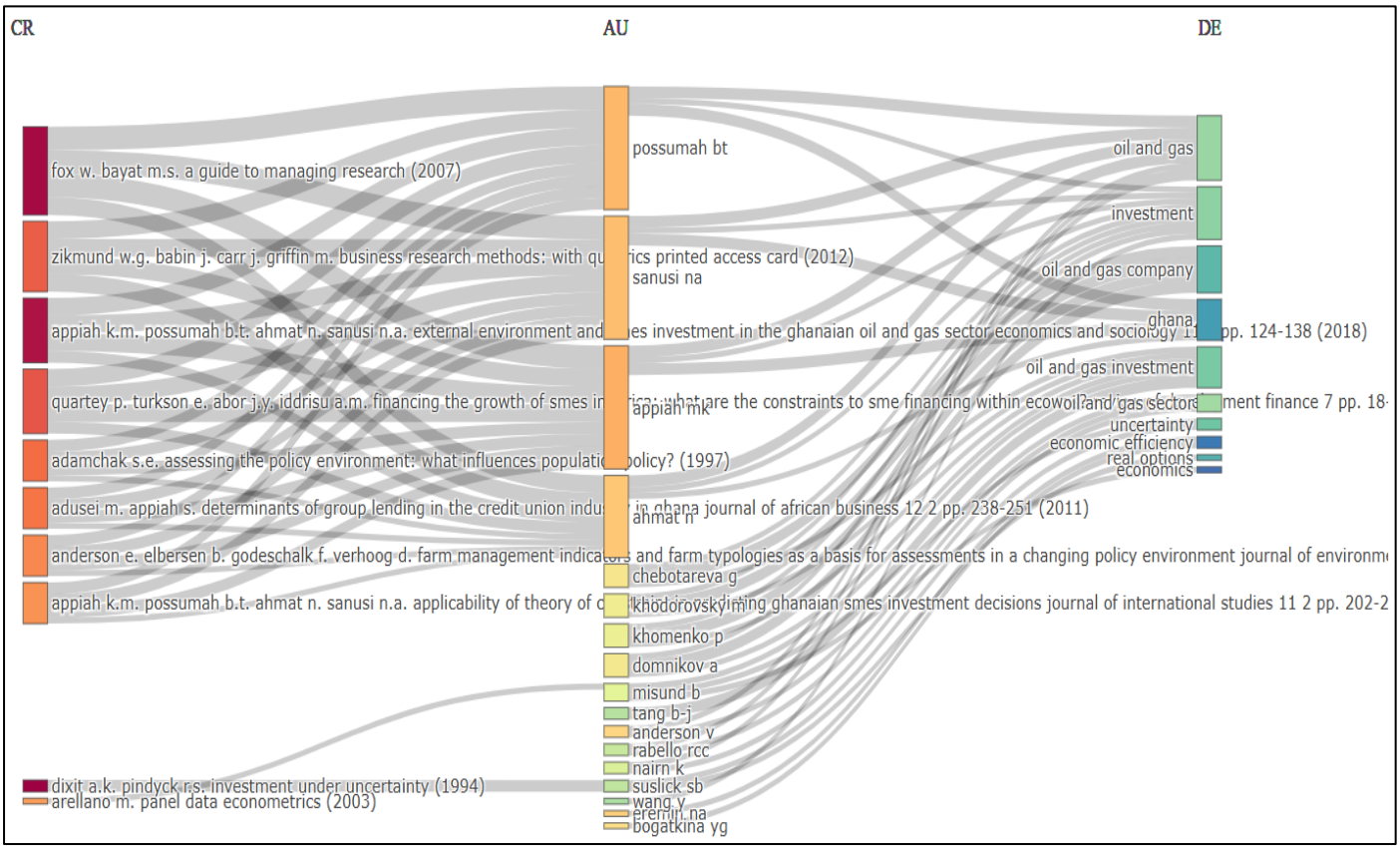

Fig 5 Intellectual Structure and Knowledge Linkages.

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The three-field bibliometric visualization presented in Figure 5 links cited references, authors, and author keywords, offering insight into the intellectual structure of oil and gas investment research. The results reveal that a relatively small group of highly cited references forms the knowledge foundation of the field, which is closely connected to a limited number of recurring authors. These authors, in turn, are strongly associated with a set of dominant keywords, including oil and gas, investment, and oil and gas companies. This structure indicates a concentrated knowledge base in which influential studies and leading contributors play a central role in shaping thematic development. At the same time, the limited dispersion of influential references suggests that the field relies heavily on a core body of literature rather than a highly diversified set of theoretical foundations.

➢ *Source Distribution and Journal Concentration*

Analysis of publication outlets, as shown in Figure 6, demonstrates that oil and gas investment research is distributed across a wide range of journals and conference proceedings. A small number of sources account for the highest publication output, with Neftyanoe Khozyaystvo – Oil Industry and the International Journal of Energy Economics and Policy emerging as the most productive outlets. Several additional journals contribute a moderate number of articles, while the majority of sources publish only one or two documents.

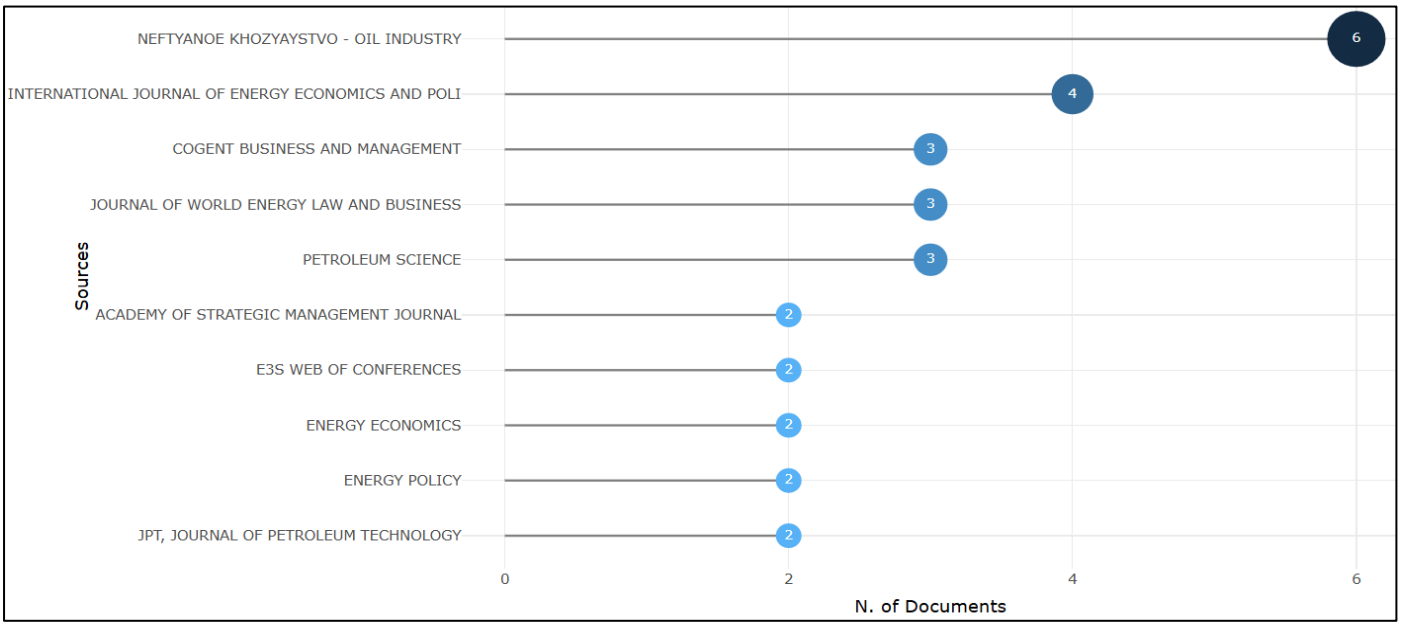

Fig 6 Source Distribution and Journal Concentration.

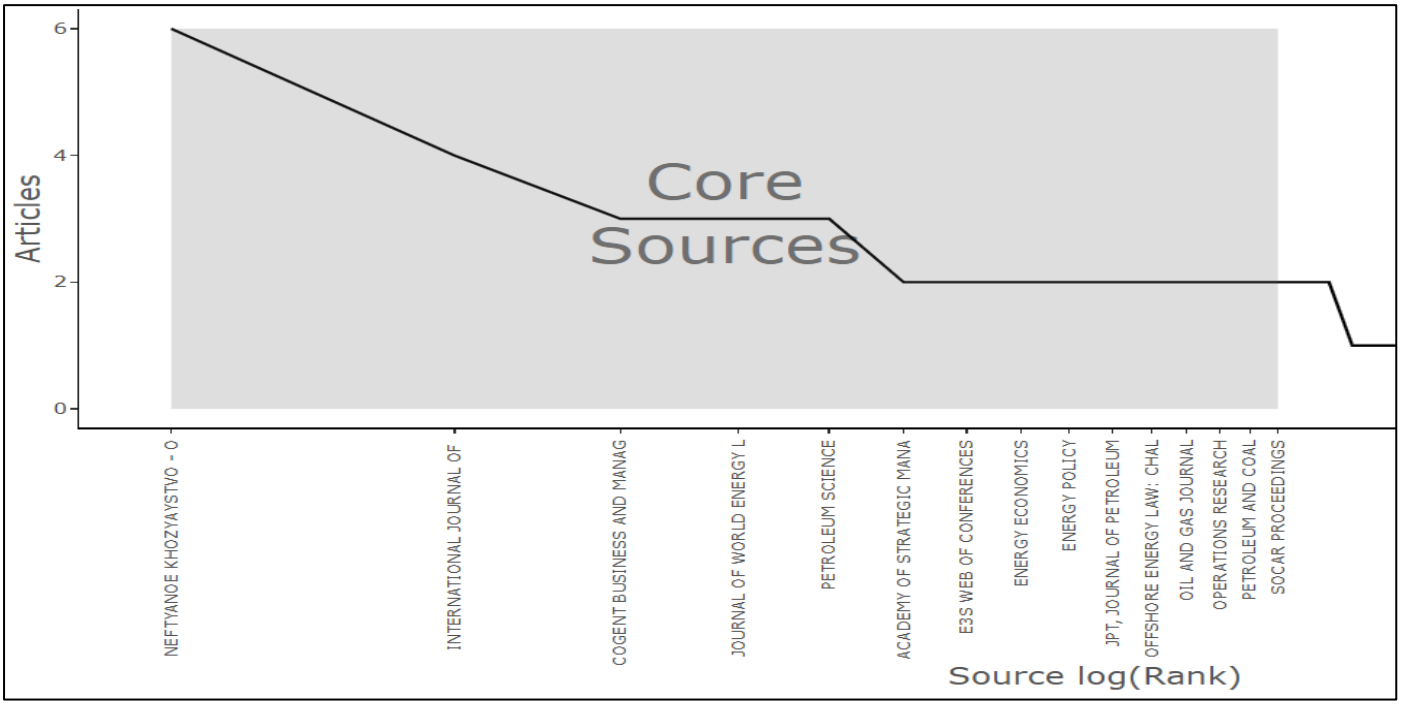

Fig 7 Core Sources by Bradford's Law.

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This distribution pattern is further confirmed by Bradford's Law of Scattering, illustrated in Figure 7. A limited set of core journals constitutes the primary dissemination channels for oil and gas investment research, while a large number of peripheral sources contribute sporadically. This finding suggests that although the field lacks a single dominant journal, scholarly communication is nonetheless anchored in a relatively stable group of key outlets.

➢ *Authorship, Institutional, and Country-Level Contributions*

Authorship analysis presented in Figure 8 indicates that research productivity is concentrated among a small group of authors. A limited number of scholars have produced multiple publications, while the majority of contributors appear only once or twice. This pattern is consistent with emerging and specialized research fields, where a core group of researchers drives thematic continuity.

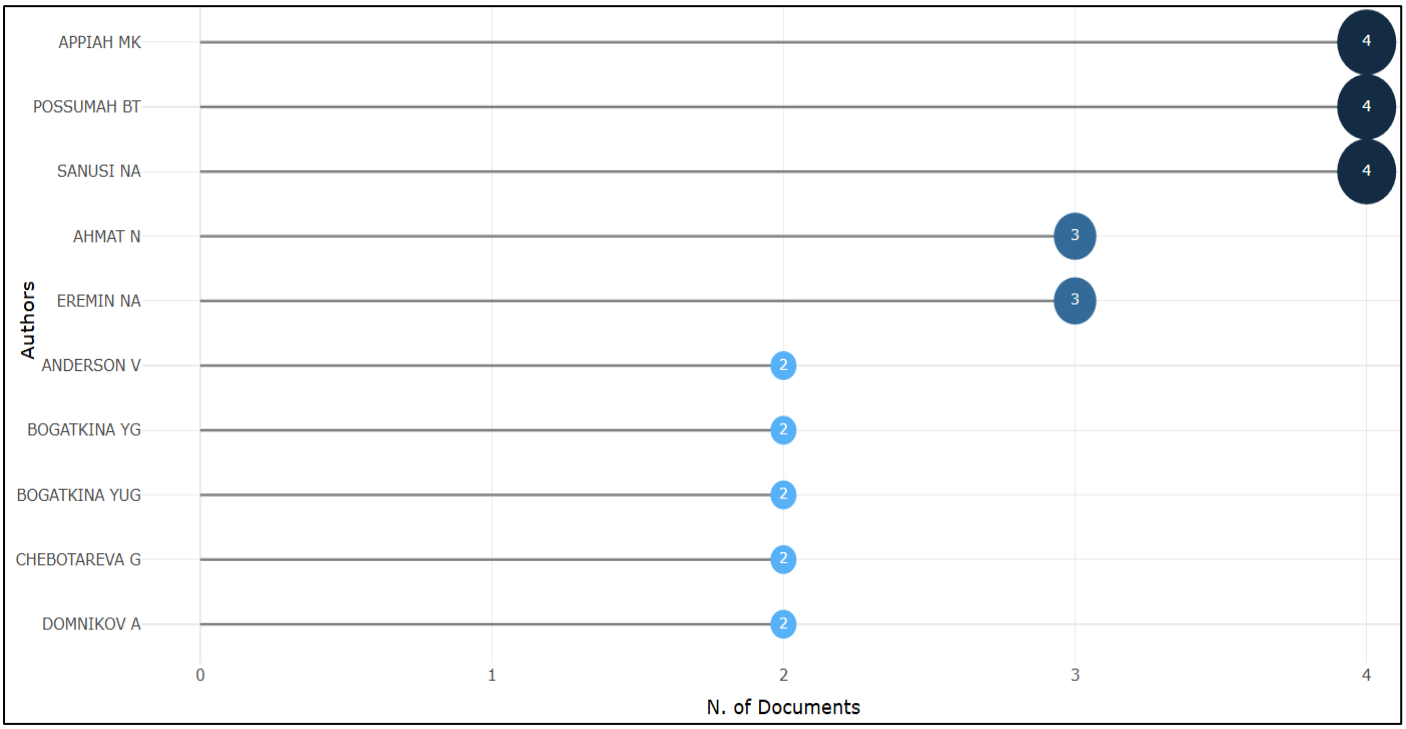

Fig 8 Most Relevant Authors.

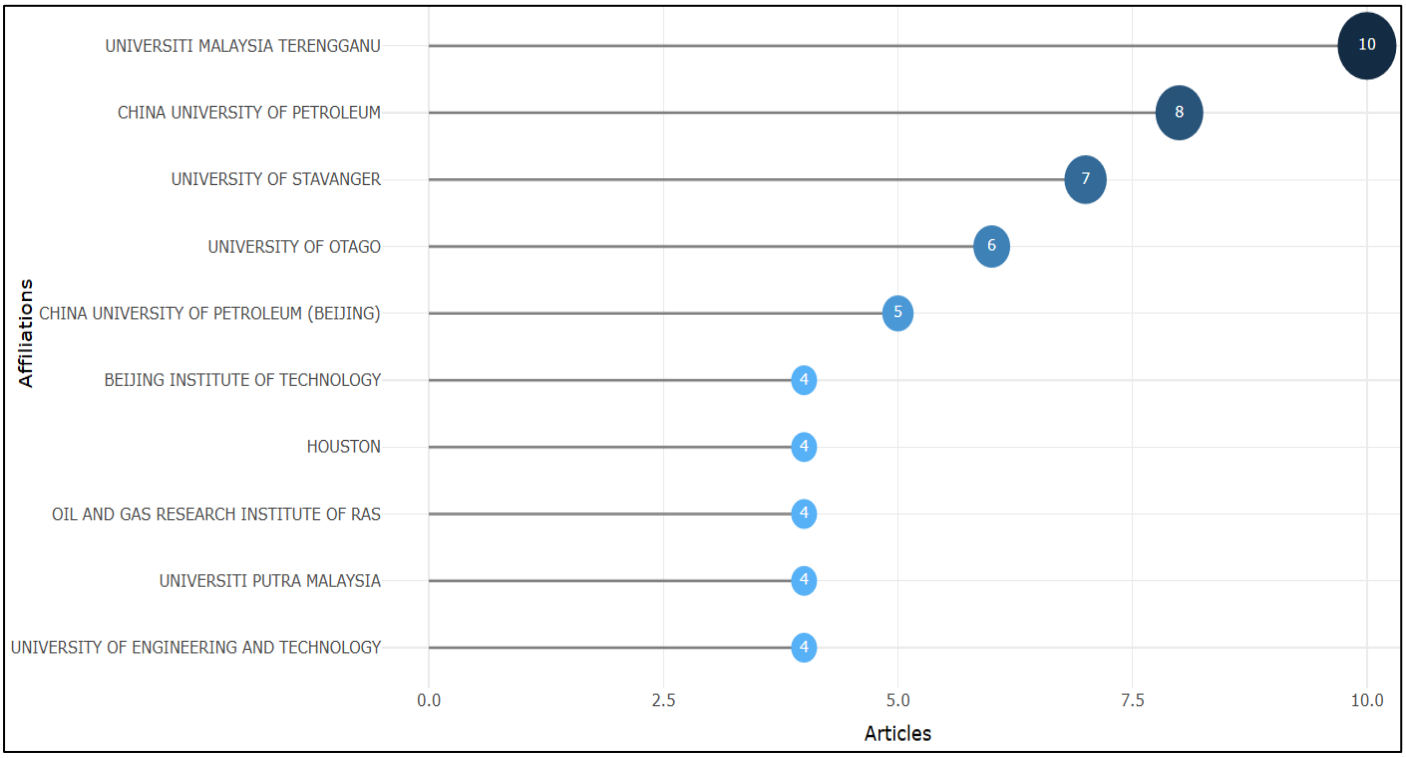

Fig 9 Most Relevant Affiliations.

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Institutional analysis, shown in Figure 9, reveals a similar concentration effect. Universities and research institutions with strong specialization in petroleum, energy, and applied economics dominate publication output. Institutions such as Universiti Malaysia Terengganu, China University of Petroleum, and the University of Stavanger emerge as leading contributors, highlighting the role of specialized academic centers in advancing oil and gas investment research.

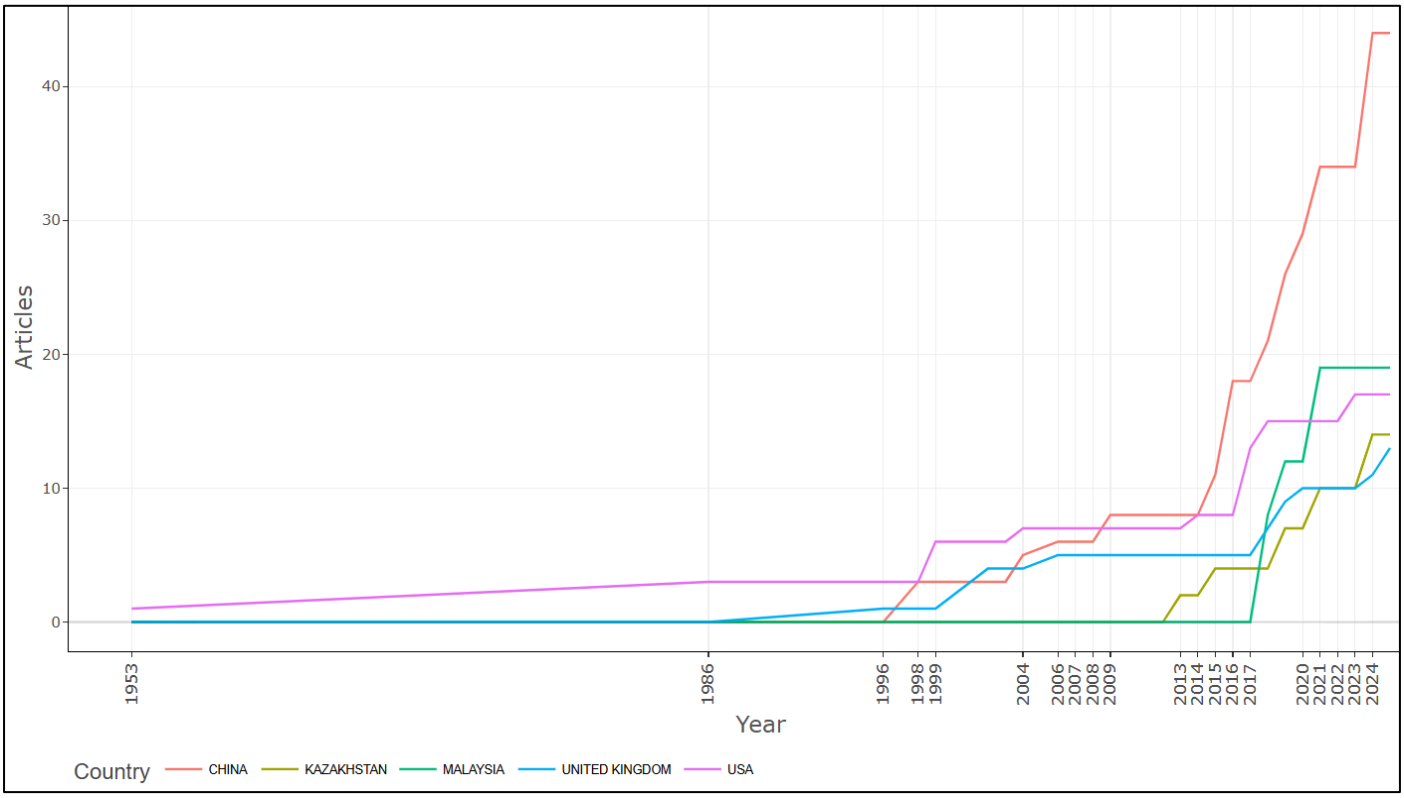

Fig 10 Countries' Production Over Time.

Country-level trends illustrated in Figure 10 show a pronounced shift in research production over time. While the United States exhibits steady long-term involvement, China demonstrates rapid growth after 2010 and becomes the leading contributor in recent years. Other countries, including Malaysia, the United Kingdom, and Kazakhstan, show increasing participation, reflecting the growing role of emerging and resource-rich economies in shaping the research agenda.

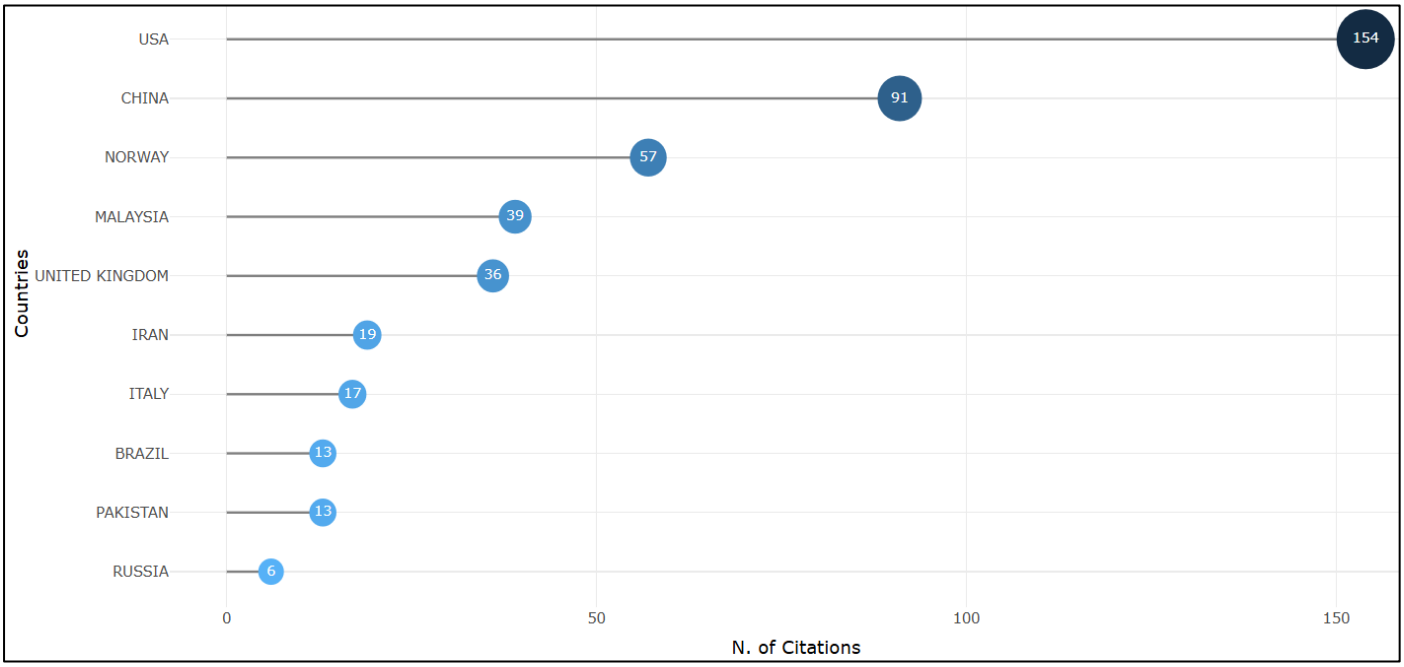

Fig 11 Most Cited Countries.

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Citation-based country influence, presented in Figure 11, remains concentrated in a small number of countries. The United States leads in total citations, followed by China and Norway, indicating that scholarly impact is closely linked to established research capacity and mature oil and gas sectors.

➢ *Influential Documents*

Citation analysis at the document level, shown in Figure 12, highlights a small number of highly influential studies that have shaped the field. Seminal works published in journals such as Operations Research, Energy Economics, and Energy Policy dominate global citation counts, underscoring their foundational role in advancing investment theory and decision-making frameworks in the oil and gas sector. This concentration suggests that theoretical and methodological innovations introduced by a limited set of studies continue to guide subsequent research.

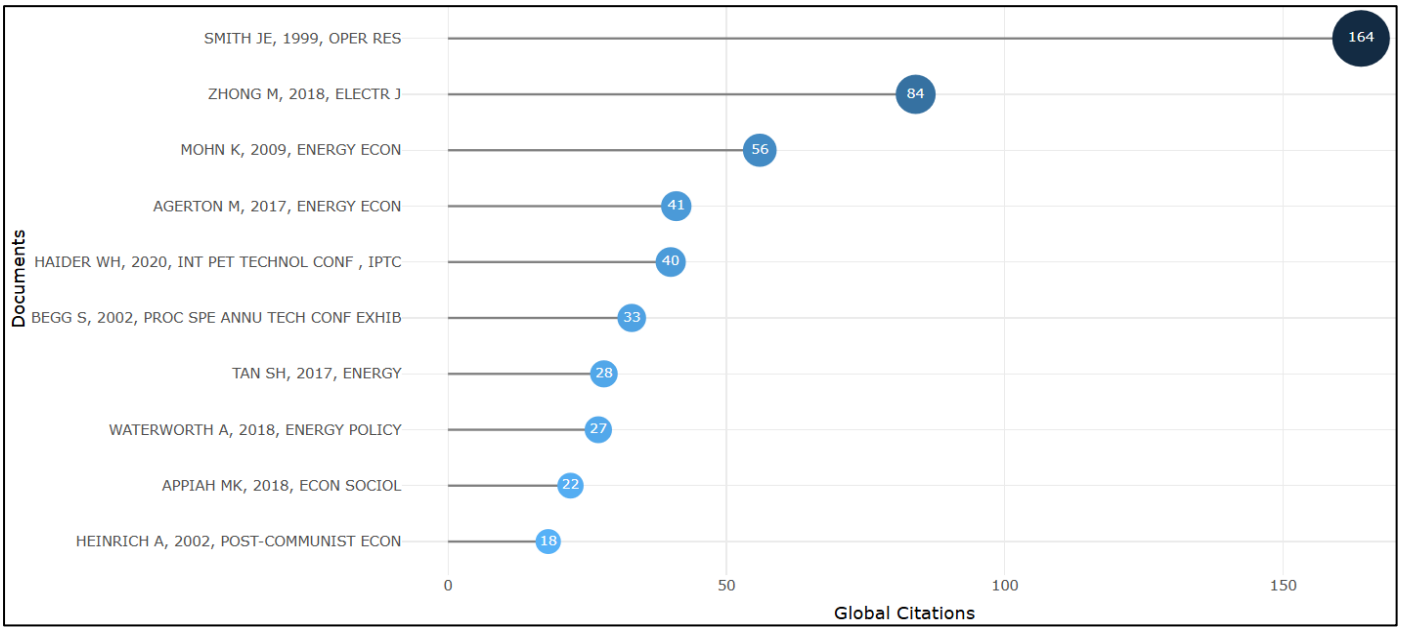

Fig 12 Most Global Cited Documents.

➢ *Keyword Analysis and Thematic Emphasis*

The keyword word cloud in Figure 13 reflects the thematic core of oil and gas investment research. Frequently occurring terms such as investments, gas industry, petroleum industry, and risk assessment indicate a strong focus on capital allocation and risk-related decision-making. Supporting keywords, including economics, uncertainty analysis, and decision making, further emphasize the analytical orientation of the field toward financial evaluation and economic impact assessment.

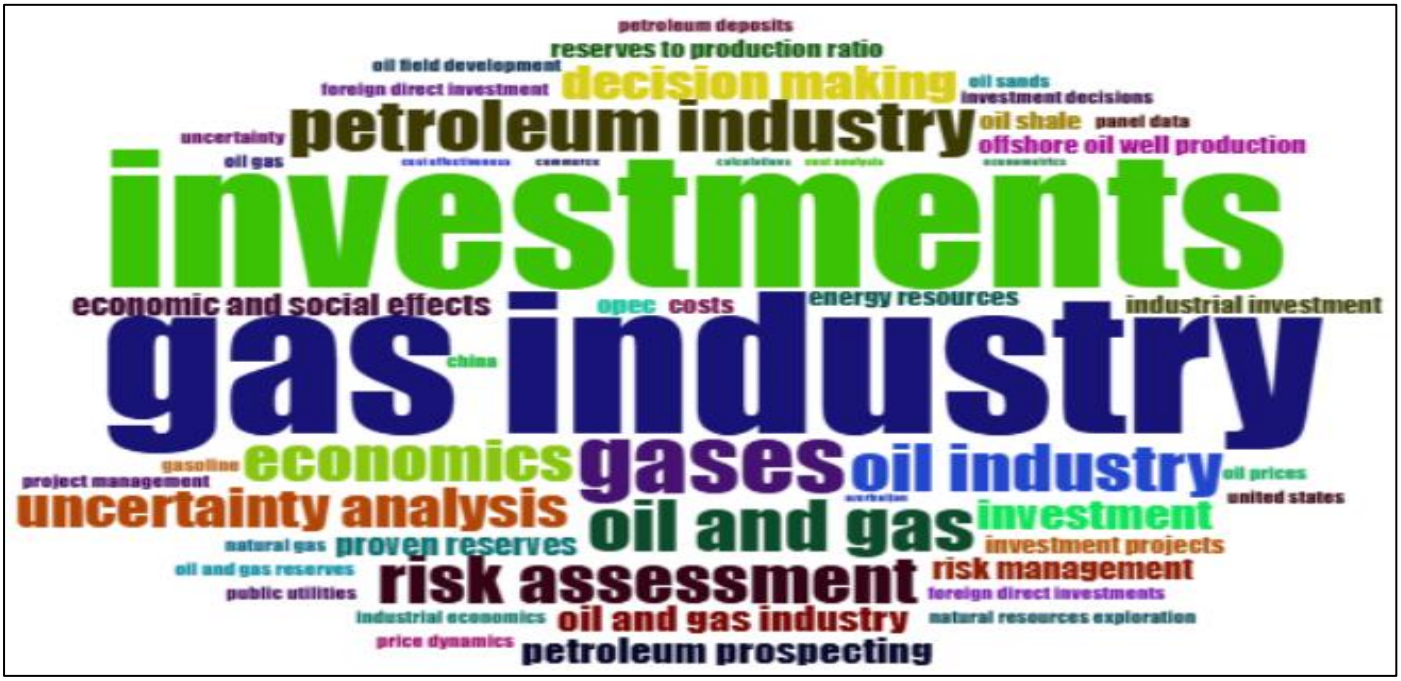

Fig 13Word Cloud.

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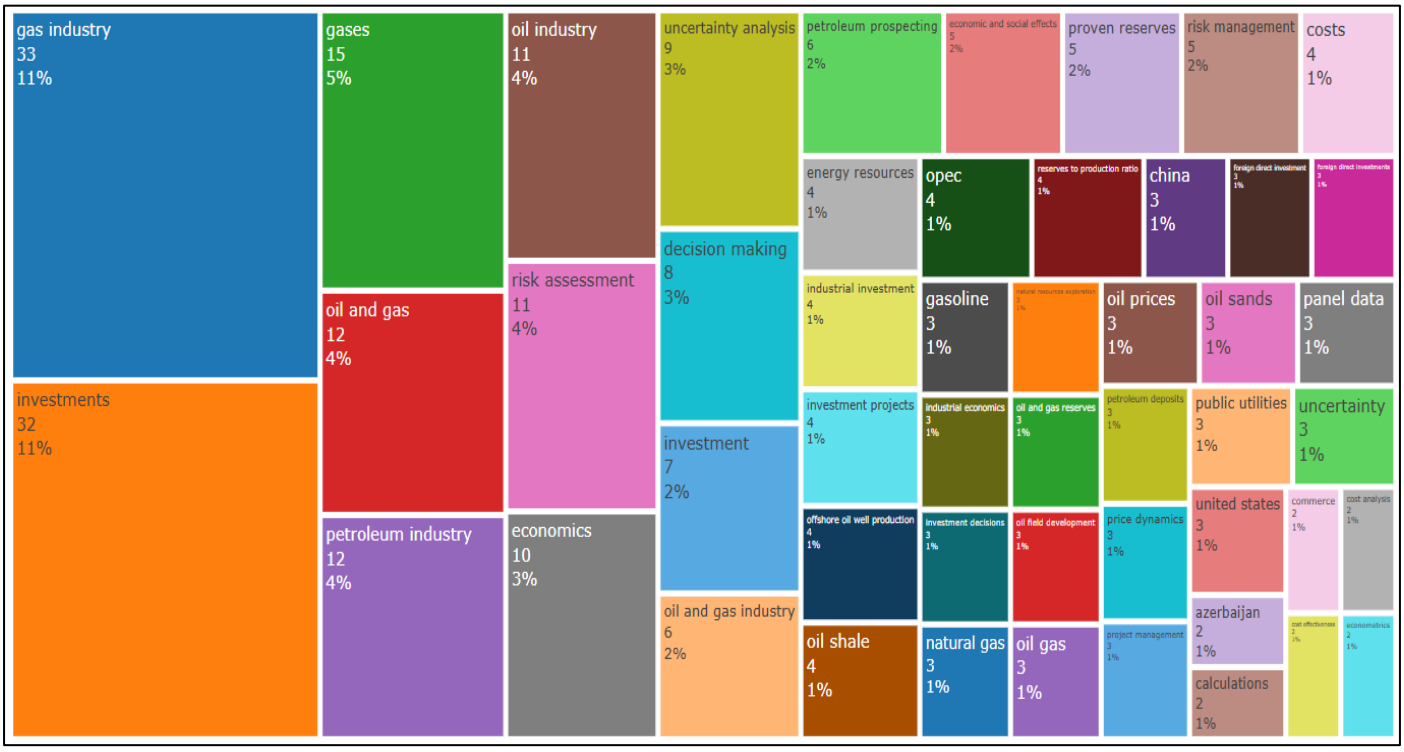

Fig 14 Treemap.

The treemap visualization in Figure 14 provides additional detail by illustrating the relative prominence of author keywords. Investment-related themes dominate the literature, while secondary topics such as oil prices, natural gas, and uncertainty analysis occupy smaller but meaningful positions, suggesting a layered thematic structure.

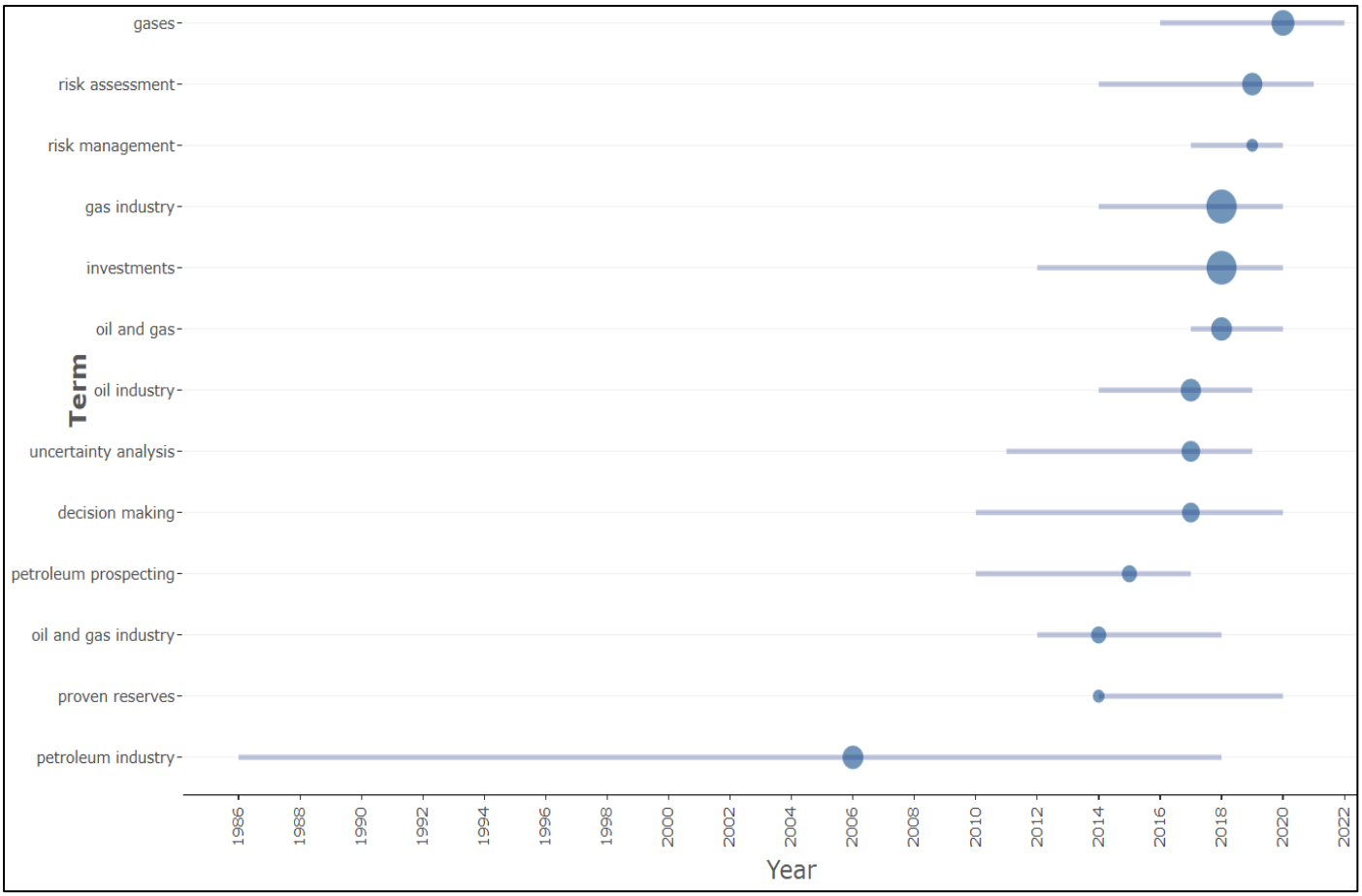

Fig 15 Trend Topics.

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Temporal analysis of keywords, shown in Figure 15, reveals a clear evolution in research focus. Early studies concentrate on industry-level and reserve-based topics, whereas more recent research increasingly emphasizes investment behavior, risk management, and strategic decision-making. This shift reflects the growing complexity of investment environments and the heightened importance of uncertainty in modern oil and gas projects.

➢ *Network and Factorial Analyses*

The keyword co-occurrence network displayed in Figure 16 illustrates the conceptual relationships within the literature. Central nodes representing investment-related terms are strongly connected to risk, uncertainty, policy, and economic themes, confirming the integrative nature of contemporary research. The temporal overlay further indicates a gradual incorporation of policy and sustainability considerations into the investment discourse.

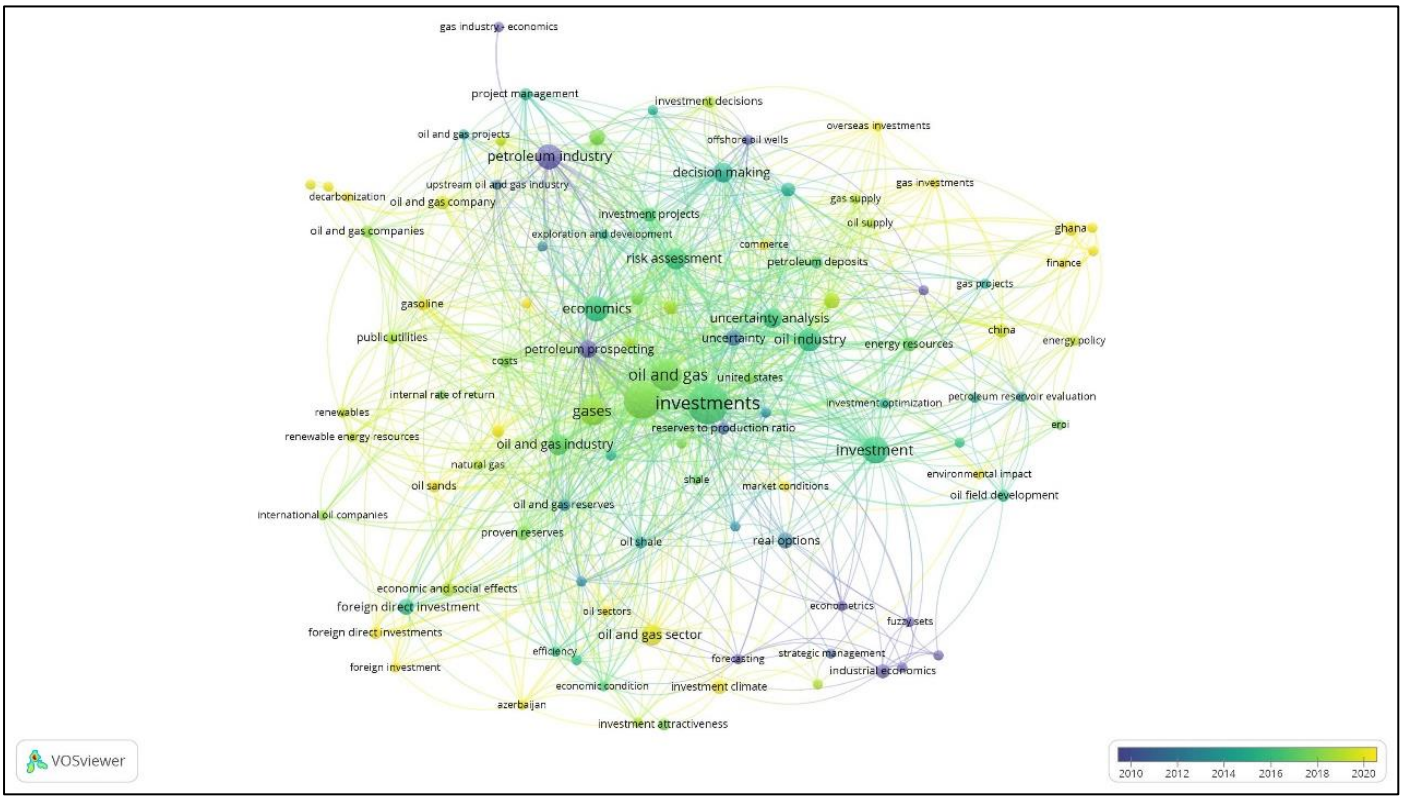

Fig 16 Keyword Co-occurrence Network and Thematic Evolution in Oil and Gas Investment Research.

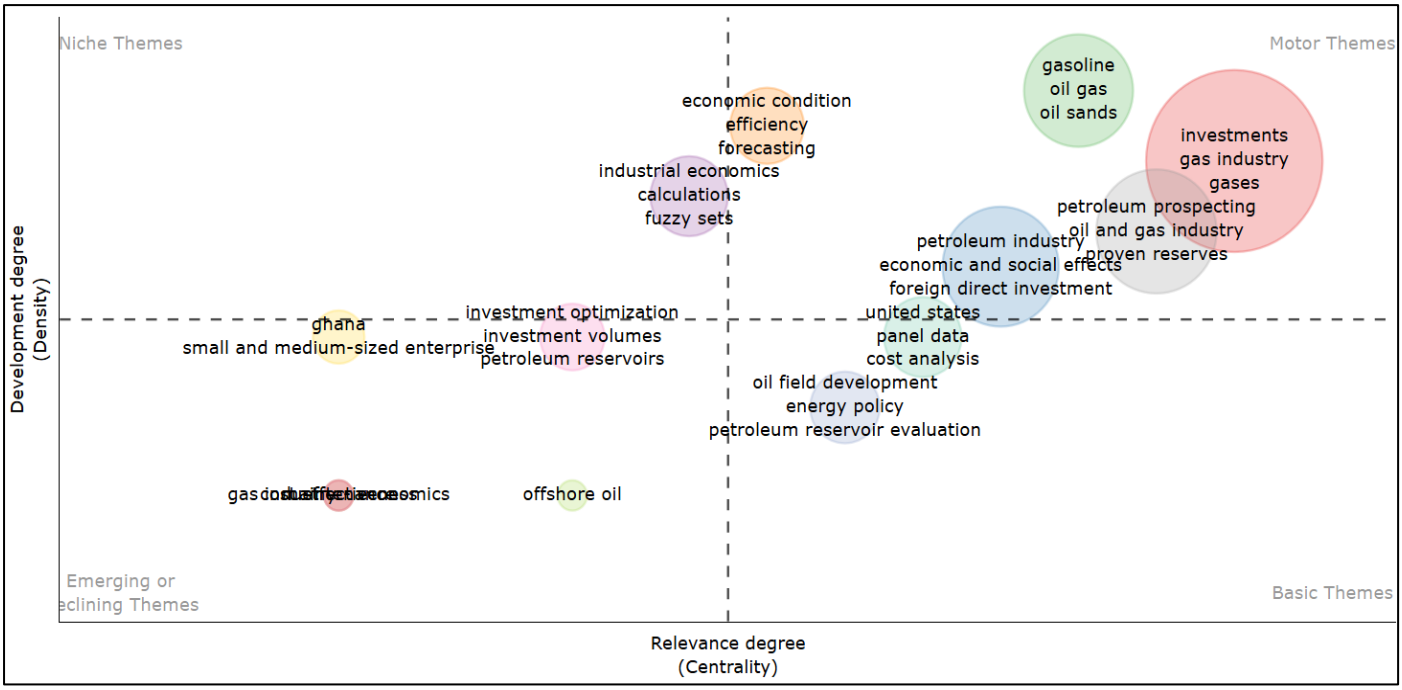

Fig 17 Thematic Map.

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The thematic map in Figure 17 classifies research topics according to their relevance and level of development. Investment and gas-related themes emerge as motor themes, while foundational topics such as petroleum industry structure and foreign direct investment function as basic themes. Niche and emerging themes remain less central, highlighting opportunities for future thematic integration.

➢ *Factorial Approach*

Factorial analysis using Multiple Correspondence Analysis (Figure 18) and hierarchical clustering (Figure 19) further confirms the intellectual structure of the field. Investment-oriented keywords form the dominant conceptual cluster, while policy, uncertainty, and industrial economics terms act as secondary or bridging elements. Finally, the collaboration network shown in Figure 20 reveals fragmented co-authorship patterns, with several small research clusters and limited cross-group collaboration, indicating potential for stronger international and interdisciplinary cooperation.

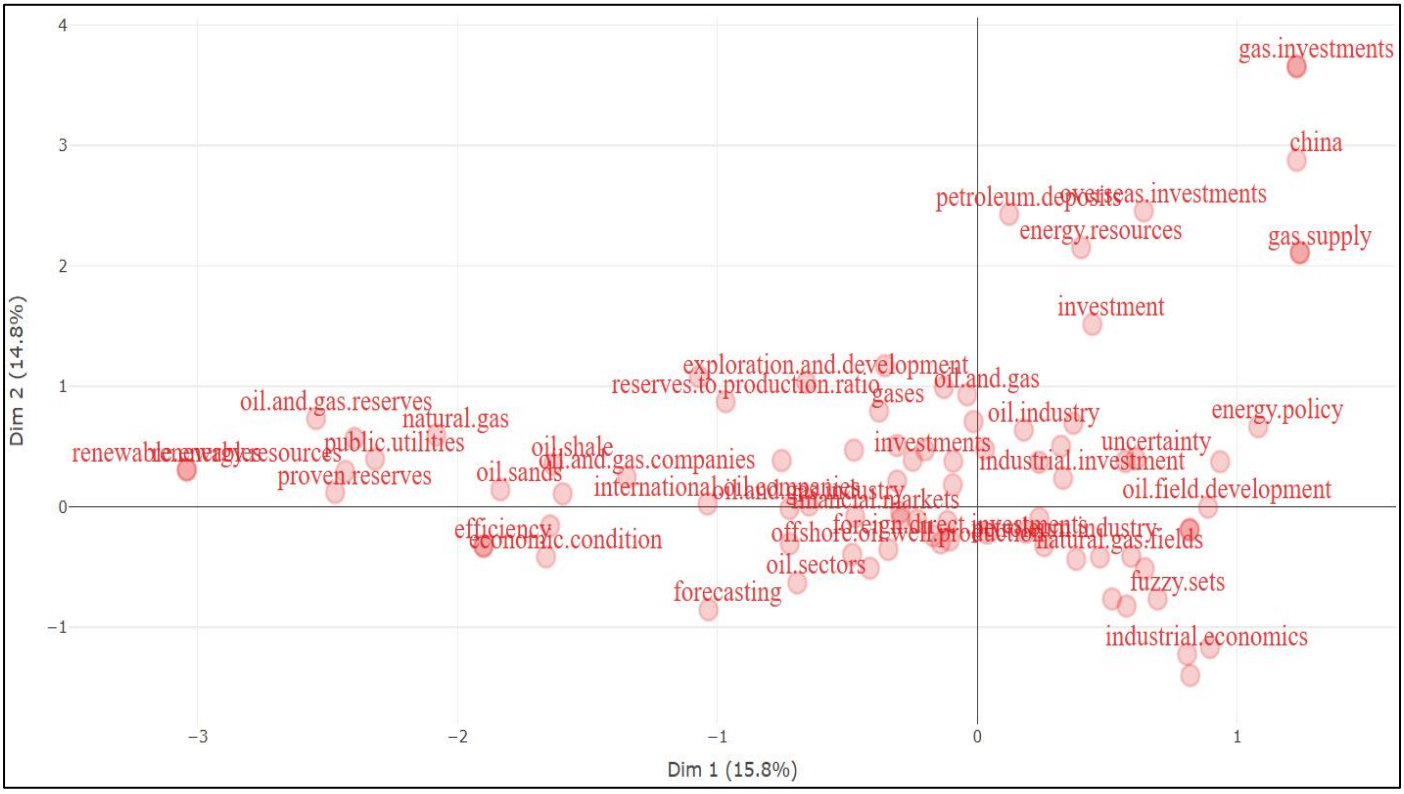

Fig 18 Word Map.

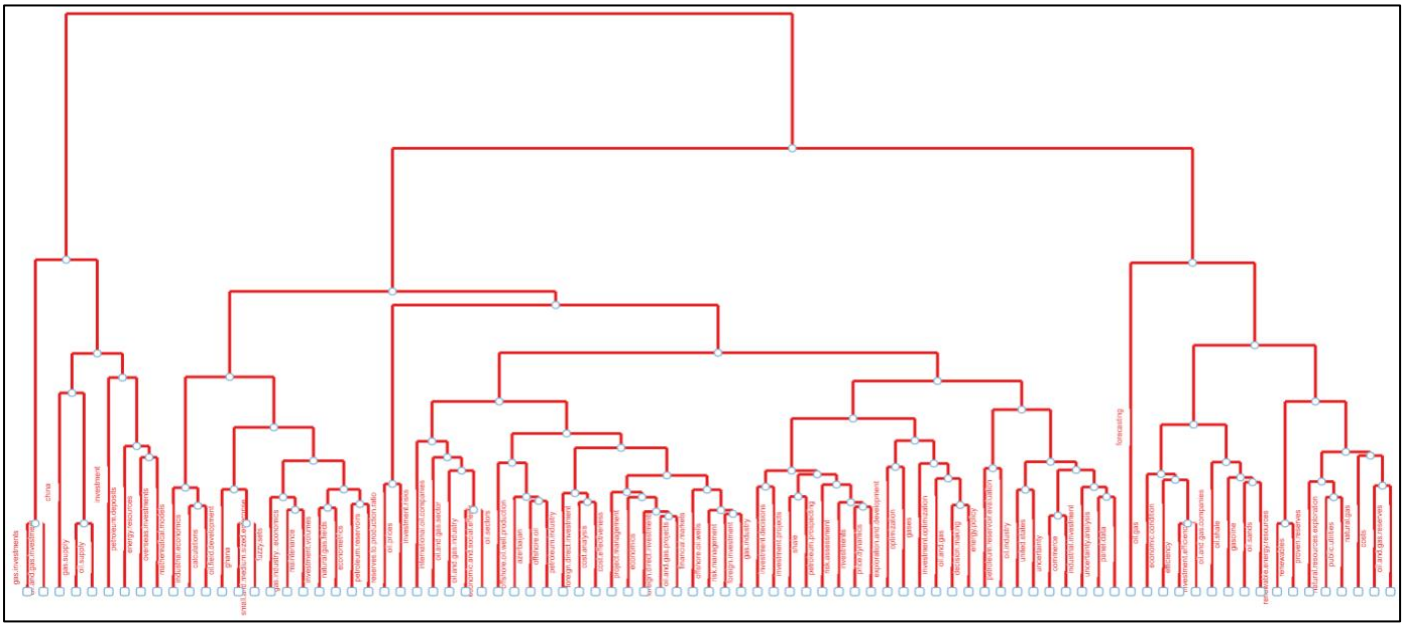
Fig 19 Topic Dendrogram.

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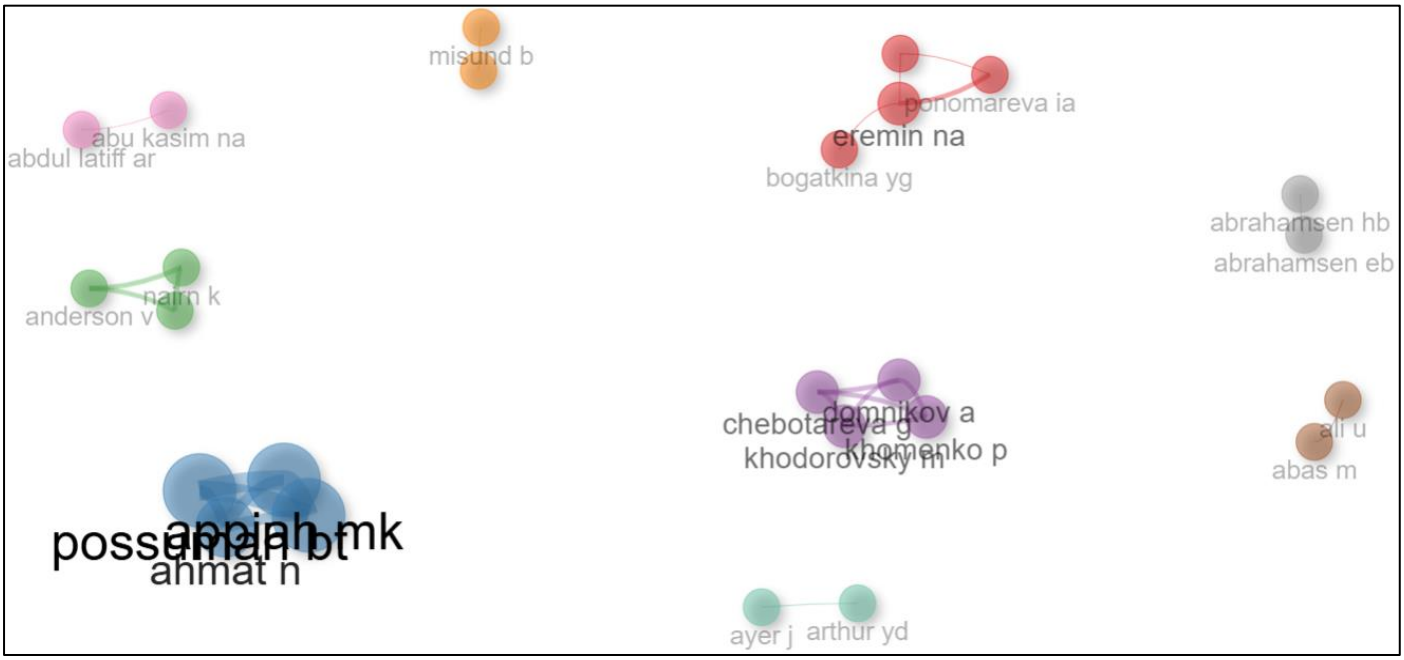

Fig 20 Collaboration network.

Table 1 Synthesizes the Research Findings

No	Aspect	Synthesized Findings
1	Research Analysis & Interpretation	The body of literature demonstrates a clear shift from early technical discussions centered on reserves and production toward more investment-driven, risk-sensitive, and decision-oriented analytical frameworks. Although the field has reached a relatively mature stage with concentration in core journals and author networks, scholarly contributions remain dispersed and international collaboration is still limited.
2	Research Trends	Key developments include: (1) a growing emphasis on investment risk and uncertainty assessment; (2) increasing scholarly attention to gas sector investments; (3) stronger integration of economic analysis with regulatory and policy dimensions; and (4) expanded use of decision-support and project management perspectives in investment studies.
3	Research Gaps	Several gaps persist, including: (1) limited application of dynamic macroeconomic and system-wide modeling approaches; (2) insufficient linkage between oil and gas investment analysis and sovereign or petroleum fund mechanisms; (3) continued dominance of static or partial risk evaluation methods; (4) inadequate incorporation of energy transition and ESG-related risks; and (5) a lack of comprehensive cross-country comparative investigations.
4	Future Research Directions	Future studies should prioritize: (1) the development of dynamic CGE and DSGE-based frameworks and integrated energy–economy models; (2) incorporation of petroleum fund governance and fiscal sustainability considerations; (3) quantitative integration of ESG and energy transition risks into investment analysis; (4) expansion of international and comparative research collaboration; and (5) methodological integration of optimization techniques, scenario analysis, and uncertainty modeling.

V. CONCLUSIONS AND RECOMMENDATION

➢ *Conclusions*

This study presents a systematic bibliometric assessment of scholarly research on oil and gas investment projects using Scopus-indexed publications spanning the period from 1953 to 2025. The results reveal a clear transformation in research focus, evolving from early emphasis on reserve evaluation and basic economic assessment toward more comprehensive analyses centered on investment behavior, risk exposure, and strategic decision-making. The marked increase in publication volume and citation activity after 2010 reflects heightened academic interest driven by oil price volatility, rising capital intensity, regulatory complexity, and structural shifts in global energy systems. The findings further indicate that research output is concentrated within a relatively small set of core journals, authors, and institutions, suggesting the presence of an established intellectual foundation in the field. Investment-related themes-particularly those associated with the gas industry form the central research core and are closely connected to studies on risk assessment, uncertainty management, economic evaluation, and investment decision processes. Nevertheless, collaboration across countries and institutions remains limited, pointing to fragmentation in knowledge production. Despite its maturity, the field exhibits notable methodological limitations. Most existing studies rely on static or project-level analytical approaches, while advanced dynamic and system-oriented models are still rarely applied. Similarly, sustainability considerations and energy

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transition dynamics are not yet fully integrated into mainstream investment analysis. These patterns indicate that oil and gas investment research is at a transitional stage, moving toward more holistic, policy-relevant, and forward-looking analytical frameworks.

➢ *Recommendation*

Based on the outcomes of this bibliometric analysis, several recommendations are proposed. First, future research should advance beyond static investment appraisal techniques by adopting dynamic and stochastic modeling approaches, such as CGE and DSGE frameworks, to better capture macroeconomic interactions, long-term uncertainty, and fiscal sustainability implications of oil and gas investments. Second, stronger conceptual and empirical linkages between oil and gas investment analysis and public financial instruments including sovereign wealth funds and petroleum funds are needed, particularly in resource-dependent economies.

Third, sustainability dimensions, especially ESG considerations and energy transition risks, should be explicitly and quantitatively incorporated into investment models rather than treated as supplementary factors. This integration is essential for evaluating long-term investment resilience under decarbonization pressures and evolving regulatory environments. Fourth, enhanced international and cross-country collaborative research is recommended to improve comparability, generalizability, and knowledge exchange across different institutional settings. Finally, scholars are encouraged to combine bibliometric insights with empirical analysis, optimization methods, and scenario-based modeling to strengthen methodological rigor and to develop more robust decision-support tools for oil and gas investment planning in an increasingly uncertain global energy landscape.

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