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What have we Learned from Firm Efficiency Research for the Past 35 Years? A Bibliometric Analysis

Abd Hadi Mustaffa[1], Nur Zahidah Bahrudin*[2], Zahariah Sahudin[3], Hasni Abdullah[4], Muhammad Ridzuan Abdul Aziz[5]
[1]Accounting Research Institute, Universiti Teknologi MARA, Selangor, Malaysia
[2,3,4,5] Faculty of Business and Management, Universiti Teknologi MARA, Selangor, Malaysia
abdhadi.phd@gmail.com, *zahidah1002@uitm.edu.my, zahariah128@uitm.edu.my, hasniabd@uitm.edu.my, ridzuandba@uitm.edu.my

Abstract: The increasing publication and citation performances of Firm Efficiency research for the past 35 years have attracted scholars to further embark on this area. Hence, the main objective of this study is to explore what scholars have learned from Firm Efficiency research over the past 35 years. This study uses bibliometric analysis to analyze top productive countries, top 10 journals, top 10 prominent authors, top 20 cited articles, and emerging themes. Selected findings indicated that the United States, China and Taiwan are the top three most productive countries in Firm Efficiency research. In addition, five emerging themes were highlighted in Firm Efficiency research for the past 35 years. The five themes were: 1) Stochastic Frontier Analysis in measuring firm productivity and size, 2) Bootstrapping DEA and SFA in measuring firm efficiency, 3) Corporate Governance and Technical Efficiency, 4) DEA as benchmarking in Firm Efficiency, and 5) Capital Structure and Ownership Structure. This study provides three contributions – 1) encourage scholars to observe the trends in publication and citation performances. 2) Allow scholars and authors to collaborate with an expert in Firm Efficiency research in the future, and 3) inspire the authors to look at the potential research gap and future directions in Firm Efficiency research.

Keywords: *Firm Efficiency, Data Envelopment Analysis, Bibliometrics, Network Analysis, Research Trend*

1. Introduction and Background

Edgeworth (1881) introduced the formulation of efficiency concepts applicable to all companies. It was continued by Pareto (1927), which Shephard (1953) documented in the book. There are numerous definitions of efficiency notions among academics. In economics, efficiency is the utilization of existing resources in a manner consistent with the company's goals while also taking into account the relevance of those resources to the company's customers (Peterson et al., 2003). The concept of efficiency as a broad performance measure for all types of organizations was originally established in the early writings of Edgeworth (1881) and Pareto (1927), and its practical application was documented in Shephard's book (1953). In economics, efficiency is defined as the highest potential ratio between the output and input of the product development process. It demonstrates the ideal allocation of available resources that would permit realizing the maximum potential (Cvilikas & Jurkonyte-Dumbliauskiene, 2016). Both efficiency and effectiveness are used to describe the performance of an entity. Still, according to Jaouadi & Zorgui (2014), efficiency summarizes the concept of producing in the best way, which means that efficiency is centered on using minimum inputs to produce the best output or the optimized use of resources to generate the best products at the lowest costs.

In management, efficiency is the study of the optimal utilization of an organization's internal elements. On the other hand, the effectiveness idea summarizes the yield of elements and the achievement of a goal without considering the optimal use of methods and resources. On the other hand, Lopez (2005) states that efficiency contributes to the success of implemented macroeconomic policies, which generate sustainable development, economic growth, and social welfare. McKinley & Banaian (2005) state the same thing, defining efficiency as the minimization of costs and maximization of profits. Efficiency is a term commonly used to measure the outcome of outputs from selected inputs. The use of inputs is expected to produce maximum outputs or at least optimize certain inputs (Aigner & Chu, 1968). Firms commonly use this measurement in managing their operating activities to ensure they can reduce the risk and expenses involved. Firms seek to improve their operations, value the shareholders, and be competitive in the market (Jones & Ville, 1996). Whose can compete in the market and sustain long-term with strong management internal and external sources will be the winner in the particular industry.

Hence, the firm must sustain and continuously demonstrate good performance and comprehend environmental changes (Epstein & Roy, 2001). Specifically, environmental change could be the main focus of scholars and practitioners in determining the efficiency or the concept of performance. In this regard, studies on a firm's efficiency performance are continuously emerging, followed by the current economic and environmental atmosphere. The firm efficiency research is broad in context because Firm Efficiency can fall into finance and other non-finance-related areas. There were several bibliometric analyses on efficiencies, such as Innovation Efficiency (Zeng et al., 2021) and Islamic Banking Efficiency (Ikra et al., 2021). However, Firms' Efficiency in Finance is still less attentive, and hence the authors fulfill the opportunity to conduct the bibliometric analysis on Firm Efficiency. The increasing trend in Firm Efficiency research puts light on the development of the literature with the following research questions:
RQ 1 – What are the publication and citation performances concerning Firm Efficiency research?
RQ 2 – What are the top productive countries affiliated with Firm Efficiency research?
RQ 3 – Which top 10 journals are the most influential with high citation impact in Firm Efficiency research?
RQ 4 – Who are the top 10 prominent authors in Firm Efficiency research?
RQ 5 – What are the top 20 cited articles on Firm Efficiency research?
RQ 6 – What are the emerging themes in Firm Efficiency research?

The presented findings in the later section will provide three contributions. First, the presented findings will encourage scholars to observe the trends in publication and citation performances. Second, it will allow scholars and authors to collaborate with an expert in Firm Efficiency research in the future. Third, the emerging themes will inspire the authors to look at the potential research gap and future directions in Firm Efficiency research. The paper is structured as follows. The second section explains the bibliometric steps and analysis used to run bibliometric results. Then, the third section presents and explains the descriptive findings of firm efficiency research. The fourth section discussed the emerging themes in Firm Efficiency research. Next, the fifth section provides the direction for future scholars to embark on Firm Efficiency research. The sixth and final sections are concluding remarks.

2. Method

The bibliometric analysis has been increasingly significant in recent years because it allows for obtaining extensive information regarding a subject or topic (Van Eck & Waltman, 2010). This helpful method was brought to people's attention claimed by Garfield (1955), who stated that it accumulates various mathematical tools and statistical techniques to examine and scan publications, such as articles, various books, book chapters, and so on. Garfield is credited with being the first person to bring this method to scholars' attention. It is the process in which statistical tools are utilized to describe a topic subject to a specific investigation, bringing attention to trends within the field (Bouyssou & Marchant, 2011). In contrast to the traditional framework method, this approach is fresh and cutting-edge. As a result, the bibliometric analysis makes it possible for scholars and readers to learn about previous tendencies in the subject area, shed light on recent developments in the subject area, and provide some room for suggesting and providing future research direction (Durieux & Gevenois, 2010).

Choosing the Database: The first phase that has to be done to get started with the bibliometric analysis is to search for databases that will help achieve the desired objective of the study. Consequently, the data sources must be credible and relevant to conduct the analysis and make appropriate decisions (Rueda et al., 2007). The databases maintained by ISI, Google Scholar, WoS, and Scopus are trusted resources that are also kept current. The study was carried out using the Scopus database, one of the most well-known databases in the world that researchers refer to.

Scope of Search: Only research on Firm Efficiency in finance related will be considered within the scope of this bibliometric analysis. Therefore, only studies focusing on Firm Efficiency received the authors' attention. Studies that addressed other than finance-related Firm Efficiency were not taken into consideration. Hence, the authors intend to include Data Envelopment Analysis (DEA) and Stochastic Frontier Approach (SFA) as supporting the scope of the study. There are some justifications for including DEA and SFA in the search string. Generally, both terms need to be included because the Firm Efficiency terms itself not only in Finance but also in other fields. DEA and SFA approaches are non-parametric techniques commonly used to measure efficiency. It was developed by Charnes et al. (1978), whereby this approach uses multiple inputs and outputs

of the Decision-Making Units (DMUs) to measure the efficiency frontiers. Then, both methods will generate a score between zero (0) to show the inefficiency level and one (1), which indicates the full efficiency level or optimum level. This non-parametric technique is widely employed as it is a relatively simple fractional programming formulation consisting of inputs, outputs and DMUs. In addition, this method can work with a small sample and assorted size of firms and does not involve any assumption on the inefficiency distribution. Several studies suggested that both do not require a preconceived structure or specific functional form to be imposed on the data in identifying and determining the efficient frontier, error and inefficiency structure of the DMUs as suggested by Bauer et al. (1998), Evanoff & Israilevich (1991), and Grifell-Tatje & Lovell (1997). Hence, both should be included in the scope of research.

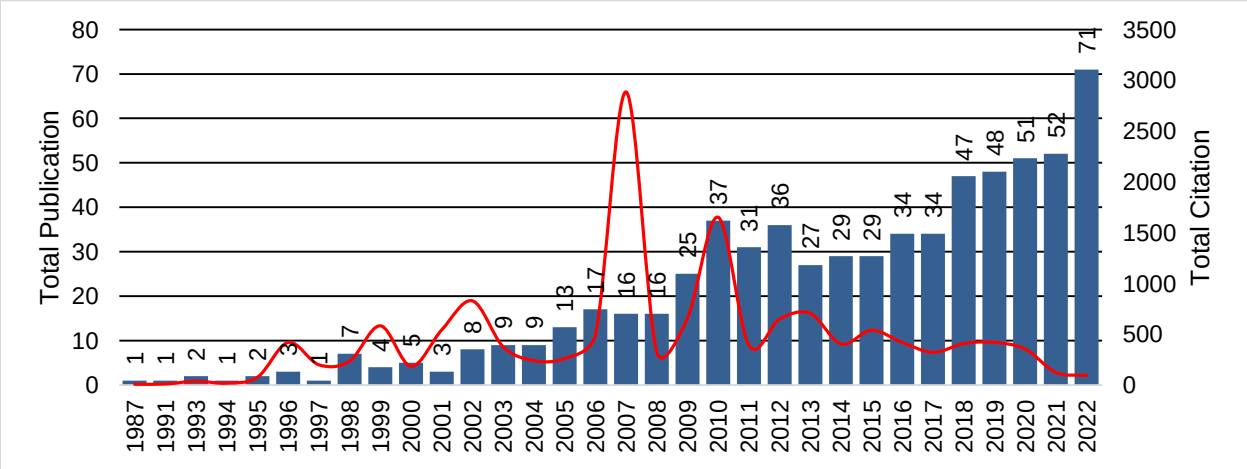
Search Criteria: The authors used two groups of keywords. The first group is on Firm Efficiency, while the second group is on the supporting scope. By using six different permutations in the first keyword group and six different permutations in the second keyword group, papers pertaining exclusively to finance-related Firm Efficiency were located using a search for documents in the Scopus database. Hence, the search string in the Scopus database in this study is ((TITLE-ABS-KEY ("firm* efficien*" OR "compan* effien*" OR "firm* performance*" OR "compan* performance*" OR "firm* productivity" OR "compan* productivity") AND TITLE-ABS-KEY ("data envelopment analysis" OR "DEA" OR "DEA model" OR "stochastic frontier analys*s" OR "SFA" OR "stochastic"))). Upon entering this search string, the system showed 677 documents related to finance-related Firm Efficiency. Following this phase, the authors only eliminate eight documents in the 2023 record since 2023 is still ongoing and concurrent. Hence, the final count was 669.

Measurement/Analysis: VosViewer and Excel were utilized in this study to perform bibliometric analysis. Authors used Excel to analyze the metadata and present the publication and citation performances, productive countries with affiliations, top 10 most productive and impactful journals, top 10 prominent authors and top 20 cited articles. On the other hand, VosViewer was utilized to analyze network and cluster analysis by depicting the geographical network using authors' keyword occurrences (Van Eck & Waltman, 2010).

3. Results

Publication and Citation Performances: Figure 1 shows the publication and citation performances of Firm Efficiency research for the past 35 years. Since 1987, the publication has shown a growing trend, and 2005 is a breakthrough year, publishing more than 10 articles. In addition, the Year 2010 shows another breakthrough by publishing more than 30 documents. Hence it shows that since 2010, Firm Efficiency research has been a hot topic to debate. In terms of citation performance, it shows an average fluctuation only. However, the documents published in 2007 received the most citation compared to the other years. The trend presented indicated that Firm Efficiency is still a developing concept because of a sudden increase in the literature.

Figure 1: Publication and Citation on Firm Efficiency Research in Scopus from 1987 to 2022



Top Productive Countries affiliated with Firm Efficiency Research: The heat map in Figure **2** shows that the knowledge generated in the Firm Efficiency study is dominated by the United States (137), China (72), Taiwan (64), Spain (51), United Kingdom (47), Malaysia (43), Italy (35), Iran (32), Vietnam (26), India (24), and South Korea (24) in terms of the number of articles produced. Based on the heat map, Asia dominated this research by producing 40.73% of 669 documents, followed by Europe (33.94%), North America (16.92%), Oceania (3.23%), Africa (2.80%), and South America (2.37%). Hence, it shows that the Firm Efficiency research was less attentive in Oceania, Africa and South America.

Analysis of the Top 10 Most Influential Journals with High Citation Impact: One of the objectives was to identify the top 10 most influential journals with high citation impact. The top 10 journals produced a total of 94 documents, which is equivalent to 14.05% of the metadata. **Error! Reference source not found.** shows that the European Journal of Operation Research produces the highest number of documents by 14. The Journal of Productivity Analysis then follows them with 10 documents. Applied Economics and the International Journal of Production Economics shared the same spot by producing 10 documents each. On the other hand, in terms of citation impact, the European Journal of Operation Research received the highest citation, 851. Journal of Productivity Analysis then followed them by 534 and Applied Economics by 260. Another interesting point to highlight is that, even though Benchmarking was at eight due to producing eight articles, they were considered good. It is because they were second in citation per paper by 49.20. It means the article receives an average of 49.20 for one paper published in Benchmarking. In conclusion, the European Journal of Operation Research is the most productive because the journal was the highest of all three criteria – number of documents, citation impact, and citation per paper.

Figure 2: Global Distribution in Firm Efficiency Research Publication, Scopus Database

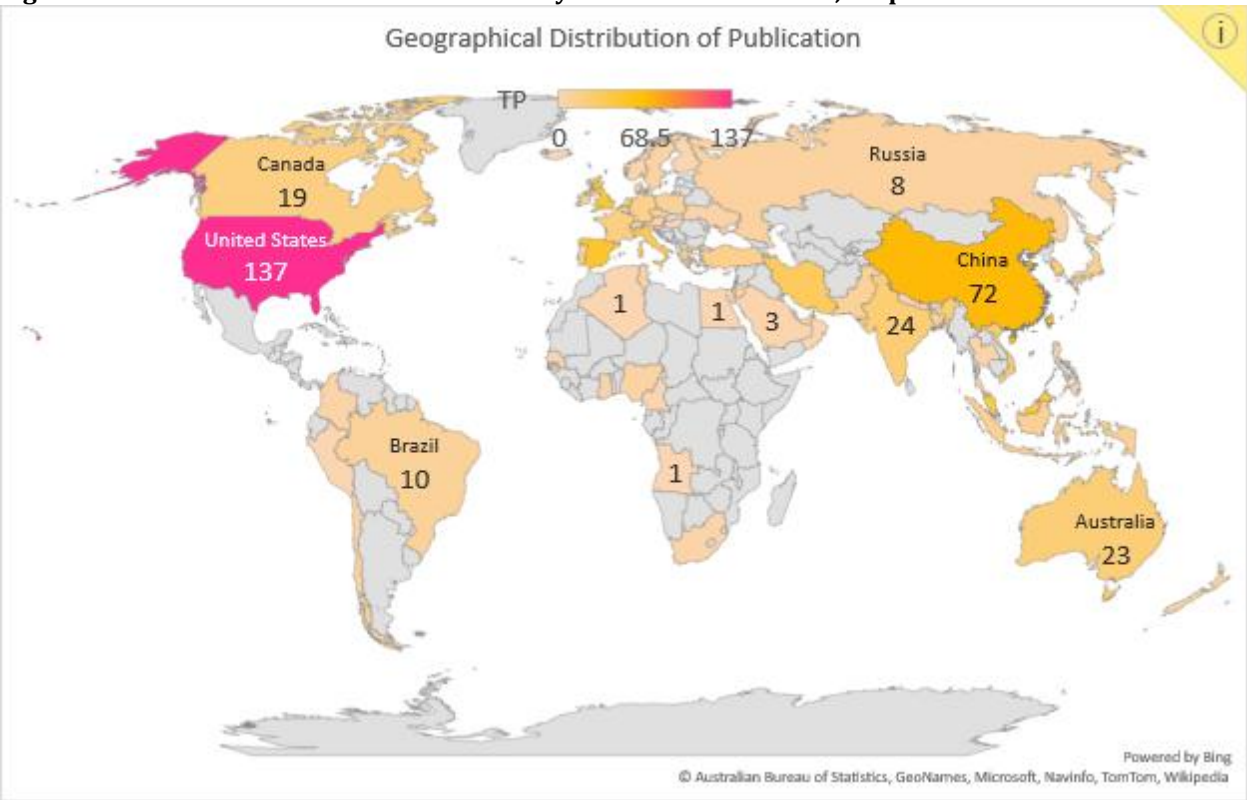


Table 1: Top 10 Journals Publishing Firm Efficiency Research Ranked by Scopus

Ranking	Journal Name	Total no of documents	Citation Impact	C/P
1	European Journal of Operational Research	14	851	60.79
2	Journal of Productivity Analysis	13	534	41.08
3	Applied Economics	10	260	26.00
4	International Journal of Production Economics	10	200	22.22
5	Sustainability Switzerland	9	29	4.14
6	Annals of Operations Research	8	51	6.38
7	Benchmarking	8	246	49.20
8	Journal of The Operational Research Society	8	142	17.75
9	Applied Economics Letters	7	56	9.33
10	Journal of Cleaner Production	7	147	21.00

Top 10 Prominent Authors in Firm Efficiency Research: Error! Reference source not found. shows the top 10 prominent authors in Firm Efficiency research ranked by Scopus. The table shows Lu is the most prominent, with the highest number of cited publications, 13, followed by Wang (7) and Kweh (6). However, in terms of individual performances in their research career, Lu still has the most citations in Scopus, with 263, followed by Wang (235) and Maziotis and Molinos-Senante (144). One of the interesting points to highlight is, Maziotis and Molinos-Senante shared the same number of cited publications (4), Scopus citations (144) and citations per cited paper (36.00). It is because, in this Firm Efficiency research, both were co-authors and worked together in publishing documents related to this research, even though they have different nationalities. Hence, it shows that even collaborating, authors can still become prominent in their respective research.

Table 2: Top 10 Prominent Authors on Firm Efficiency Research Ranked by Scopus

Ranking	Name of prominent authors	Authors' affiliated country	Numbers of Cited Publications	Scopus Citations	C/CP
1	Lu, W.M.	Taiwan	13	263	20.23
2	Wang, W.K.	Taiwan	7	235	33.57
3	Kweh, Q.L.	UAE	6	53	8.83
4	Amirteimoori, A.	Iran	4	84	21.00
5	Kamarudin, F.	Malaysia	5	15	3.00
6	Ting, I.W.K.	Malaysia	5	30	6.00
7	Kapelko, M.	Poland	6	51	8.50
8	Maziotis, A.	Chile	4	144	36.00
9	Molinos-Senante, M.	Spain	4	144	36.00
10	Tan, K.M.	China	5	15	3.00

Top 20 Cited Articles: Error! Reference source not found. displays the top 20 cited articles about Firm Efficiency. Based on the table, Simar & Wilson (2007) received the highest number of citations by 2027, titled "Estimation and inference in two-stage, semi-parametric models of production processes". The second most cited article belongs to Dutta et al. (1999), with 482 total citations, with the title "Success in high-technology markets: Is marketing capability critical?". Finally, the third most cited article belongs to Tyteca (1996) with 408 citations, with the title "On the measurement of the environmental performance of firms - A literature review and a productive efficiency perspective". In terms of citations per year, Simar & Wilson (2007) still lead the line by 126.69 average citations per year. However, Margaritis & Psillaki (2010), with the title "Capital structure, equity ownership and firm performance", receives the second most citations per year by 25.77. Then followed by Cruz-Cázares et al. (2013) with the title "You can't manage right what you can't measure well: Technological innovation efficiency" by receiving the third most citations per year by 20.8.

Table 3: Top 20 Cited Articles on Firm Efficiency

No.	Author(s)	Title	TC	C/Y
1	Simar & Wilson (2007)	Estimation and inference in two-stage, semi-parametric models of production processes	2027	126.69
2	Dutta et al. (1999)	Success in high-technology markets: Is marketing capability critical?	482	20.08
3	Tyteca (1996)	On the measurement of the environmental performance of firms - A literature review and a productive efficiency perspective	408	15.11
4	Delgado et al. (2002)	Firm productivity and export markets: A non-parametric approach	361	17.19
5	Margaritis & Psillaki (2010)	Capital structure, equity ownership and firm performance	335	25.77
6	Sarkis & Cordeiro (2001)	An empirical evaluation of environmental efficiencies and firm performance: Pollution prevention versus end-of-pipe practice	253	11.5
7	Kao & Hwang (2010)	Efficiency measurement for network systems: IT impact on firm performance	236	18.15
8	Wu (2009)	Supplier selection: A hybrid model using DEA, decision tree and neural network	212	15.14
9	Narasimhan et al. (2001)	Supplier Evaluation and Rationalization via Data Envelopment Analysis: An Empirical Examination	210	9.55
10	Cruz-Cázares et al. (2013)	You can't manage right what you can't measure well: Technological innovation efficiency	208	20.8
11	Wang et al. (1997)	Use of Data Envelopment Analysis in assessing Information Technology impact on firm performance	199	7.65
12	Castellani (2002)	Export Behavior and productivity growth: Evidence from Italian manufacturing firms	167	7.95
13	Ding et al. (2007)	On the integration of production and financial hedging decisions in global markets	163	10.19
14	Krasnikov et al. (2009)	The impact of customer relationship management implementation on cost and profit efficiencies: evidence from the US commercial banking industry	150	10.71
15	Margaritis & Psillaki (2007)	Capital structure and firm efficiency	121	7.56
16	Durand & Vargas (2003)	Ownership, organization, and private firms' efficient use of resources	120	6
17	Chen et al. (2015)	Production frontier methodologies and Efficiency as a performance measure in strategic management research	119	14.88
18	Psillaki et al. (2010)	Evaluation of credit risk based on firm performance	116	8.92
19	Grewal & Slotegraaf (2007)	Embeddedness of organizational capabilities	113	7.06
20	Zelenyuk & Zheka (2006)	Corporate Governance and Firm's Efficiency: The Case of a transitional country, Ukraine	105	6.18

4. Emerging Themes in Firm Efficiency Research: For the past 35 years, Firm Efficiency research has delivered five themes.

Theme #1 - The applications of Stochastic Frontier Analysis in measuring firm productivity and firm size: The findings from the customers' age groups concur with H1 (the different customer age groups experience mobile network operators differently) and are compatible with the study conducted. Respondents aged between 19 and 30 constituted the higher number of customers that experienced network operators differently. About 51.8% experienced the operators similarly.

Managerial Implications and Recommendations: The first theme discussed in Firm Efficiency research is the application of Stochastic Frontier Analysis in measuring firm productivity and size. It is clustered by red color as per

Figure 3. The theme was developed based on the combination of keywords of stochastic frontier analysis, firm productivity, and firm size. This cluster was associated with 37 cited documents and received total citations of 690. The most cited article is Krasnikov et al. (2009) 's "The Impact of customer relationship management implementation on cost and profit efficiencies: evidence from the U.S. commercial banking industry", with 150 total citations. In-depth, this cluster discusses the performance comparison between small and large-size SMEs using SFA. In addition, this cluster also discussed in-depth productivity comparisons between different industries using SFA (Chen et al., 2011; Kumbhakar et al., 2012). Furthermore, corporate social responsibility and firm performance have also been discussed in this cluster (Al-Shammari et al., 2022). Finally, this cluster also emphasized innovation mediating firm efficiency (Yoo et al., 2022). Hence, it concludes that SFA is one of the well-known tools for measuring Firm Efficiency.

Theme #2 - Bootstrapping DEA and SFA in Measuring Firm Efficiency: The second theme concerning firm efficiency is bootstrapping DEA and SFA as emerging tools in measuring firm efficiency. This cluster represents green color as per Figure 3, combining bootstrap, productivity and performances. 19 cited articles fall into this theme and receive 2488 citations. The most cited article in this cluster belongs to Simar & Wilson (2007) 's "Estimation and inference in two-stage, semi-parametric models of production processes". This cluster discussed using Bootstrap for technological innovation efficiency (Cruz-Cázares et al., 2013), sensitivity analysis of efficiency and productivity (Tortosa-Ausina et al., 2008) and bootstrap procedure (Valiyattoor & Bhandari, 2020). Hence, it concludes that bootstrap DEA and SFA are the advanced methods in measuring firm efficiency compared to the traditional ones.

Theme #3 – Corporate Governance and Technical Efficiency: The third theme focuses on Corporate Governance and Technical Efficiency, which represents in blue in

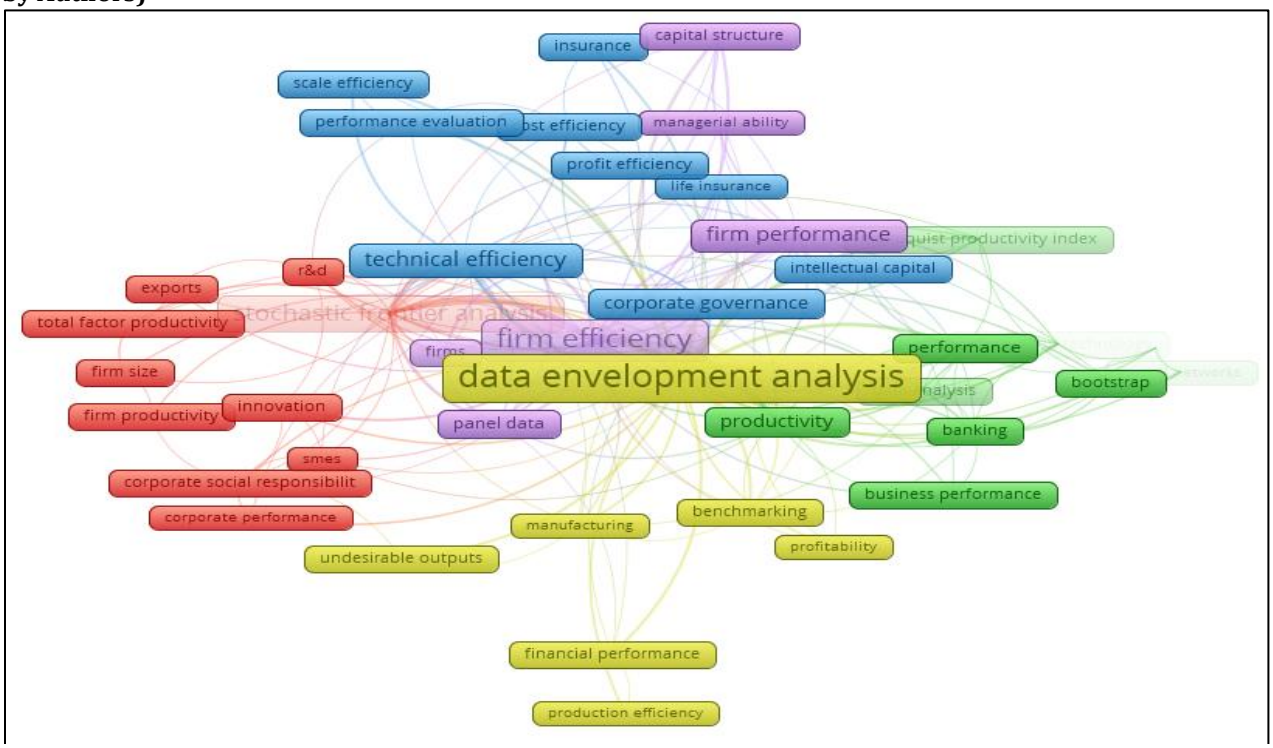
Figure 3. Based on VosViewer network analysis, 22 documents are associated with corporate governance, while 59 documents are associated with technical efficiency. Hence, this cluster receives a total citation of 1228. The most cited article is Zelenyuk & Zheka (2006), "Corporate Governance and Firm's Efficiency: The case of a transitional country, Ukraine", with 105 citations. Other notable articles discussing the relationship between corporate governance, technical efficiency, and firm efficiency are Lu et al. (2012), which emphasizes the airline industry and Sueyoshi et al. (2010) on manufacturing. Other than corporate governance and technical efficiency, this cluster also discussed cost efficiency (Ansah-Adu et al., 2011; Tagashira & Minami, 2019), profit efficiency (Akhigbe et al., 2017; Hardwick et al., 2011), and scale efficiency (Jiang et al., 2019). Hence, it concludes that corporate governance is one of the drivers influencing firm efficiency, while technical efficiency is a measurement in evaluating firm efficiency.

Theme #4 – DEA as Benchmarking in Firm Efficiency: The fourth theme is Data Envelopment Analysis, which is used as a benchmark in measuring Firm Efficiency. This cluster represents yellow color as per

Figure 3. DEA represented the largest link strength in this cluster with 278 articles and received 4712 citations. The most cited article in this cluster is Tyteca (1996) 's "On the measurement of the environmental performance of firms - A literature review and a productive efficiency perspective", with 408 citations. Some in-depth discussions on DEA were highlighted in Firm Efficiency research, such as DEA evaluation and rationalization (Narasimhan et al., 2001), Bilevel DEA programming (Wu, 2010), and route-based DEA analysis (Chiou et al., 2012). Apart from DEA, this cluster has also discussed other keywords, such as performance measurement (Ho, 2007) and undesirable outputs (Wu et al., 2015). Hence, it concludes that DEA is a main benchmarking tool for analyzing Firm Efficiency.

Theme #5 – Capital Structure and Ownership Structure: The fifth and final theme discussed Firm Efficiency's capital and ownership structure. This cluster represents the purple color in *Figure* 3. The capital structure has 11 documents, while the ownership structure has 16 documents in this cluster. This cluster receives total citations of 787 citations. The most cited article in this cluster belongs to Margaritis & Psillaki (2010) 's "Capital Structure, equity ownership and firm performance". This cluster notably discussed capital structure in different areas, such as the airline industry (Capobianco & Fernandes, 2004) and the banking industry (Yeh, 2011). In addition, ownership structures are discussed in depth in different countries such as Israel (Lauterbach & Vaninsky, 1999), India (Wanke et al., 2022) and China (Su & He, 2012). Hence, it concludes that capital structure and ownership structure are the indicators for measuring Firm Efficiency.

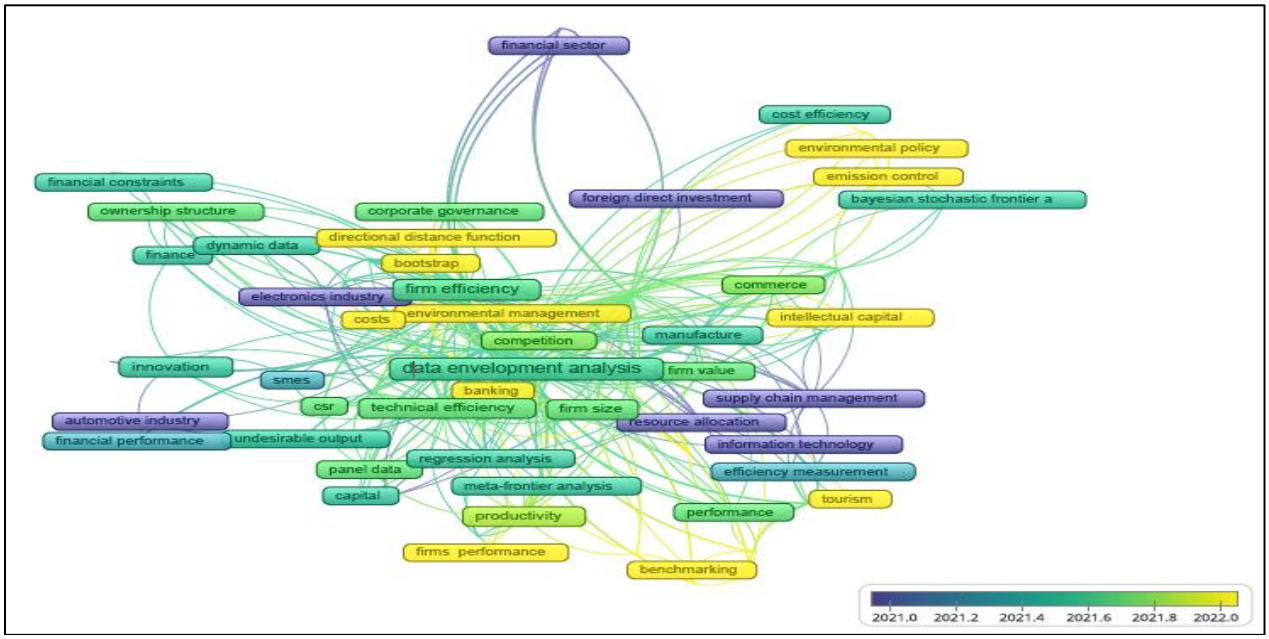
Figure 3: Keyword Network Analysis on Emerging Research Trends on Firm Efficiency (Visualization by Authors)



Moving forward: Future Research Direction on Firm Efficiency Research

Even though Firm Efficiency is considered a matured study due to 669 documents published since 1987, it still has the potential to embark on and explore potential areas in the future. The authors provide two suggestions for Firm Efficiency's future research direction, based on yellow keywords highlighted in *Figure 4*. First, there is a potential to explore Firm Efficiency in Environmental, Social, and Governance (ESG) related companies. It is because ESG efficiency is not only in Finance but also in other indicators such as carbon emission and green housing gas emissions. Hence, Firm Efficiency has the potential to explore the relationship between ESG indicators and Firm Efficiency using DEA and SFA. Second, the author suggested looking for directional distance function in Firm Efficiency. It is an alternative to DEA and SFA, whereby it estimates the relative efficiency of a Decision-Making Unit (DMU) along a pre-determined direction vector that is not restricted by the radial direction. Hence, it will determine if Firm Efficiency's direction of DMUs.

Figure 4: Keyword Network Analysis on Firm Efficiency Research from 2021 to 2022. Visualization by VosViewer



5. Conclusion and Limitations

Firm Efficiency research started in 1987, and for the past 35 years, scholars have received huge attention to embark and conduct research in this area. Hence, this is an opportunity for the authors to conduct a bibliometric to analyze publication and citation performances, top productive countries, top 10 most influential journals, top 10 prominent authors, top 20 cited articles, and emerging themes in Firm Efficiency research. Furthermore, this study presents a direction to those scholars interested in studying Firm Efficiency to develop conceptual or theoretical models and analyze Firm Efficiency using the advance or bootstrap method. The selected findings indicated that for the past 35 years, it shows a growing trend in publication and citations, with the year documents published in 2007 receiving the highest number of citations. In addition, the United States, China and Taiwan are the top three productive countries affiliated with Firm Efficiency research. The main foundation of Firm Efficiency is lying on Finance and Business domains. However, the European Journal of Operational Research, Journal of Productivity Analysis, and Applied Economics dominated the top three most influential journals with high citation impact in Firm Efficiency research. Finally, five emerging themes were discussed in Firm Efficiency research for the past 35 years. First, the application of Stochastic Frontier Analysis in measuring firm productivity and firm size. It's a well-known tool for measuring Firm Efficiency.

Second is bootstrapping DEA and SFA in measuring Firm Efficiency. It is an advanced method of measuring Firm Efficiency compared to the traditional ones. The third theme is the combination between corporate governance and technical efficiency. Corporate Governance is one of the drivers influencing firm efficiency, while technical efficiency is a measurement in evaluating Firm Efficiency. The fourth theme is DEA as benchmarking in Firm Efficiency. The fifth and final theme is capital structure and ownership structure, a benchmark or indicator for measuring Firm Efficiency. Although scholars have learned much about Firm Efficiency over the past 35 years, the outcomes described are subject to certain limitations. First, the research is based on Scopus-published documents. This methodology's second issue is the problem with researchers with identical names. Thirdly, it is noted that this research was conducted with a specific field in mind: Firm Efficiency. Therefore, other researchers should exercise caution regarding the generalizability of these findings. The authors suggested to the scholars that may wish to do bibliometric analysis utilizing additional

databases, such as Google Scholar or Web of Science, which will bring more information to this topic. Finally, additional research should be conducted using sociograms to determine the correlation between different factors in the field of Firm Efficiency.

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