InTraders
International Trade Academic Journal

(InTraders Journal)

Publisher

Kürşat ÇAPRAZ

Volume 7 Issue 2

December 2024

Open access, peer reviewed academic journal

e-ISSN: 2667-4408

Publisher

Kürşat ÇAPRAZ

ORCID: https://orcid.org/0000-0001-7133-6052

Address: Sakarya University, Sakarya, Türkiye

www.intraders.org

intradersorg@gmail.com

WhatsApp+90 539 529 4288

InTraders International Trade Academic Journal

Volume 7, Issue 2

December 2024

Open access, peer reviewed academic journal
e-ISSN: 2667-4408

InTraders International Trade Academic Journal, Volume 7, Issue 2, December 2024

www.intraders.org

e-ISSN-2667-4408

InTraders Journal

InTraders International Trade Academic Journal is peer reviewed academic journal, open access and accepts "PRINCIPLES OF TRANSPARENCY", follows the practice guidelines prepared by the Publication Ethics Committee (COPE).

About

InTraders, which started its publication period in 2018, offers open access. The journal is a publication type of the InTraders Academic Platform, which started its processes with trademark registration in 2017. Platform: It publishes in Congress, journal and book chapter types.

The journal's main subject is international trade. For 2024 and beyond, it accepts economy-based studies outside international trade and original studies on tourism issues.

Authors must upload plagiarism reports and copyright transfer forms to the system along with their work. The work uploaded to the system must be prepared by the journal writing rules. The uploads made outside the spelling rules will be returned at the pre-check stage. Obtaining necessary permissions from ethics committees or commissions for studies that require ethics committee permission (works that require a survey or scale application, contain interviews and observations, documents, pictures, questionnaires, etc., developed by others and require permission to use), specifying these in the study content or must be submitted in addition. Without these permissions, the publication is returned to the author at the preliminary examination stage.

InTraders runs all its processes through Dergipark.

Broadcast range: July-December

Manuscript language: English (Should not include abstracts in languages other than English.).

e-ISSN-2667-4408

*-English studies are accepted for 2024 and later. Studies in English should not include abstracts in languages other than English.

Aim

InTraders International Trade Academic Journal will be able to publish scientific studies of researchers; aims to create an international platform that can contribute to their academic development and increase the number of qualified academic studies.

Scope

InTraders International Trade Academic Journal is peer-reviewed by international referees and an international journal that publishes original scientific research in English, primarily in international trade.

The journal's main subject is international trade. For 2024 and beyond, it accepts economy-based studies outside international trade and original studies on tourism issues. The journal is available free and open access to all researchers. The language, scientific, legal, and ethical responsibilities of the articles published in the journal belong to the authors. The articles published in the journal can only be used when showing the source.

Review Process

1-Editor assignment is made for the field of the article uploaded to the system.

2-Editor: checks the files—checks whether the article is within the scope of InTraders Journal. If there are missing or incomplete files, send the article to the author and request the completion of the deficiencies. After the deficiencies are completed, the editor reads the article. Decide whether the article is suitable for evaluation. If the article is unsuitable for evaluation, the reason is detailed, and the editor rejects the article. If the article is suitable for evaluation, a secretariat is assigned to check the spelling and bibliography of the article.

2-Secretariat: receives the spelling-language report of the article with the paid Grammarly Program and uploads it to the additional files section of the system. The spelling-language report is expected to be 95% and above. A bibliography check is performed. If corrections are necessary in the article, the secretariat indicates the notes on the article. Uploads the correction request file to the additional files section in the system. Completes the process by directing the article to the editor.

3-Editor: According to the secretariat's report, if the study's spelling and grammar need to be corrected, the article is sent to the author. The author makes the necessary revisions and uploads the file to the system.

4-Editor: Sends the article back to the spelling and grammar secretariat.

5-The spelling and grammar secretariat checks whether the requested revision has been made and obtains a spelling and grammar report again with the Grammarly Program. If the report is 95% and above, it is accepted. If the deficiencies are completed, the secretariat completes the process. The study takes on the role of editor. If the necessary corrections are not completed, the editor is informed, and a recommendation is made to reject the study.

6-The editor runs a "two-blind peer referee" process for articles with completed deficiencies. The article is sent to two referees related to the field. The article with incomplete deficiencies is rejected by the editor with a reason as a result of the secretariat's recommendation decision or sent back to the author for correction.

7-Referees: They choose one of four options: rejection, acceptance, major revision, or minor revision. They fill out the evaluation form, and the reasoning for the decision is stated in detail in the report.

For the study to be published, it must be accepted by both referees.

7.1 The referees' reports are examined. The referees must detail their reports. The editor sends the article to new referees when he/she decides that the decisions of both or one of the referees are insufficient, even if both give a favourable decision. Referees who do a superficial review cannot be articleed with in the following periods and are removed from the journal board.
7.2. If one of the referees accepts and the other rejects, the editor may reject the study or send it to a third referee. The decision is the editor's choice.

7.3 If the referees make major/minor revisions to the article, they send them to the author, who makes the necessary corrections and uploads them to the system.

8. A "doi" assignment is made for the article whose processes are completed positively. After the doi is obtained, it is sent to the "final reader editor." The Final Reader Editor reads the study and may request the necessary corrections. If a correction is necessary, upload the report to the system. This completes the process.

9. If there is a correction request in accordance with the final reader editor report, the editor sends the study to the author. The author completes the necessary corrections. If the editor deems it necessary, the study is sent back to the final reader for control purposes.

10. The final reader checks again and completes the process if the corrections are complete. Sends the article to the editor.

11. The editor sends the completed study to the "layout editor," who prepares the article for publication.

12. The article, which has completed all processes positively, will be included in the earliest issue to be published.

*The editor reserves the right to reject all processes. The editor rejects the article for a reason. Reasons for rejection by the editor may be the author uploading incomplete files, not responding

to the necessary revision requests or not doing so within the given time, recommendations and justifications of the referees and the secretariat.

The articles submitted for publication in InTraders must have never been published before, not been accepted for publication, and not submitted for publication.

**The Editor has the right to reject the work/deem it unsuitable for publication at each stage.

Publishing Periods

It is published twice a year. It is published in July and December. If it is deemed necessary, specific numbers / supplements may be issued for specific topics and for expanded notifications qualified by InTraders subject to conventions. Articles may always be accepted by InTraders.

Writing Rules

Preliminary Information

-English studies are accepted for 2024 and later. Studies in English should not include abstracts in languages other than English.

After the author/s have prepared the forms below, they should start uploading files.

-InTraders Journal Article Writing Format

-APA 7 Reference Style Sample File

-Author Information File (Refer to item 4). At the end of the page, it should be stated whether there is a conflict of interest, whether there is an institution from which financial support is received, and the contribution rates of the authors.

-Copyright Agreement Form

-Ethics Committee Permission (Ethics Committee approval is mandatory for studies sent from Turkey (researchers located within the borders of the Republic of Turkey). Ethics committee approval is the author's responsibility due to the country's own management and systems.). In studies that do not require ethics committee permission, the author must upload the signed document stating "I declare that the study does not require ethics committee permission" by stating the study title and author information on a form while uploading the article to the system.

-Decleration of Artificial Intelligence (Valid for 2025 studies)

1. Only English articles are published in InTraders Journal for 2024 and later. Articles submitted to the journal must have yet to be published/presented or sent for publication/presentation elsewhere. Only studies presented orally at scientific events organized by the InTraders Academic Platform and whose full text has yet to be published in writing can be submitted for publication.

2. The APA 7 system should be used for article citations and source indication. The journal's rules will be followed for other article-writing rules.

3. Articles must be written on A4-sized paper with 1.5 spacing, in Times New Roman font, 12-point font, and not to exceed 25 pages. Submissions made from outside the DergiPark platform are strictly not accepted. Your article must be edited using the Article Writing Template. You can download the Article Writing Template here. (Author information should be excluded from the Article File).

4. Author Information File: The article should not contain any information about the author(s). (The file from the author is used to initiate the 2-blind referee process of the article. Therefore, the information about the author(s) should be specified on a separate Word page and uploaded to the system. The following information should be included on the separate Word page: (i) title of the article; (ii) author(s) name and academic title; (iii) ORCID ID numbers; (iv) address of the institution to which the author(s) is affiliated; (v) keywords and (vi) JEL codes of the study, (vii) e-mail address, (viii) telephone The number should be stated as +. The abstract should be at least 150 and at most 250 words.

5. Tables, figures and graphs should be given titles and numbers. Table titles should be placed above the tables, and titles of figures and graphs should be placed below the relevant figure or graph. References should be written below the tables, figures and graphs. Commas must separate decimal fractions in numbers. The sequence number to be given to the equations should be placed in parentheses at the far right of the page. If the derivation of equations is not clearly shown in the manuscript, the derivation process with all its steps should be given on a separate page for the referees' evaluation. Times New Roman type and 11-point font should be used in

table and figure titles and in-table text. If the table does not fit, 8-9-10 point size may be preferred.

6 Footnotes regarding the references made in the articles should be included at the bottom of the page.

7. At the end of the text, a list of sources used in the study is given under the heading REFERENCES. This bibliography lists the references used in the study and is prepared alphabetically according to the author's surname.

Example of creating a bibliography (justified on both sides, 1.5 spacing, Times New Roman, 12-point font)

"Baral, G. (2023). Kiracı Konumundaki Şirketlerin Finansal Kiralama İşleyişlerindeki Muhasebeleştirme Hataları veya Hileleri. InTraders International Trade Academic Journal, 6 (1), 26-43.DOI:10.55065/intraders.1288268"

8. References to sources should be made in the text, not in footnotes, including page numbers, as shown in the examples below.

9. The page layout of the articles to be added to the system must be made by the author and by the following values:

Paper Size: A4 Vertical (Landscape pages should not be included in the article)
Top Margin: 2.5 cm

Bottom Margin: 2.5 cm

Left Margin: 1.0 cm

Right Margin: 1.0 cm

Font: Times New Roman

Font Size: 12 and bold in the title, 12 in the text, 11 in abstracts and 8 in footnotes.
Paragraph Spacing: 6 pt before- 6 pt after, line spacing 1.5 in the text; In abstracts, first 6 pt - then 6 nk, line spacing - Single (The aim is for the abstracts to be easily read by the reader.)
10. There should be no paragraph beginnings (indentations) in the article text, and paragraph breaks should be made clear by leaving spaces (spacing before:6nk after:6nk, line spacing: 1.5 lines).

11. Section Headings: The article can use main, intermediate, and subheadings to ensure an orderly transfer of information; headings will not be numbered. Headings should be levelled according to case sensitivity as specified in the Article Writing Template.
12. Tables and Figures: Tables must have numbers and titles and be located where they should be in the text. Figures must be prepared for colour printing. Table numbers and titles should be written centred on the table, and figure numbers and names should be set just below the figure (See Article Writing Template).

13 Images: They should be included in the text in high-resolution, print-quality scans. When naming pictures, the rules in figures and tables must be followed.

14. Advice(Not compulsory): At least 3 sources each from WOS/Scopus and TR Index, at least 3 sources from journals in Dergipark that cannot be included in the TR Directory, sources from congress books and books must be used, and the Doi of the sources used must be stated in the bibliography section. Wos/Scopus sources should be included in the bibliography in red text, TR Index sources should be listed in orange, and sources not in the TR Index but in Dergipark should be included in the bibliography in blue text.

15. Articles that do not comply with InTraders Journal Publication Principles in any respect will not be evaluated.

Privacy Policy

Information such as names, titles and contact addresses shared through the InTraders website will only be used for the purposes set forth by InTraders; for any other purpose or for the use of third parties.

Copyright and Licensing

Copyright Holder: The author(s) holds commercial rights, patent rights, and intellectual property rights, including copyright, of the author(s) or, if any, of the author(s) employer, which are reserved. InTraders Journal allows authors to retain the copyright of their papers without restrictions.

copied, and reproduced in any size and format other than for commercial use, including re-editing, transforming, and building upon the original work, provided that it is properly cited.

The author(s) declare and undertake that the article submitted for consideration for publication in InTraders has not been previously published in any language, nor has it been accepted for publication and has not been sent to another journal for publication. InTraders aims to publish original research and audit it at every stage.

All legal and scientific responsibilities regarding the content of the articles published in InTraders belong to the author(s).

InTraders does not pay royalties for articles.

Ethical Principles and Publication Policy

1. General Ethical Principles

1. Obtaining the necessary permissions from the ethics committees or commissions for studies that require permission from the Ethics Committee (for studies that require the application of a questionnaire or scale, including interviews and observations; documents, pictures, questionnaires, etc., developed by others and require permission to use), and these should be stated in the article content. or as an addendum. Without these permissions, the publication is returned to the author at the preliminary examination stage. Ethics Committee approval is mandatory for studies sent from Turkey (researchers located within the borders of the Republic of Turkey). Ethics committee approval is the author's responsibility due to the country's own management and systems.

2. It is essential that the raw data regarding the research in the peer reviews be submitted when requested by the referees. It is obligatory to provide the data after the article's publication when necessary.

3. The authors accept that the contact information (mail, institution, ORCID) specified in their article will be included to be published/published in InTraders. InTraders agrees not to publish the authors' information anywhere other than the journal issues and not to share it with third parties for commercial and advertising purposes.

A. Ethical Principles for Authors

1. Authors guarantee that their work is original, and when they include ideas, languages, pictures, graphics and tables of other researchers in their work, they must indicate this as a quotation. Quoting without specifying the source is plagiarism.

2. Each author named in the study is equally responsible for the content of the study. It is unacceptable to not include the name of the researcher who contributed to the study or his name unjustly, even though he did not contribute.

3. Authors should stick to their research findings. It is out of the question to change the findings, make up findings and results, and conduct research based on them. Situations such as tampering with data and materials, deleting, removing, or skipping the interpretation of difficult data are distrustful.

4. Simultaneous submission of the study to journals is not possible. Authors cannot send their previously published works to the journal.

As of 2020, the TR Index-Journal Evaluation criteria have been updated. The articles related to the ethics committee permission, which should be in scientific research, have been detailed. The "documents and information requested for studies requiring ethics committee approval" is not expected to be applied to studies submitted in previous years, the evaluation process of which has been completed but has not yet been published, and for which research data before 2020 has been used, although the evaluation process is still ongoing. The process will start in 2020, and research data will be mandatory for articles starting in 2020. The articles for which the Ethics Committee Permission Document is required are explained below. EXPLANATION AND INFORMATION on the Ethical Rules Made by TR Index: The articles related to the Code of Ethics, which were included in the previous years' criteria, were detailed with explanations in 2020, and the issue of "includes information about the permission in the article" was added to the criteria, assuming that the permissions were obtained for the studies

Requiring ethics committee permission in the research field. QUESTION: Is ethics committee approval required for all articles? No. The criteria state that it applies to "articles that require the permission of the Ethics Committee."

Studies that require the approval of the Ethics Committee are as follows:

• All kinds of research conducted with qualitative or quantitative approaches require data collection from the participants using surveys, interviews, focus group work, observation, experiments, and interview techniques.

• The use of humans and animals (including material/data) for experimental or other scientific purposes,

• Clinical studies on humans,

• Research on animals,

• Retrospective studies by the law on the protection of personal data,

Also;

• Indicating that an "informed consent form" was received in case reports,

• Obtaining and specifying permission from the owners for the use of scales, questionnaires, photographs belonging to others,

• Indication of compliance with copyright regulations for the intellectual and artistic works used

QUESTION: Should a retrospective Ethics Committee Permission be obtained for publications produced from studies and a thesis completed in previous years? Retrospective ethics committee approval is not required for articles published before 2020, produced from master's/doctoral studies (must be specified in the article), submitted an application for publication to the journal in the previous year, and accepted but not published. QUESTION: Are there any restrictions on publications made outside universities with these rules of the TR Directory?

No. Non-university researchers can also apply to the Ethics Committees in their regions. Also;

In articles to be published in journals, it should be stated in the article whether ethical committee permission and/or legal/special permission is required. If it is necessary to obtain these permissions, it should clearly state from which institution, on what date, and with which decision or number the permission was obtained.

If the study requires the use of human and animal subjects, an international declaration, guide, etc., should be declared appropriate.

B. Ethical Principles for Referees

1. Referees should know that the evaluation process is confidential and should not be shared with third parties.

2. The referees must submit an objective, impartial, scientific, understandable and constructive evaluation report about the study within the specified time.

3. Referee reports will also include an assessment of the scientific nature of the article (the subject covered, the method used, or the appropriate use of the relevant literature). This evaluation must be made about the content, whether positive or negative.

4. It is not recommended or considered unethical for the reviewer to request citations for their work. If the referee's studies are related to the study he is examining, he can specify one or two studies, but the studies mentioned are advisory, and it is up to the author whether to use the specified studies or not.

5. When it is understood that the work is plagiarized or has been previously published elsewhere, the referees should notify the editor.

2. Publication Policy

1. InTraders International Trade Journal (InTraders) is an international, peer-reviewed and scientific journal. It is published using the publication principles listed below.
2. InTraders aims to contribute to developing science at the national and international levels by creating a platform for publishing scientific studies.

3.InTraders publishes original scientific research in international trade, economics, business, supply chain management, law, and international relations, presenting congress papers, book reviews, and letters to the editor.

4. InTraders publishes scientific studies in English.

5. InTraders is published electronically twice a year, in the Summer (July) and Autumn (December) terms. It also publishes a special issue if deemed necessary.

6. InTraders does not accept articles for any issue, but articles can be submitted to the journal anytime.

7. InTraders publishes using the TÜBİTAK ULAKBİM DergiPark system. All transactions related to the article are carried out through the DergiPark system.

8. InTraders publishes at https://dergipark.org.tr/tr/pub/intraders. In addition, it offers all issues in the archive section of its congress pages free of charge to open access. www.intraders.org

9. The author/authors declare and undertake that the article submitted to InTraders for evaluation for publication has not been published, accepted for publication, or sent to another journal for publication, in Turkey and/or abroad, in Turkish or any other language before.

10. Copyright Holder: The author(s) holds Commercial rights, Patent rights, and intellectual property rights, including copyright, of the author(s) or, if any, of the author(s) employer are reserved. InTraders Journal allows authors to retain the copyright of their papers without restrictions.

11. All legal and scientific responsibilities regarding the content of the articles published in InTraders belong to the author(s).

12. InTraders does not pay royalties for work.

13. InTraders is free of charge for authors and readers.

14. InTraders published articles can be quoted by showing the source.

15. InTraders permits readers to read, download, copy, distribute, print, and use the articles in the journal for any legal purpose by citing the source.

16. InTraders undertakes not to publish in violation of publication ethics, and all articles submitted to the journal are subject to plagiarism/similarity control by the editor.

17. Whether the article submitted to InTraders is covered by the journal; the editor checks whether it is uploaded to the system correctly and completely and is prepared properly.

18. InTraders uses a double-blind referee evaluation system. The "positive" opinion of at least two referees is sought for the article's acceptance for publication. If one of the referees gives a "positive" opinion and the other a "negative" opinion, the article is sent to a third referee. The editor completes the referee evaluation process by sending two “positive” referee opinions to the Editorial Board.

19. The Editorial Board decides to publish all articles with two “positive” referee opinions.

20. For articles accepted for publication, the editor sends a “Certificate of Acceptance for Publication” signed by the author upon the author's request.

21. Uses information such as names, titles and e-mail addresses shared on the journal website only for the stated purposes of this journal; It is not used for any other purpose or made available to other people.

22. InTraders accepts the Open Access Principles outlined in the Budapest Open Access Initiative. The journal has accepted the Budapest Open Access Initiative.

23. InTraders is committed to applying publication ethics to the highest standards and following the practice guide prepared by the Committee on Publication Ethics (COPE: Committee on Publication Ethics).

24. Articals in InTraders are archived with the Dergipak system.

25. InTraders is licensed under a Creative Commons (CC) Attribution 4.0 International License.

Archive

The archiving system is provided by DergiPark and InTraders' own web pages.

https://dergipark.org.tr/en/pub/intraders/archive

https://intraders.org/archive/

Indexes

EBSCOhost (Contract Date: June 13,2022)

Index Copernicus (2022, 2024)

ERIH PLUS (Approved 2024-01-03)

Sherpa Romeo (Approved 2024-02-15)

Index of Academic Documents

For questions, suggestions and comments, you may contact to intradersorg@gmail.com

Appreciation

I am gratified to have the honor to put forward the vote of thanks to all the InTraders Journal Committees and Authors who provided the intensive work performance for the InTraders Journal under the name of InTraders Academic Platform.

The journal's main subject is international trade. For 2024 and beyond, it accepts economy-based studies outside international trade and original studies on tourism issues. In upcoming next issue, waiting your studies.

Wish to meet you all in this new international conferences…

Kürşat ÇAPRAZ

Publisher of InTraders Journal

www.intraders.org

Contents

Research Article

Analysis of the Effects of the Covid-19 Process on the Financial Performance of Businesses in the Defense Industry By the TOPSIS, EDAS, CoCoSo Method: ISE Sample **43-66**

Cemalettin AKTEPE

Fatma İZGİ

Research Article

The Effect Of Digital Technologies On Financial Inclusion: The Case Of The Emerging European Economies **67-80**

Hilal OK ERGÜN

「Research Article」

InTraders International Trade Academic Journal

e-ISSN: 2667-4408 **www.intraders.org**

Volume: 7
Issue : 2

Received : 9 September 2024
Revision : 3 December 2024
Accepted : 7 December 2024
DOI: 10.55065/intraders.154673

Analysis of the Effects of the Covid-19 Process on the Financial Performance of Businesses in the Defense Industry By the TOPSIS, EDAS, CoCoSo Method: ISE Sample[1]

Cemalettin AKTEPE[2], Fatma İZGİ[3]

Abstract

The defense industry has recently received attention due to its significant advancements. This study examines the impact of the COVID-19 pandemic on the financial performance of companies operating in the Turkish defense sector. The financial data from 2019 to 2023 of defense industry firms listed on Borsa Istanbul, namely ASELS, OTKAR, PAPIL, SDTTR, NETAŞ, and KATMER, were analyzed. The primary objective of this research is to evaluate the financial performance of these companies during the pandemic by comparing it with the pre-pandemic period. In this context, eight financial ratios related to liquidity, turnover, financial structure, and profitability were utilized to assess financial performance. The criteria weights were determined using the Entropy method, and the performance rankings of the companies were established through Multi-Criteria Decision Making (MCDM) techniques, including TOPSIS, EDAS, and CoCoSo. This study offers a novel perspective by examining the effects of the COVID-19 pandemic on Turkish defense industry firms and uncovering their financial performance compared to previous periods. According to the results of the entropy method, the most significant criteria for evaluating the financial performance of companies listed on Borsa Istanbul (BİST) are Active Profitability Ratio (APR) and Equity Profitability Ratio (EPR). In 2020, which was significantly impacted by the pandemic, companies with strong financial performance included ASELS, PAPIL, SDTTR, and NETAŞ. Conversely, KATMER was identified as one of the companies with weaker financial performance during the same period.

Keywords: *Defense industry, Financial Performance, ISE, MCDM*

JEL Codes: *C44, D81, G10*

INTRODUCTION

The coronavirus first broke out in Wuhan, China, and spread rapidly worldwide. World Health Organization 11 March 2020 COVID-19 was declared a pandemic, and our country's first case was seen on this date (Ministry of Health, 2020). Covid-19 has had an impact on both social life and commercial activities. COVID-19 has triggered the contraction of production, domestic trade, and foreign trade in the global economy, primarily in tourism, industry, services, and sectors. The COVID-19 pandemic led to merchandise trade declining by 8 percent and trade in commercial services contracting by 21 percent year-on-year in 2020 (WTO, 2021).

The COVID-19 pandemic also affected the Turkish economy, and this effect was seen intensely in the second

[1] There is not a conflict of interest.
[2] Prof. Dr. Ankara Hacı Bayram Veli University, c.aktepe@hbv.edu.tr, OI: 0000-0001-5426-2530. Contribution rate: 50 %.
[3] Corresponding Author, Res. Asst. Bayburt University fatmaizgi@bayburt.edu.tr OI: 0000-0002-5313-2360. Contribution rate:50 %.

quarter of 2020. The COVID-19 process has directly affected many sectors; therefore, this effect was also realized in the defense industry sector, and the foreign trade tables of the defense industry decreased in 2020. Table 1 demonstrates Turkey's defense export and import data for 2012-2022. Between 2012 and 2017, defense industry exports continued to increase at a certain level. Defense industry exports increased in 2018 and 2019. According to Table 1, it is realized that the impact of the COVID-19 pandemic was intense in 2020. Due to the COVID-19 pandemic, defense industry exports decreased in 2020 and this decrease was -16.9%. Defense industry exports increased by 40.9% in 2021. In 2022, defense industry exports increased by 36.9%, reaching 4,39 billion dollars. Defense industry imports continued at a certain level between 2012 and 2015. Defense industry imports increased between 2016 and 2019. In 2020, the impact of the Covid-19 pandemic emerged, and imports decreased. In 2022, defense industry imports amounted to 2 billion dollars (Table 1).

Table 1: The export and import data of the Turkish defense industry 2012-2022

Years	Export	Import
2012	1 260 809 984	4 150 070 402
2013	1 388 803 070	3 307 883 356
2014	1 647 759 086	4 111 989 522
2015	1 656 276 856	4 982 779 849
2016	1 677 106 338	5 566 972 692
2017	1 740 758 126	4 504 150 144
2018	2 035 923 048	4 761 589 364
2019	2 740 684 239	5 435 012 520
2020	2 278 631 824	5 152 300 101
2021	3 210 141 106	4 161 604 563
2022	4 395 997 079	2 061 197 991

Source: Defense and Aerospace Industry Manufacturers Association (SASAD)

The study aimed to scrutinize the consequences of the COVID-19 pandemic on the financial performance of BIST-registered businesses operating in the defense industry (ASELS, OTKAR, PAPIL, SDTTR, NETAŞ, KATMER). Depending on the purpose of the study, data for the 2019-2023 periods were used to examine the effects of the pandemic on businesses. The criteria weights were determined using the Entropy method, and the companies' performance rankings were conducted by applying Multi-Criteria Decision Making (MCDM) techniques, specifically TOPSIS, EDAS, and CoCoSo methods. This study holds significant importance as it addresses a gap in the existing literature by focusing specifically on the financial performance of companies

within the defense industry, an area that has not been thoroughly examined in prior research.

The absence of such studies makes this analysis particularly valuable, as it provides unique insights into the financial dynamics of a strategically critical sector, offering a foundation for future academic inquiry and practical applications in financial decision-making within the defense industry.

The structure of the paper is organized as follows. The introduction offers export and import data of the defense industry sector from 2012 to 2022. Chapter 2 provides a comprehensive literature review, encompassing studies that have employed multi-criteria decision-making methods specific to the defense industry and those that have applied these methods during the COVID-19 pandemic. Chapter 3 outlines the data sources and methodologies utilized in the study in detail. Chapter 4 analyses the financial performance of defense industry companies listed on BIST. Finally, the Conclusion and Recommendations section summarizes the study's key findings and offers strategic recommendations for the defense industry sector.

Literature Review

More studies in the literature need to examine companies' financial performance in the defense industry listed on BIST. Therefore, it is essential to conduct a study that evaluates the financial performance of the defense industry during the COVID-19 period using current data. Existing literature includes studies that utilize Multi-Criteria Decision Making (MCDM) methods specifically for the defense industry. Çelikkol (2017) employed the TOPSIS method to select a subcontractor for a Turkish company in the defense industry for visual guidance, focusing on supplier selection. Ögel and Nuryyev (2021) analyzed the financial performances of three defense enterprises (ASELS, KATMR, OTKAR) traded on Borsa Istanbul from 2010 to 2019 using the Fuzzy TOPSIS method and ranked them based on their findings. Kurtay et al. (2021) used six different MCDM methods to model and prioritize 20 projects planned for the Turkish defense industry. They concluded that these methods generally support each other with overlapping priority levels. Yücel and Arslan (2021) analyzed the financial performance of ASELSAN, a defense company listed on Borsa Istanbul, from 2008 to 2019 using Gray Relational Analysis and Multi-MOORA methods to determine periods of high financial performance. Mirgen and Tepeli (2023) examined the financial situations of defense industry companies (OTKAR, KATMR, ASELS, PAPIL SDTR) listed on BIST, using financial ratios to predict future performance, emphasizing that defense industry companies generate more profit from their sales. Rasmussen et al. (2023) utilized three MCDM methods—AHP, TOPSIS, and SECA—in the supplier selection process of an Aerospace and Defense (A&D) company. The findings demonstrate a strong correlation between the AHP and TOPSIS models while indicating little or no correlation between these MCDM models and the current supplier selection practices. Desticioglu Tasdemir and Asilogullari Ayan (2024) examined the problem of sustainable supplier selection (SSS) in the defense industry. They used the Analytical Hierarchy Process (AHP) method to determine the criteria weights. Subsequently, they employed the

Fuzzy Technique for Order Preference by Similarity to the Ideal Solution (FTOPSIS) method to determine the optimal supplier based on these calculations.

Several studies have examined the effects of the COVID-19 pandemic process using Multi-Criteria Decision-Making Methods. Some of these studies include Bayraktar (2020), Orji and Ojadi (2021), Kondak (2021), Ghosh and Saima (2021), Dağlı (2021), Meral (2021), Ersoy (2021) ,Çalış and Sakarya (2022), Ertaş and Yetim (2022), Nguyen et al. (2022), Temel and Çakır (2022), Kurt and Kablan (2022), Ghosh and Bhattacharya (2022), Sakarya and Budak (2022), Wang et al. (2022), Tezsürücü Coşansu and Okursoy (2022). Elma (2023), Makki and Alqahtani (2023), Kaplan (2023), Şenol (2023), Özgüner et al. (2023) and Özarı (2024). Bayraktar (2020) investigated the impact of the COVID-19 pandemic on BIST, specifically in the manufacturing sector. They examined 39 stocks of the manufacturing sector traded on BIST and found that the manufacturing sector earned more returns on the BIST basis than before the pandemic. Orji and Ojadi (2021) explored the integrated Multi-Criteria Decision Making (MCDM) method to assess the impact of the COVID-19 pandemic on sustainable supplier selection within Nigeria's manufacturing sector. They found that the economic and pandemic dimensions hold the highest rankings regarding calculated relative importance weights and are critical for supply chain sustainability decisions during the COVID-19 pandemic. Kondak (2021) analyzed the financial performances of food companies traded in Borsa Istanbul using online marketing activities during the COVID-19 pandemic. They used data covering the periods 2018:3-2021:3 and found that while Ülker was ranked first before the pandemic, it was ranked lower during the pandemic period. Ghosh and Saima (2021) analyzed the financial performance of commercial banks in Bangladesh during the Covid-19 pandemic and used two commonly used multi-criteria decision-making (MCDM) methods, the TOPSIS method and the HELLWIG method, to analyze the data. Based on their performance scores according to the result findings, the banks were categorized into three groups (six banks each), namely most resilient, medium resilient, and low resilient. Dağlı (2021) analyzed the financial performances of leading airline companies in Europe before and during COVID-19 and used the TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) method. The study's findings revealed that airline companies' financial performances differed for the three periods evaluated.

Meral (2021) analyzed the impact of the COVID-19 pandemic on the Turkish insurance sector between 2016 and 2020. They used the entropy-weighted TOPSIS method and found that the sector's performance ranked first in the non-life branch and third in the life branch in 2020. Ersoy (2021) aimed to select the best laptop computer using Entropy-based EDAS, CODAS, and TOPSIS methods for a company operating in the online commerce sector in the COVID-19 period and 6 different laptop alternatives were evaluated according to hard disk capacity, RAM, battery power, processor speed, weight, and price criteria for laptop selection of an e-commerce company. Çalış and Sakarya (2022) analyzed the financial performance of automotive firms operating in BIST during the Covid-19 period (2020-2021) and before (2018-2019) and the CRITIC-based CoCoSo method, which is one of

the multi-criteria decision-making methods, was used to analyze the financial performance of firms. According to the results, it was determined that there was no change in the financial performance ranking in the pre-pandemic period and the pandemic period, and the pandemic did not change the financial performance rankings of the firms. Ertaş and Yetim (2022) examined the financial performance of 20 businesses in the food and beverage industry traded on Borsa Istanbul during COVID-19. They applied the TOPSIS method and used 16 financial ratios as criteria. The study highlighted an improvement in the businesses' financial performance in the third and fourth quarters of 2020. Nguyen et al. (2022) evaluated the performance of the Vietnamese banking sector under the effects of COVID-19 by analyzing data from 23 Vietnamese commercial banks collected in 2019 and Q3 2020. They used the CRITIC and DEMATEL methods to calculate the weights of selected financial ratios and then determined the financial performance ranking of these banks using the TOPSIS method. Temel and Çakır (2022) analyzed the financial performance of 21 textile sector businesses traded on BIST for the 2020-2021 periods within the Covid-19 context. They used the TOPSIS method and identified the businesses with the best financial performance in 2020 as Yataş, Sönmez, and Desa, and in 2021 as Sönmez, Yataş, and Bilici. Kurt and Kablan (2022) looked into the financial performance of airline companies in the BIST transportation index during the COVID-19 pandemic. Their study revealed that the pandemic harmed the financial performance of airline transportation. Ghosh and Bhattacharya (2022) analyzed the impact of the pandemic on the financial performance of 22 listed hotels and nine listed travel agencies in India using a Multi-criteria decision-making technique, MEREC, and CoCoSo methods. Based on their findings, EIH, Advani Hotels and Resorts, and TGB Banquets performed relatively better. Sakarya and Budak (2022) examined the financial performances of retail trade sector companies traded on Borsa Istanbul between 2017 and 2020 due to the COVID-19 epidemic. They used the TOPSIS method and identified MIGROS, SOKM, and MIGROS as the most successful companies in financial performance between 2017 and 2020. Wang et al. (2022) constructed a hybrid MCDM model using Fuzzy Analytic Hierarchy Hierarchy Process (FAHP) model and Preference Ranking Technique with Similarity to Ideal Solution (TOPSIS) to assist the supplier selection process in the apparel industry in a fuzzy decision-making environment during the Covid-19 period. Tezsürücü Coşansu and Okursoy (2022). In this study, the financial performances of the firms in the BIST retail trade sector for the periods covering 2019-2021 were determined by FUCOM and VIKOR, which are multi-criteria decision making (MCDM) methods. According to the results of the analysis, BİM in 2019, ŞOK and BİM in 2020, and ŞOK in 2021 were determined as the firms with the best financial performance. Elma (2023) analyzed the financial performance of companies in the health sector, which came to the forefront globally during the pandemic-affected period, and MOORA and TOPSIS methods were used in the study. The results of the analysis display that the same companies shared the first place for both methods in three of the four periods examined. Makki and Alqahtani (2023) analyzed the financial performance of companies in the Saudi energy sector in 2019, 2020, and 2021. They applied AHP and TOPSIS methods and found that efficiency and profitability were the most significant dimensions, followed by leverage and liquidity.

Kaplan (2023) evaluated the financial performances of 8 companies in the automotive sector traded on BIST for the 2017-2021 periods, including the COVID-19 pandemic period. The study used TOPSIS and ELECTRE methods and identified DOAS, TTRAK, and FROTO as the most successful companies. Şenol (2023) analyzed the financial performance of healthcare businesses registered in Borsa Istanbul during COVID-19 using the TOPSIS method. Özgüner et al. (2023) analyzed the impact of COVID-19 on the Turkish manufacturing sector using the Analytical Hierarchy Process (AHP) and the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) methods. The study found that the automotive sector was most affected by COVID-19, while the pharmaceutical and medical equipment sector was the least affected. Özarı (2024) evaluated the financial performance of the enterprises operating in Borsa Istanbul in the Transportation and Warehousing Sector in the Covid 19 period and used EDAS and COPRAS methods from multi-criteria decision-making techniques and used Tobin's Q ratio to determine financial performance and widely accepted criteria such as Altman Z-Score, Springate S-Score, Taffler T-Score, Zmijewski X-Score to measure financial failure and Current and Cash Ratio from liquidity ratios.

Dataset and Methodology of The Study

The study aimed to explore the impact of the COVID-19 pandemic on the financial performance of businesses in the defense industry listed on Borsa Istanbul (BIST). Data from 2019 to 2023 were used in the study, which included six businesses in the BIST defense industry. The names and codes of the businesses included in the study are displayed in Table 2.

Table 2: Businesses Included in the Study

Code	Businesses
ASELS	ASELSAN Electronic Industry and Trade Inc.
OTKAR	OTOKAR Automotive and Defense Industry Inc.
PAPIL	PAPİLON Defense Technology and Trade Inc.
SDTTR	SDT Space and Defense Technologies Inc.
NETAŞ	NETAS Telecommunication Co.
KATMER	KATMERCİLER Vehicle Mounted Equipment Industry and Trade Co.

Source: Public Disclosure Platform (KAP)

The research utilized a dataset obtained from the financial reports of businesses during reporting periods, which were published on KAP and included as part of the study. The study focused on financial ratios that illustrate the liquidity, profitability, financial structure, and activity levels of businesses. Table 3 provides a detailed classification of these financial ratios commonly used in the literature. The current ratio reflects the relationship between current assets and short-term liabilities. Meanwhile, the cash ratio indicates the proportion of a business's cash reserves that can cover its short-term debts.

Additionally, the liquidity ratio demonstrates current assets, excluding stocks, to short-term liabilities (Yaslıdağ, 2018, p.161-163). Furthermore, the equity profitability ratio compares the efficiency of an investment with its return (Karapınar & Zaif, 2021, p.316). At the same time, the activity profitability ratio displays the total profit per asset a business owns. The Asset Turnover ratio assesses the efficiency of all business assets, and the Stock Turnover rate measures how quickly a business sells its stock. Lastly, the financial leverage ratio demonstrates the proportion of assets financed by external sources versus those financed by equity (Yaslıdağ, 2018, p.163).

The normalization methods, weighting method, Multi-Criteria Decision Making methods, financial ratios and code used in the study to measure the financial performance of the companies are indicated in Table 3. In addition, figure 1 demonstrates the flow diagram created for the study.

Table 3: Normalization Method, Weighting MCDM Methods, Financial Rations used in this Study

Normalization Method	**Weighting**	**MCDM Methods**	**Financial Rations and code**
Sum, Vector, Max-min	Entropy Method	-Technique For Order Preference by Similarity to Ideal Solutions (TOPSIS), -Evaluation Based on Distance From Average Solution (EDAS), -Combined Compromise Solution (CoCoSo) Method	**-Liquidity Rations** Current Ratio (CUR) Liquidity Ratio (LİR) Cash Ratio (CAR) **-Activity Rations** Asset Turnover, (AST) Stock Turnover (STT) -P**rofitability Rations** Active Profitability Ratio (APR) ratio Equity Profitability Ratio (EPR) **-Financial Structure and ratio** Leverage Ratio (LER)

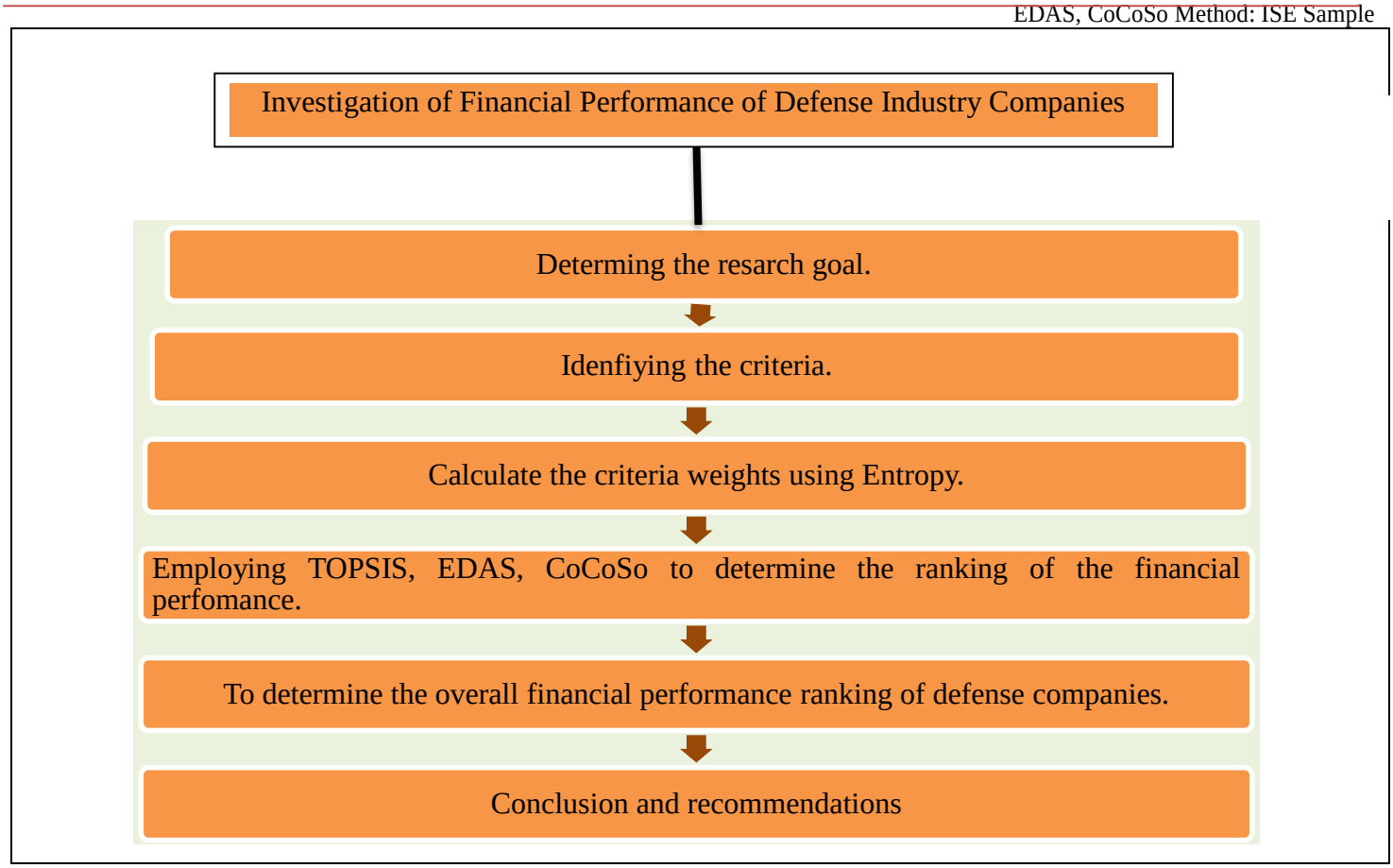

Figure 1: Flow diagram of the study

The Entropy Method

The concept of entropy, initially introduced by Rudolph Clausius in 1865, measures system disorder and uncertainty (Zhang et al., 2011). Over time, it has been widely adopted across various scientific disciplines. In 1948, Shannon adapted the concept to the field of information theory. The entropy method now quantifies the valuable information derived from a given data set (Wu, 2011). This method determines the weight coefficients of objective criteria by evaluating the uncertainty present in the information content of the decision matrix. It achieves this by assessing the degree of mutual contrast among individual criterion values across the alternatives for each criterion and subsequently across all criteria. Due to its direct derivation of weight values from criteria data, the method is considered objective, eliminating potential biases related to subjectivity, lack of expertise, or the involvement of a decision-maker.

Additionally, the nature and orientation of the criteria are independent of the process. In the initial step, the criteria values for the alternatives are normalized, resulting in a normalized decision matrix. The entropy values, representing the information content of the normalized decision matrix for each criterion, are constrained within the 0 to 1 range by applying a constant. The divergence level is calculated by assessing the average information content across all criteria. Lastly, the relative weights of the criteria are determined through simple additive

normalization, providing a measure of the intensity of contrast among the criteria (Petrovic et al., 2024, p.38).

Table 4: Phases of the entropy method

1st Step: Construct the Decision Matrix	$\begin{Bmatrix} X_{11} & X_{12} & \dots & X_{1n} \\ X_{21} & X_{22} & \dots & X_{2n} \\ \dots & \dots & \dots & \dots \\ X_{m1} & X_{m2} \dots & & X_{mn} \end{Bmatrix}$	**(1)**
2nd Step: Normalize the Decision Matrix	$Pij \frac{X_{ij}}{\sum_{i=1}^{m} Xij}$	**(2)**
3rd Step: Calculate the Entropy for Each Criterion	$E_j = -k \sum_{j=1}^{n} pijlnpij$	**(3)**
4th Step: Determine the Degree of Diversification (d_j) for Each Criterion	d_j= 1- E_j, $\forall_j$	**(4)**
5th Step: Calculate the Entropy Weight for Each Criterion	$Wi = \frac{1-ei}{\sum_{i=1}^{m}(1-ei)}$	**(5)**

Technique for Order Preference by Similarity to Ideal Solutions (TOPSIS)

The TOPSIS method, which stands for Technique for Order Preference by Similarity to an Ideal Solution, was introduced in the work of Chen and Hwang (1992) and further developed by Hwang and Yoon (1981). The fundamental principle of this method is to select an alternative that is as close as possible to the ideal solution and as far away as possible from the negative ideal solution (Opricovic & Tzeng, 2004, p.488). Just like in any decision-making process, defining the necessary criteria is crucial. The alternatives are evaluated by following the method's required steps. In TOPSIS, the goal is to choose the alternative closest to the positive ideal solution and farthest from the negative ideal solution. The positive ideal solution maximizes the utility criterion, while the negative ideal solution minimizes the utility criterion. By revealing positive and negative ideal solutions, the TOPSIS method helps identify suitable solutions. This method is user-friendly and can be applied in various fields due to its precise evaluation and interpretation of results (Kurtay et al., 2021, p.8).

Table 5: Phases of the TOPSIS method

1. Step: Construct the Decision Matrix	$\begin{Bmatrix} a_{11} & a_{12} & \dots & a1n \\ a_{21} & a_{22} & \dots & a_{2n} \\ \dots & \dots & \dots & \dots \\ a_{m1} & a_{m2} \dots & & a_{mn} \end{Bmatrix}$	**(6)**
2. step: Performing vector normalization, the normalization decision matrix (R) is formed**.**	$r_{ij} = \frac{a_{ij}}{\sqrt{\sum_{k=1}^{m} a^2{}_{kj}}}$	**(7)**
3. Step: If there are criterion weights (wi) determined in the problem being examined, the weighted normalized decision matrix (V) is obtained by multiplying it with the normalized decision matrix (R). Results	$\begin{Bmatrix} w_1 r_{11} & w_2 r_{12} & \dots & a_n r_{1n} \\ w_1 r_{21} & w_2 r_{22} & \dots & a_n r_{2n} \\ \dots & \dots & \dots & \dots \\ w_1 r_{m1} & w_2 r_{m2} & \dots & a_n r_{mn} \end{Bmatrix}$	(8)

4. Step. Ideal positive for all alternatives(A*) and ideal negative (A^-) solutions are available.	$A^*= \{(\max_i V_{ij})\ j\ E\ j\ \}, \{(\min_i V_{ij})\ E\ J^{\prime}\ \}$ $A^-=\{(\min_i V_{ij})\ j\ E\ j\ \}, \{(\max V_{ij})\ E\ J^{\prime}\ \}$	(9)
5. Step: Calculating the distances for each alternative, the Ideal Positive Discrimination (S_i^*) and Ideal Negative Discrimination (S_i^-) measurements are calculated.	$S_i^* = \sqrt{\sum_{j=1}^{n}[vij - v_j^*)2}$ $S_i^- = \sqrt{\sum_{j=1}^{n}[vij - v_j^-)2}$	(10)
6. Step: The relative number of alternatives considered in the sorting process is performed by calculating the distances (Ci*).	$c_i^* = \frac{S_{ij}}{S\bar{i} + S_i^*}$	(11)

The EDAS (Evaluation Based on Distance From Average Solution) Method

The EDAS (Evaluation based on Distance from Average Solution) method is a multi-criteria decision-making (MCDM) approach introduced into the literature in 2015. The authors of this method—Keshavarz Ghorabaee, Zavadskas, Olfat, and Turskis—tested its validity by comparing it with other well-known MCDM methods such as COPRAS, TOPSIS, SAW, and VIKOR. These comparative analyses validated the EDAS method as a reliable decision-making tool (Keshavarz Ghorabaee et al., 2015, p.435-451). According to the EDAS method, the best alternative is determined based on distance from the average solution rather than from a positive (ideal) or negative (anti-ideal) solution, as with other methods. In EDAS, two types of distances need to be calculated to assess the preferability of alternatives: the positive distance from the average solution and the negative distance from the average solution. These distances are computed based on the type of criteria, whether they are benefit or cost-oriented. In the EDAS method, the selected criteria are considered independent (Ecer, 2020, p.274). The stages of the EDAS method are displayed in the table 6.

Table 6: Phases of the EDAS method

1. Step: Creating the Decision Matrix ($X=x_{ij}$)	$a_{11}\ \ a_{12}\ \ \ldots\ \ a_{1n}$ $a_{21}\ \ a_{22}\ \ a_{2n}$ $\ldots\ \ \ldots\ \ \ldots\ \ \ldots$ $a_{m1}\ \ a_{m2}\ldots\ \ a_{mn}$	**(12)**
2. Step: Creation of Average Values Matrix	$AVj = \frac{\sum_{i=1}^{n} xij}{n}$	**(13)**
3. Step: Creation of Positive and Negative Distance Matrices from the Mean	$PDA= [PDA_{ij}]_{nxm}$ $NDA= [NDA_{ij}]_{nxm}$	*(14)*

4. Step: Calculation of Weighted Total Values	$SP_i=\sum_{j=1}^{m} wj\ x\ PDAij$ $SN_i=\sum_{j=1}^{m} wj\ x\ NDAij$	***(15)***
5. Step: Normalization of Total Weighted Distance	$NSPi = \frac{SPi}{maxi\ (SPi)}$ $NSNi = 1 - \frac{SPi}{maxi\ (SNi)}$	(**16**)

Combined Compromise Solution (CoCoSo) Method

The CoCoSo (Combined Compromise Solution) method is a new multi-criteria decision-making (MCDM) approach proposed by Yazdani, Zarate, Zavadskas, and Turskis in 2019. This method emerged from integrating two existing MCDM techniques: SAW (Simple Additive Weighting) and EWP (Exponentially Weighted Product). CoCoSo combines the strengths of both methods to provide a more comprehensive decision-making framework (Ecer, 2020, p.299). The CoCoSo method offers a compromised solution for addressing multi-criteria decision-making (MCDM) problems. After identifying the alternatives and relevant criteria, the procedure of the CoCoSo model is outlined as follows (Yazdani et al., 2019, p.2507). The stages of the CoCoSo method are indicated in the table 7.

Table 7: Phases of the CoCoSo method

Step 1: A decision matrix is constructed, as revealed in Equation 17.	$x = (x_{ij})m \times n = \begin{bmatrix} x_{11} & x_{12} & \dots x_1 n \\ x_{21} & x_{22} & \dots xzn \\ \dots & \dots & \\ x_{1n_i} & x_{m_2} & xm_n \end{bmatrix}$	**(17)**
Step 2: The compromise normalization Equations (18) and (19) normalize the criteria values, respectively.	$r_{ij} = \frac{X_{ij-min i}X_{ij}}{max_i X_{ij-min i}X_{ij}}$	(18)
	$r_{ij} = \frac{max_i X_{ij} - X_{ij}}{max_i X_{ij-min i}X_{ij}}$	(19)
Step 3: The sum of the weighted comparability sequence SiSi and the total of the power weighted comparability sequence PiPi for each alternative is calculated using Equations (20) and (21), respectively.	$S_i = \sum_{j=1}^{n}(w_j r_{ij})$	(20)
	$P_i = \sum_{j=1}^{n}(r_{ij})^{w_j}$	(21)
Step 4: The relative weights of the alternatives are calculated based on the following aggregating strategies. Three performance score strategies are applied in this stage to calculate the relative weights of other options. The arithmetic means of the sums of the WSM (weighted sum method) and WPM (weighted product method) scores are expressed by Equation (21). Equation (22) is the sum of the relative scores of WSM and WPM compared to the best. Equation (23) generates the balanced compromise of the WSM and WPM model scores. In this paper, the value of $\lambda\lambda$ is considered as 0.5 (λ=0.5λ=0.5) for the beginning analysis.	$k_{ia} = \frac{S_i + P_i}{\sum_{i=1}^{m}(P_i + S_i)}$	(21)
	$k_{ib} = \frac{S_i}{min_i S_i} + \frac{P_i}{min_i P_i}$	(22)
	$k_{ic} = \frac{\lambda(Si) + (1-\lambda)(P_i)}{\lambda_{max i} S_i + (1-\lambda)}; 0 \le \lambda \le 1$	(23)
Step 5: The final ranking of the alternatives is calculated based on the kiki value, i.e., appraisal score (as more significant or better), as seen in Equation 24.	$k_i = (k_{ia}k_{ib}k_{ic})^{\frac{1}{3}} + \frac{1}{3}(k_{ia} + k_{ib} + k_{ic})$	(24)

RESULTS

The Entropy Method Results

The entropy method was utilized to determine the criteria weights of the business in the defense industry sector registered in BIST. The purpose of applying the Entropy method in the study is to determine the weights of the criteria objectively. As in other Multi-Criteria Decision-Making Methods, it is concluded that this method's criteria are benefit or cost-orientated. Therefore, the criteria were determined as a benefit (CUR, LIR, CAR, AST, STT, APR, EPR) and cost (LER). The criteria values of the financial ratios obtained from the calculation of the Entropy method were used as weighting values in TOPSIS, EDAS, and CoCoSo methods, and the results were compared. Firstly, the decision matrix of the defense industry companies for the 2019-2023 period was created for the Entropy method. In addition, normalization of the decision matrix values and weighting over the normalized values should be performed. Table 8 emphasizes the decision matrix of businesses in the defense industry. Since the values of PAPIL and NETAŞ (APR-EPR) are negative, the positivisation process was applied due to not doing the calculation while finding ln values. The values determined as a result of these processes are displayed in Table 8.

Table 8: Constructed Decision Matrix

ASELS	**Years**	**CUR**	**LİR**	**CAR**	**AST**	**STT**	**APR**	**EPR**	**LER**
	2023	1,45	0,81	0,13	0,46	1,65	5,27	9,30	41,31
	2022	1,41	0,88	0,18	0,70	2,78	1,34	2,43	44,20
	2021	1,38	0,93	0,15	0,50	2,05	17,71	32,83	44,34
	2020	1,59	1,14	0,33	0,54	2,30	14,90	28,36	46,92
	2019	1,80	1,23	0,45	0,58	2,40	14,81	28,27	47,06
OTKAR	**Years**	**CUR**	**LİR**	**CAR**	**AST**	**STT**	**APR**	**EPR**	**LER**
	2023	1,15	0,80	0,33	0,85	2,66	7,08	28,16	74,14
	2022	1,11	0,67	0,17	1,09	3,23	12,37	50,30	75,49
	2021	1,39	0,89	0,23	0,87	2,02	20,18	80,19	75,01
	2020	1,49	0,87	0,24	0,83	1,63	17,63	75,17	76,76
	2019	1,87	1,13	0,21	0,98	2,07	14,12	68,45	76,19
PAPIL	**Years**	**CUR**	**LİR**	**CAR**	**AST**	**STT**	**APR**	**EPR**	**LER**
	2023	19,08	15,40	14,02	0,22	0,82	18,22	19,51	6,80
	2022	19,66	17,00	14,15	0,35	2,51	-23,21	-25,27	6,43
	2021	12,64	11,40	9,68	0,27	2,23	22,49	24,12	8,25
	2020	29,28	25,71	24,41	0,29	2,31	10,11	35,31	4,82
	2019	10,33	9,33	8,90	0,00	0,00	0,00	47,94	10,51
SDTTR	**Years**	**CUR**	**LİR**	**CAR**	**AST**	**STT**	**APR**	**EPR**	**LER**
	2023	2,71	1,72	0,86	0,61	1,18	19,99	31,39	37,81
	2022	3,29	2,34	1,59	1,99	2,57	14,70	22,87	32,99
	2021	2,29	1,52	0,75	1,27	2,25	32,87	73,00	44,21
	2020	1,80	1,06	0,29	1,14	2,18	27,25	85,90	70,21
	2019	1,66	0,94	0,37	0,00	0,00	0,00	0,00	65,21
NETAŞ	**Years**	**CUR**	**LİR**	**CAR**	**AST**	**STT**	**APR**	**EPR**	**LER**
	2023	0,76	0,68	0,02	1,40	15,69	2,01	86,26	96,11
	2022	0,80	0,69	0,05	1,02	9,00	-0,78	-121,48	99,58

	2021	0,84	0,73	0,15	0,76	9,09	-21,99	-214,86	99,03
	2020	1,06	0,95	0,18	0,78	10,12	-3,22	-12,69	75,71
	2019	1,25	1,14	0,16	0,69	10,93	-7,68	-22,02	73,27

Source: Created by Authors.

The entropy values (ej) of the components are based on the weighted values, the degrees of differentiation (dj) of the components are based on the entropy values of the components and the degrees of significance (wj) of the components are based on the degrees of differentiation of the components are calculated. In this context, the entropy values, degrees of differentiation, and degrees of the significance of the defense industry companies registered in Borsa Istanbul (BIST) are indicated in Table 9. The results reveal that the criteria with the highest entropy weights for evaluating the financial performance of BIST-listed companies are Active Profitability Ratio (APR) and Equity Profitability Ratio (EPR). In the analyses made on a company basis, the following findings were obtained: EPR, APR, and CAR were discovered to be more significant in ASELS. In OTKAR and PAPIL companies, the degree of significance of Equity Profitability Ratio (EPR), Active Profitability Ratio (APR), and Stock Turnover Ratio (STT) criteria were found to be higher. In SDTTR, the degree of significance of Equity Profitability Ratio (EPR), Asset Turnover Ratio (AST), and Active Profitability Ratio (APR) criteria were determined to be higher. In KATMER and NETAŞ companies, Cash Ratio (CAR), Active Profitability Ratio (APR), and Equity Profitability Ratio (EPR) criteria were found to be more vital.

Table 9: Calculation of significance weights

	criters	**ej**	**dj**	**wj**	**ranking**
ASELS	**CUR**	0,8954	0,1045	0,0910	7
	LİR	0,8911	0,1088	0,0947	5
	CAR	0,8328	0,1671	0,1455	3
	AST	0,8922	0,1077	0,0938	6
	STT	0,8902	0,1097	0,0956	4
	APR	0,7781	0,2218	0,1931	2
	EPR	0,7740	0,2259	0,1967	1
	LER	0,8976	0,1023	0,0891	8
	criters	ej	dj	wj	ranking
OTKAR	**CUR**	0,8978	0,1121	0,1211	5
	LİR	0,8901	0,1098	0,1186	6
	CAR	0,8847	0,1152	0,1244	4
	AST	0,8951	0,1048	0,1132	7
	STT	0,8823	0,1176	0,1271	3
	APR	0,8684	0,1315	0,1420	2
	EPR	0,8672	0,1327	0,1433	1
	LER	0,8982	0,1017	0,1099	8
	criters	ej	dj	wj	ranking
PAPIL	**CUR**	0,8616	0,1383	0,0284	6
	LİR	0,8663	0,1363	0,0280	7
	CAR	0,8592	0,1407	0,0289	5
	AST	0,7661	0,2338	0,0480	4
	STT	0,7351	0,2648	0,0554	3
	APR	-1,1474	2,1474	0,4411	1
	EPR	-0,6858	1,6858	0,3463	2
	LER	0,8796	0,1203	0,0247	8

	criters	ej	dj	wj	ranking
SDTTR	**CUR**	0,8803	0,1196	0,0168	8
	LİR	0,8681	0,1318	0,0185	6
	CAR	0,8022	0,1977	0,0278	5
	AST	-0,6312	1,6312	0,2298	2
	STT	-0,6263	1,6263	0,2291	4
	APR	-0,6274	1,6274	0,2293	3
	EPR	-0,6367	1,6367	0,2306	1
	LER	0,8737	0,1262	0,0177	7
	criters	ej	dj	wj	ranking
NETAŞ	**CUR**	0,8877	0,1122	0,0265	7
	LİR	0,8858	0,1141	0,0269	6
	CAR	0,7871	0,2128	0,0502	3
	AST	0,8778	0,1221	0,0288	4
	STT	0,8851	0,1148	0,0271	5
	APR	-0,6886	1,6886	0,3987	2
	EPR	-0,7631	1,7631	0,4163	1
	LER	0,8932	0,1067	0,0252	8
	criters	ej	dj	wj	ranking
KATMER	**CUR**	0,8970	0,1029	0,0912	8
	LİR	0,8926	0,1073	0,0950	7
	CAR	0,7349	0,2650	0,2347	1
	AST	0,8894	0,1105	0,0978	6
	STT	0,8653	0,1346	0,1192	4
	APR	0,8534	0,1465	0,1298	2
	EPR	0,8572	0,1427	0,1264	3
	LER	0,8806	0,1193	0,1056	5

Source: Created by Authors.

TOPSIS Method Results

Normalizing the decision matrix is a crucial step in the analysis, and these operations are presented in the study's appendix under the section "TOPSIS Method Results." The normalized matrix was weighted using the Entropy method, and the results were displayed as the weighted decision matrix. Determining positive and negative ideal values requires classifying the criteria as benefit-oriented or cost-oriented. In this context, the criteria were categorized as benefit-oriented (CUR, LIR, CAR, AST, STT, APR, EPR) and cost-oriented (LER). The positive and negative distance values were calculated in the subsequent step, and the relative closeness was computed to establish the rankings. The positive ideal distance measures, negative ideal distance measures, and financial performance rankings are highlighted in Table 10.

Table 10: TOPSIS Method Results

ASELS	**Years**	**Sİ$^+$**	**Si$^-$**	**Ci**	**Ranking**
	2023	0,14931	0,271275213	0,6449939	4
	2022	0,173906	0,268648967	0,607040385	5
	2021	0,077041	0,266868808	0,775984018	3
	2020	0,042263	0,213162446	0,834540366	2
	2019	0,029044	0,156725074	0,843657252	1
OTKAR	**Years**	**Sİ$^+$**	**Si$^-$**	**Ci**	**Ranking**

	2023	0,084433	0,044244916	0,343842944	5
	2022	0,069235	0,051713442	0,427564925	4
	2021	0,045086	0,078769713	0,635980101	1
	2020	0,051947	0,068521086	0,568791464	3
	2019	0,048153	0,065580352	0,576613926	2
PAPIL	**Years**	**Sİ$^+$**	**Si$^-$**	**Ci**	**Ranking**
	2023	0,149588203	0,211034402	0,585194603	2
	2022	0,633407091	0,361343141	0,36325012	4
	2021	0,118384084	0,259828829	0,686990898	1
	2020	0,154586452	0,135466345	0,467040298	3
	2019	0,261998571	0,116218099	0,307279155	5
SDTTR	**Years**	**Sİ$^+$**	**Si$^-$**	**Ci**	**Ranking**
	2023	0,190682	0,139060627	0,421724536	4
	2022	0,152801	0,237941659	0,608946942	3
	2021	0,070039	0,273429074	0,796083155	1
	2020	0,08404	0,265190368	0,759356832	2
	2019	0,323251	0,00157652	0,0048534	5
NETAŞ	**Years**	**Sİ$^+$**	**Si$^-$**	**Ci**	**Ranking**
	2023	0,029628173	0,825006486	0,965332352	1
	2022	0,336528552	0,587195302	0,635682731	4
	2021	0,630338821	0,204951605	0,245365682	5
	2020	0,181691186	0,651509769	0,781935937	2
	2019	0,238865409	0,587107444	0,710807191	3
KATMER	**Years**	**Sİ$^+$**	**Si$^-$**	**Ci**	**Ranking**
	2023	0,14605844	0,313846098	0,682415745	3
	2022	0,140728602	0,27284395	0,659724511	4
	2021	0,057277853	0,341347793	0,856311671	1
	2020	0,162125631	0,273233489	0,627604836	5
	2019	0,058719955	0,338560679	0,852195273	2

Source: Created by Authors.

According to the financial performance rankings derived using the TOPSIS method, in 2023, NETAŞ (0.9653) had the highest financial performance, followed by KATMER (0.6824) and ASELS (0.6449). The companies with the lowest financial performance in 2023 were OTKAR (0.3438) and SDTTR (0.4217).

As of 2022, the companies with the highest financial performance were KATMER (0.6597), NETAŞ (0.6356), SDTTR (0.6089), and ASELS (0.6070), while the lowest performers were PAPIL (0.3632) and OTKAR (0.4275).

In 2021, when the effects of the COVID-19 pandemic were most pronounced, KATMER (0.8563), SDTTR (0.7960), and ASELS (0.7759) had the highest financial performance, while NETAŞ (0.2453) exhibited the lowest performance.

During the height of the pandemic in 2020, the top-performing companies were ASELS (0.8345), NETAŞ (0.7819), and SDTTR (0.7593), with the lowest financial performance recorded by PAPIL (0.4670) and OTKAR (0.5687).

In 2019, KATMER (0.8521), ASELS (0.8436), and NETAŞ (0.7108) demonstrated the highest financial performance, while SDTTR (0.0048) and PAPIL (0.3072) exhibited the lowest performance.

EDAS Method Results.

The financial performance of defense industry companies listed on Borsa Istanbul (BIST) has been evaluated using the EDAS method. In the EDAS method, the first step involves calculating the mean values for each component in the decision matrix, as presented in Table 8. The average positive and negative distance values must be calculated relative to these mean values. These average positive and negative distance values are provided in the appendix (EDAS Method Results). In the subsequent step, the average positive and negative distance values are multiplied by the weight assigned to each component to obtain the weighted positive and negative distance values, also revealed in the appendix.

The process continues by summing the component-based values in the weighted positive and negative distance matrices, resulting in SP (Positive Distance) and NP (Negative Distance) values. These SP and NP values are then normalized. The normalization of SP values (NSPi) is calculated by dividing each company's SP value by the maximum SP value across all companies. For NSNi, normalization is done by subtracting the ratio of each company's NP value from the maximum NP value by 1. In the final step, the performance scores for the alternatives are calculated, as highlighted in Table 11.

Based on the financial performance rankings obtained through the EDAS method in 2023, which follows the COVID-19 pandemic period, the companies with the highest financial performance were NETAŞ (0.9650) and PAPIL (0.8439). The companies with the lowest financial performance were KATMER (0.0867) and ASELS (0.0863).

In 2022, the highest financial performers were SDTTR (0.8478) and OTKAR (0.4843), while the companies with the lowest performance were PAPIL (0.0218), ASELS (0.0754), and NETAŞ (0.2549).

During 2021, a year when the effects of the COVID-19 pandemic were still pronounced, the highest financial performance was observed in SDTTR (0.9993), PAPIL (0.9952), OTKAR (0.9261), KATMER (0.7740), and ASELS (0.7734). The lowest performer was NETAŞ (0.0321), indicating that five defense industry companies listed on BIST had a solid financial performance that year.

In 2020, at the peak of the pandemic, the companies with the highest financial performance were SDTTR (0.9382), ASELS (0.8363), PAPIL (0.7507), and OTKAR (0.7181), while KATMER (0.0391) recorded the lowest financial performance.

In 2019, the highest financial performers were ASELS (0.9942), OTKAR (0.8912), and KATMER (0.7069), while the lowest performance was observed in SDTTR (0.00).

Table 11: EDAS Method Results

ASELS	**Years**	**SPi**	**SNi**	**NSPi**	**NSNi**	**ASi**	**Ranking**
	2023	0,006955551	0,341692	0,02197	0,150642136	0,086306086	4
	2022	0,047752999	0,402295	0,150834	0	0,075417114	5
	2021	0,246548129	0,093249	0,778755	0,768208407	0,773481802	3
	2020	0,218932279	0,007536	0,691527	0,981266528	0,836396688	2
	2019	0,316592595	0,004604	1	0,988556824	0,994278412	1
OTKAR	**Years**	**SPi**	**SNi**	**NSPi**	**NSNi**	**ASi**	**Ranking**
	2023	0,068727156	0,185642534	0,64338965	0	0,321694825	5
	2022	0,070638176	0,128556603	0,661279681	0,307504589	0,484392135	4
	2021	0,106820425	0,027414361	1	0,852327156	0,926163578	1
	2020	0,076537027	0,052017274	0,716501803	0,719798729	0,718150266	3
	2019	0,100745535	0,029837546	0,943129885	0,839274194	0,89120204	2
PAPIL	**Years**	**SPi**	**SNi**	**NSPi**	**NSNi**	**ASi**	**Ranking**
	2023	1,015291129	0,04115763	0,701241191	0,986617589	0,84392939	2
	2022	0,063296915	3,075501948	0,043717908	0	0,021858954	5
	2021	1,447848676	0,029488977	1	0,990411654	0,995205827	1
	2020	0,726210752	0	0,501579181	1	0,75078959	3
	2019	0,475738189	0,585020243	0,328582812	0,809780565	0,569181688	4
SDTTR	**Years**	**SPi**	**SNi**	**NSPi**	**NSNi**	**ASi**	**Ranking**
	2023	0,026599802	0,214854935	0,055118831	0,775051	0,415084698	4
	2022	0,415692065	0,158287583	0,86137711	0,834276	0,847826361	3
	2021	0,482590099	0,001289859	1	0,99865	0,99932477	1
	2020	0,441949021	0,037468321	0,915785511	0,960771	0,93827841	2
	2019	0	0,955125468	0	0	0	5
NETAŞ	**Years**	**SPi**	**SNi**	**NSPi**	**NSNi**	**ASi**	**Ranking**
	2023	1,595114	0,430725	1	0,930193	0,965097	1
	2022	0,115179	3,470034	0,072207	0,437617	0,254912	4
	2021	0,102455	6,170237	0,064231	0	0,032115	5
	2020	0,117321	1,247927	0,07355	0,797751	0,43565	2
	2019	0,127548	1,603706	0,079962	0,74009	0,410026	3
KATMER	**Years**	**SPi**	**SNi**	**NSPi**	**NSNi**	**ASi**	**Ranking**
	2023	0,043938284	0,249807934	0,173507521	0	0,086753761	4
	2022	0,044002397	0,125172883	0,173760697	0,498923508	0,336342102	3
	2021	0,253235615	0,112892224	1	0,548083915	0,774041957	1
	2020	0,008024691	0,238161219	0,031688637	0,04662268	0,039155658	5
	2019	0,217138372	0,110784767	0,857455901	0,556520222	0,706988062	2

Source: Created by Authors.

CoCoSo Method Result

As with the other methods used in this study, the CoCoSo method begins with the creation of the decision matrix, the formation of which is illustrated in Table 8 under the Entropy Method section. The normalization of the decision matrix for benefit- and cost-oriented criteria was carried out using Equations (18) and (19), and the results are offered. After normalization using the CoCoSo method, the third step involved calculating the Si values using Equation (20). After calculating Si values, the Pi values were determined using Equation (21), and these results are displayed in Table 12. In the fourth step of the CoCoSo method, kia, kib, and kic values were

calculated using Equations (21), (22), and (23). Finally, in the last step, the *ki* value, used to rank the financial performance of defense industry companies listed on BIST, was calculated using Equation (24); the results are demonstrated in Table 12.

According to the financial performance rankings obtained using the CoCoSo method, in 2023, following the COVID-19 pandemic, the companies with the highest financial performance were SDTTR (38.317), NETAŞ (7.497), and PAPIL (4.697). The companies with the lowest financial performance were OTKAR (1.647) and ASELS (1.312).

In 2022, the highest financial performers were SDTTR (58.093) and NETAŞ (4.953), while the companies with the lowest financial performance were PAPIL (2.584), KATMER (2.100), ASELS (2.015), and OTKAR (1.582).

In 2021, a year when the effects of the COVID-19 pandemic were still significant, the companies with the highest financial performance were SDTTR (65.614) and PAPIL (4.874). In contrast, those with the lowest performance were KATMER (2.927), ASELS (2.780), OTKAR (2.345), and NETAŞ (1.610).

In 2020, at the peak of the pandemic, the highest-performing companies were SDTTR (59.661), NETAŞ (7.007), PAPIL (5.020), and ASELS (3.312), while the companies with the lowest financial performance were OTKAR (1.574) and KATMER (0.859).

In 2019, the highest financial performers were NETAŞ (6.278), ASELS (3.481), and KATMER (3.009), while the lowest-performing companies were OTKAR (2.397), PAPIL (2.136), and SDTTR (0.995).

Table 12: CoCoSo Method Results

ASELS	**Years**	**S_i**	**P_i**	**K_{ia}**	**K_{ib}**	**K_{ic}**	**K_i**	**Ranking**
	2023	0,195811	3,356322401	0,112754787	2	0,437504744	1,312165175	5
	2022	0,279631	5,335697761	0,178246452	3,01781045	0,691621799	2,015110836	4
	2021	0,518061	6,240409224	0,214533005	4,50501748	0,832418829	2,780716147	3
	2020	0,627155	7,351362148	0,253260746	5,3931582	0,982688019	3,312787125	2
	2019	0,767713	6,831010916	0,24120501	5,95594209	0,935910033	3,481400762	1
OTKAR	**Years**	**S_i**	**P_i**	**K_{ia}**	**K_{ib}**	**K_{ic}**	**K_i**	**Ranking**
	2023	0,362378	5,260153768	0,177960329	2,12236391	0,708357052	1,64725849	3
	2022	0,409428	4,691466217	0,161449845	2,13086051	0,642638374	1,58298812	4
	2021	0,548686	7,294171647	0,248236482	3,07049002	0,988085734	2,34542512	2
	2020	0,403914	4,686673996	0,161123644	2,11462218	0,641339957	1,57468124	5
	2019	0,57679	7,360635932	0,251229699	3,16222685	1	2,39731641	1
PAPIL	**Years**	**S_i**	**P_i**	**K_{ia}**	**K_{ib}**	**K_{ic}**	**K_i**	**Ranking**
	2023	0,71	7,63	0,24719919	9,00101921	0,96942743	4,69794788	3
	2022	0,15	5,92	0,18000427	4,39672894	0,70591284	2,58449123	4
	2021	0,78	7,63	0,2491436	9,43941176	0,97705273	4,87478827	2
	2020	0,81	7,79	0,25499504	9,74216602	1	5,02006466	1
	2019	0,57	1,74	0,0686579	4,74047378	0,26925189	2,13697248	5
SDTTR	**Years**	**S_i**	**P_i**	**K_{ia}**	**K_{ib}**	**K_{ic}**	**K_i**	**Ranking**
	2023	0,454619	7,332806	0,24129	105,205219	0,92269	38,3176	4

	2022	0,714095	7,625677	0,25841	162,644483	0,98814	58,0934	3
	2021	0,814208	7,580842	0,26012	184,700373	0,99469	65,614	1
	2020	0,750964	5,503185	0,19378	169,356388	0,74102	59,661	2
	2019	0,004533	1,492935	0,0464	2	0,17743	0,99568	5
NETAŞ	**Years**	**S_i**	**P_i**	**K_{ia}**	**K_{ib}**	**K_{ic}**	**K_i**	**Ranking**
	2023	0,883957	4,941036045	0,177514211	17,750391	0,686054627	7,497657426	1
	2022	0,510166	5,279391643	0,176434329	10,7357768	0,681881112	4,953732183	4
	2021	0,052772	5,574394636	0,171485553	2,12818336	0,662755149	1,610534725	5
	2020	0,716838	7,60661024	0,253653585	15,1230736	0,980317096	7,007415502	2
	2019	0,649877	6,599191901	0,220912322	13,6503171	0,853779085	6,278910915	3
KATMER	**Years**	**S_i**	**P_i**	**K_{ia}**	**K_{ib}**	**K_{ic}**	**K_i**	**Ranking**
	2023	0,451162	5,669206873	0,210223397	4,86578	0,846899114	2,26306732	3
	2022	0,417205	5,406168841	0,200022173	4,55942	0,805802795	2,10004337	4
	2021	0,608185	6,439515939	0,242075544	6,1193	0,975217635	2,92707339	2
	2020	0,161588	2,7338126	0,099451685	2	0,40064781	0,8599299	5
	2019	0,616279	6,610518393	0,248227201	6,23195	1	3,00903873	1

Source: Created by Authors.

The financial performance rankings for 2019-2023 were calculated using the TOPSIS, EDAS, and CoCoSo methods, and the results were compared in Table 13. The following findings were obtained from the analyses:

ASELS Company: According to evaluations made with the TOPSIS, EDAS, and CoCoSo methods, ASELS demonstrated high financial performance in 2019, 2020, and 2021. However, performance declined in 2022 and 2023. This consistency across the methods indicates alignment in the assessment criteria of ASELS's performance.

OTKAR Company: Based on the TOPSIS and EDAS methods, OTKAR's financial performance was strong in 2021, 2019, and 2020. The CoCoSo method also identified high performance in 2019 and 2023. In contrast, TOPSIS and EDAS indicated that OTKAR's performance was lower in 2023 and 2022, while CoCoSo pointed to 2022 and 2020 as periods of weaker performance. These findings highlight fluctuations in OTKAR's financial performance across the years.

PAPIL Company: According to the TOPSIS and EDAS methods, PAPIL exhibited strong financial performance in 2021, 2023, and 2020. The CoCoSo method similarly identified high performance in 2020, 2021, and 2023. However, all methods agreed that PAPIL'S financial performance was weaker in 2022 and 2019, indicating sustained declines in these years.

SDTTR Company: The analyses conducted using the TOPSIS, EDAS, and CoCoSo methods revealed that SDTTR's financial performance was strong in 2021, 2020, and 2022, while weaker performance was observed in 2023 and 2019. These results indicate a consistent trend across the methods used to evaluate SDTTR's performance.

NETAŞ Company: According to the TOPSIS, EDAS, and CoCoSo methods, NETAŞ displayed high financial performance in 2023, 2020, and 2019, with a decline in performance in 2022 and 2021. The consistency of these

findings across all methods indicates general alignment in assessing NETAŞ's performance.

KATMER Company: The EDAS and TOPSIS methods identified solid financial performance for KATMER in 2021 and 2019, while the CoCoSo method found high performance in 2019 and 2021. All three methods agreed that KATMER's financial performance in 2020 was low, ranking fifth. This finding highlights the negative impact of the pandemic on KATMER's performance.

Table 13: General Ranking Results

		TOPSIS	EDAS	COCOSO
ASELS	**Years**	**Ranking**	**Ranking**	**Ranking**
	2023	4	4	5
	2022	5	5	4
	2021	3	3	3
	2020	2	2	2
	2019	1	1	1
OTKAR	**Years**	**Ranking**	**Ranking**	**Ranking**
	2023	5	5	3
	2022	4	4	4
	2021	1	1	2
	2020	3	3	5
	2019	2	2	1
PAPIL	**Years**	**Ranking**	**Ranking**	**Ranking**
	2023	2	2	3
	2022	4	5	4
	2021	1	1	2
	2020	3	3	1
	2019	5	4	5
SDTTR	**Years**	**Ranking**	**Ranking**	**Ranking**
	2023	4	4	4
	2022	3	3	3
	2021	1	1	1
	2020	2	2	2
	2019	5	5	5
NETAŞ	**Years**	**Ranking**	**Ranking**	**Ranking**
	2023	1	1	1
	2022	4	4	4
	2021	5	5	5
	2020	2	2	2
	2019	3	3	3
KATMER	**Years**	**Ranking**	**Ranking**	**Ranking**
	2023	3	4	3
	2022	4	3	4
	2021	1	1	2
	2020	5	5	5
	2019	2	2	1

Conclusion and Recommendations

The defense industry is pivotal in fostering economic mobility and, more crucially, driving sustainable economic growth. The future trajectory of the defense sector is intricately linked to its ability to sustain competitiveness in a globally competitive environment. The Turkish defense industry, witnessing a marked increase in its global standing, occupies a strategic position in Turkey's economic advancement. This sector contributes significantly to high value-added production, the cultivation of a skilled workforce, and advancements in technological development. The continuous momentum in the development of Turkey's defense industry underscores the nation's substantial achievements and innovations in this field.

This study comprehensively examines the impact of the COVID-19 pandemic on the financial performance of companies operating in the defense industry, focusing on the period from 2019 to 2023. The significance levels of the criteria were calculated using the Entropy method, one of the objective criteria weighting techniques. The TOPSIS, EDAS, and CoCoSo evaluations revealed significant fluctuations in the companies' financial performance, demonstrating that the pandemic had particularly adverse effects in specific years.

ASELS exhibited solid financial performance during 2019-2021; however, a decline in 2022 and 2023 suggests that post-pandemic uncertainties harmed the company. Similarly, companies like OTKAR and PAPIL experienced high performance in specific years but saw a weakening, particularly in 2022 and 2023. These findings indicate that the pandemic had widespread effects across the sector. Fluctuations were also observed in the performance of SDTTR and NETAŞ, while KATMER's significant decline in 2020 highlights the pandemic's impact.

This study is significant because it underlines the necessity of analyzing the financial performance of companies in strategic sectors, such as the defense industry, during periods of crisis like the pandemic. These analyses assess past performance and emphasize the need for strategic decision-making to enhance resilience against potential future crises.

In this context, several recommendations can be made for companies. Sources of income should be diversified by adapting defense technologies to civilian sectors and by focusing on international markets. It is critical to use derivative instruments (hedging) against foreign exchange risk and to reduce vulnerabilities in the supply chain with alternative sources. Adequate cash reserves should be established for crisis periods and long-term fixed interest financing methods should be preferred. Fixed costs should be reduced, flexible cost structures should be adopted and the business should be adapted to crises. Digital transformation in defense technologies should be accelerated, and solutions that can be used in both military and civilian areas should be developed. Various researches can be conducted to increase the resilience of defense industry companies to crises. For example, the effects of revenue diversification and supply chain strategies, financial resilience factors, and the effectiveness of

instruments used against foreign exchange and interest rate risks can be analyzed. In addition, the impact of financial planning and government support policies can be analyzed through crisis simulations. A new study can be conducted to analyze the financial performance of different sectors and businesses during the COVID-19 period using updated Multi-Criteria Decision-Making (MCDM) methods.

REFERENCES

Bayraktar, A. (2020). COVID 19 pandemisinin finansal etkileri: BİST imalat sektörü uygulaması. *Turkish Studies*, 15(8), 3415-3427. https://dx.doi.org/10.7827/TurkishStudies.46807

Chen, S. J., & Hwang, C. L. (1992). Fuzzy multiple attribute decision-making methods. In *Fuzzy multiple attribute decision making: Methods and applications* (pp. 289-486). Berlin, Heidelberg: Springer Berlin Heidelberg.

Çalış, N., & Sakarya, Ş. (2022). Covid-19 döneminde ve öncesinde firmaların finansal performanslarının CRITIC temelli CoCoSo yöntemi ile analizi; BIST otomotiv sektörü üzerine bir uygulama. *Bingöl Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, *6*(2), 287-322.

Çelikkol, M. (2017). Tedarikçi Seçimi Problemi: Savunma Sanayinde Bir TOPSIS Uygulaması Supplier Selection Problem: An Application in defence Sector. DOI: 10.13140/RG.2.2.27815.24485

Dağlı, D. (2021). Havayolu işletmelerinin Covid-19 öncesi ve Covid-19 sürecindeki finansal performanslarının TOPSIS yöntemi ile değerlendirilmesi. *İşletme Araştırmaları Dergisi*, *13*(3), 2242-2255.

Desticioglu Tasdemir, B., & Asilogullari Ayan, M. (2024). Sustainable Supplier Selection in the Defense Industry with Multi-criteria Decision-Making Methods. In: Şen, Z., Uygun, Ö., Erden, C. (eds) Advances in Intelligent Manufacturing and Service System Informatics. IMSS 2023. Lecture Notes in Mechanical Engineering. Springer, Singapore. https://doi.org/10.1007/978-981-99-6062-0_10

Ecer, F. (2020). *Çok Kriterli Karar Verme-Geçmişten Günümüze Kapsamlı Bir Yaklaşım.*SeçkinYayıncılık. Ankara

Elma, O. E. (2023). Financial Performance Analysis of Healthcare Companies on Borsa Istanbul During COVID-19 Via MOORA And TOPSIS Methods. *6th International Conference on Applied Research in Management, Business & Economics, 3-5 March Vienna, Austria,*

Ersoy, Y. (2021). Equipment selection for an e-commerce company using Entropy-based TOPSIS, EDAS and CODAS methods during the COVID-19. *LogForum*, *17*(3).

Ertaş, F. C., & Yetim, A. (2022). Covıd-19 pandemisinde gıda ve içecek sektöründeki işletmelerin finansal performansının TOPSIS yöntemiyle incelenmesi: BIST örneği. *Muhasebe ve Finansman Dergisi*, (93), 53-74.

Ghosh, R., & Saima, F. N. (2021). Resilience of commercial banks of Bangladesh to the shocks caused by COVID-19 pandemic: an application of MCDM-based approaches. *Asian Journal of Accounting Research*, *6*(3), 281-295.

Ghosh, S., & Bhattacharya, M. (2022). Analyzing the impact of COVID-19 on the financial performance of the hospitality and tourism industries: an ensemble MCDM approach in the Indian context. *International Journal of Contemporary Hospitality Management*, *34*(8), 3113–3142.

Hwang, C. L., & Yoon, K. (1981). Methods for multiple attribute decision making. *Multiple attribute decision making: methods and applications a state-of-the-art survey*, 58-191.

Kaplan, G. (2023). Evaluation of Performances of Automotive Sector Companies Traded in BIST, Including the COVID-19 Pandemic Period, with TOPSIS, ELECTRE, and CRITIC Methods. *Aksaray University Journal of Science and Engineering*, *7*(2), 85–98.

Karapınar A., & Zaif F. A. (2021). *Uluslararası Finansal Raporlama Standartları İle Uyumlu Finansal Analiz*. Ankara: Gazi Kitabevi.

Keshavarz Ghorabaee, M., Zavadskas, E. K., Olfat, L., & Turskis, Z. (2015). Multi-criteria inventory classification using a new method of evaluation based on distance from average solution (EDAS). Informatica, 26(3), 435-451. doi: 10.15388/ınformatica.2015.57

Kondak, G. N. (2021). Covid-19 Pandemi Sürecinde Bist Yildiz Pazarda İşlem Gören Gida Şirketlerinin Mali Performanslarinin Değerlendirilmesi. *Uluslararası Beşeri ve Sosyal Bilimler İnceleme Dergisi*, *5*(2), 154-168.

Kurt, G., & Kablan, A. (2022). Covid-19'un, BİST ulaştırma endeksinde faaliyet gösteren havayolu işletmelerinin finansal performansı üzerindeki etkilerinin, çok kriterli karar verme yöntemleri ile analizi. *İşletme Akademisi Dergisi*, *3*(1), 16-33.

Kurtay, K. G., Gökmen, Y., Altundaş, A., & Dağıstanlı, H. A. (2021). Savunma Sanayii Projelerinin Çok Kriterli Karar Verme Yöntemleriyle Önceliklendirilmesi ve Karşılaştırılması: Karma Bir Model Önerisi. *SAVSAD Savunma ve Savaş Araştırmaları Dergisi*, *31*(1), 1-24.

Makki, A. A., & Alqahtani, A. Y. (2023). Capturing the effect of the COVID-19 pandemic outbreak on the financial performance disparities in the energy sector: A Hybrid MCDM-Based evaluation approach. *Economies*, *11*(2), 61.

Meral, H. (2021). Covid-19 Türk Sigorta Sektörünü Nasıl Etkiledi?. *Finans Ekonomi ve Sosyal Araştırmalar Dergisi*, *6*(3), 443-458.

Mirgen, Ç., & Tepeli, Y. (2023). *Savunma Sanayi Şirketlerinin Finansal Oran Analizleri İle İncelenmesi.* Ankara: Nobel Yayınevi.

Ministry of Health (2020). Covid-19 Information Platform 2020. Https://Saglık.Gov.Tr/ (Accessed on 24.12.2023).

Nguyen, P. H., Tsai, J. F., Hu, Y. C., & Ajay Kumar, G. V. (2022). A Hybrid method of MCDM for evaluating the financial performance of Vietnamese commercial banks under COVID-19 impacts. Shifting Economic, Financial and Banking Paradigm: New Systems to Encounter COVID-19, pp. 23–45. https://doi.org/10.1007/978-3-030-79610- 5_2

Opricovic, S., & Tzeng, G. H. (2004). Compromise solution by MCDM methods: A comparative analysis of VIKOR and TOPSIS. *European journal of operational research*, *156*(2), 445-455.

Orji, I. J., & Ojadi, F. (2021). Investigating the COVID-19 pandemic's impact on sustainable supplier selection in the Nigerian manufacturing sector. *Computers & Industrial Engineering*, *160*, 107588.

Ögel, S., & Nuryyev, K. (2021). Borsa İstanbul'da işlem gören savunma sanayi şirketlerinin Bulanık TOPSIS yöntemi ile finansal performans analizi. *Business & Management Studies: An International Journal*, *9*(1), 307-326.

Özarı, Ç. (2024). Covid-19 Sürecinde Ulaştırma Ve Depolama Sektöründeki İşletmelerin Finansal Performans Analizi: Entropi Tabanlı Edas Ve Copras Yöntemleriyle. Akademik Hassasiyetler, 12(25), 602-631.

Özgüner, Z., Özgüner, M., & Durmaz, Y. (2023). The evaluation of the effects of the COVID-19 pandemic on the Turkish manufacturing sector using AHP-TOPSIS methods. *Journal of Business & Industrial Marketing*, *38*(7), 1562-1573.

Petrovic, N., Jovanovic, V., Markovic, S., Marinkovic, D., & Petrovic, M. (2024). Multicriteria sustainability

assessment of transport modes: A European Union case study for 2020. *J. Green Econ. Low-Carbon Dev*, *3*(1), 36-44.

Rasmussen, A., Sabic, H., Saha, S., & Nielsen, I. E. (2023). Supplier selection for the aerospace and defense industry through MCDM methods. *Cleaner Engineering and Technology*, *12*, 100590.

Sakarya, Ş., & Budak, M.Y. (2022). Covid-19 Pandemisi Sürecinde BİST Perakende Ticaret Sektöründe Faaliyet Gösteren Şirketlerin Finansal Performanslarının Geliştirilmiş Entropi Temelli TOPSIS Yöntemi ile Belirlenmesi. *Uluslararası Muhasebe ve Finans Araştırmaları Dergisi*. 4(1), 17–39.

Şenol, A. (2023). Covid-19 Salgını Sürecinde Borsa İstanbul'da İşlem Gören Sağlık İşletmelerinin Finansal Göstergeler ile TOPSIS Yöntemiyle Değerlendirilmesi. *Elektronik Sosyal Bilimler Dergisi*, *22*(88), 1445-1459.

Temel, E., & Çakır, U. (2022). Covid-19 salgınının tekstil sektöründeki işletmelerin finansal performanslarına etkilerinin TOPSIS yöntemiyle analizi: BİST örneği. *Afyon Kocatepe Üniversitesi Sosyal Bilimler Dergisi*. 24(4), 1446-1466.

Tezsürücü Coşansu, D., & Okursoy, A. (2022). Financial Performance Analysis of Retail Trade Firms Registered in BIST with FUCOM Based VIKOR Method. Alphanumeric Journal, 10(2), 223-235. https://doi.org/10.17093/alphanumeric.1205322

Wang, C. N., Pan, C. F., Nguyen, V. T., & Husain, S. T. (2022). Sustainable supplier selection model in supply chains during the COVID-19 pandemic. *Computers, Materials and Continua*, *70*(2), 3005-3019.

WTO, World Trade Organization (2021). World Trade Review 2021. https://www.wto.org/english/res_e/statis_e/wts2021_e/wts2021_e.pdf(Accessed on 29.12.2023)

Wu, J. (2011). Asymmetric roles of business ties and political ties in product innovation. *Journal of Business Research*, *64*(11), 1151–1156.

Yaslıdağ, B. (2018). *Finansal Yönetim ve Finansal Analiz.* Ankara: Seçkin Yayıncılık

Yazdani, M., Zarate, P., Kazimieras Zavadskas, E., & Turskis, Z. (2019). A combined compromise solution (CoCoSo) method for multi-criteria decision-making problems. *Management decision*, *57*(9), 2501-2519.

Yücel, S., & Arslan, H. M. (2021). Gri İlişkisel Analiz ve Multi Moora Yöntemleri ile Borsa İstanbul'da İşlem Gören Savunma Sanayi Sektörünün Finansal Performansının Değerlendirilmesi, *Düzce Üniversitesi Sosyal Bilimler Dergisi*, 11(1), 36-57.

Zhang, H., Gu, C. L., Gu, L. W., & Zhang, Y. (2011). The evaluation of tourism destination competitiveness by TOPSIS & information entropy–A case in the Yangtze River Delta of China. *Tourism Management*, *32*(2), 443–451.

「Research Article」

InTraders International Trade Academic Journal

e-ISSN: 2667-4408 **www.intraders.org**

Volume: 7
Issue : 2

Received : 1 July 2024
Revision : 13 December 2024
Accepted : 19 December 2024
DOI: 10.55065/intraders.1508696

The Effect Of Digital Technologies On Financial Inclusion: The Case Of The Emerging European Economies[1]

Hilal OK ERGÜN[2]

Abstract

The study aims to empirically research the effect of digital technologies on financial inclusion. The paper examined emerging European countries and discussed the period from 2010-2019. A panel data analysis was performed. Six different panel data models were constructed. The number of bank branches per 100.000 people and the number of debit cards per 1.000 people are used in the models as indicators of financial inclusion. Fixed broadband subscriptions per 100 people, active mobile broadband subscriptions per 100 people, and the proportion of Internet users are used as indicators of digital technologies. The estimation of the models confirmed that digital technologies have a significant and negative effect on the number of bank branches per 100.000 people and a significant and positive effect on the number of bank cards per 1.000 people. According to results the utilize of digital technologies has a positive effect on financial inclusion, especially in the banking sector. This situation will allow countries to improve the degree of financial inclusion.

Keywords: *Financial Inclusion, Digital Technologies, Panel Data Analysis*

JEL Codes: G20, G21, G29

INTRODUCTION

Researchers, policymakers, and those working in the area debate the issue of financial inclusion. Mainly characterized by access to credit, the concept of financial inclusion refers, from a broad viewpoint to the facilities of formal financial services at purchasable prices for all (Siddik et al., 2015).

The deficiency of accessibility, affordable, and convenient financial services has always been a universal issue. According to forecasts, around 2.9 billion people worldwide cannot access traditional banking and financial services (Lapukeni, 2015). Financial inclusion is seen as a crucial element in improving the living standards of low-income people. According to Lapukeni (2015), enhanced access to financial services contributes to deprivation remission by lowering frailty, improving the efficiency of micro, small, and medium enterprises, and promoting the formalization of firms. Enhanced access to financial services has an affirmative effect on economic growth and financial stability, both at the micro and macro levels. Enhanced financial inclusion helps to cover the emptiness in financial infrastructure for underserved individuals, especially in countries where the distance and time costs of banking services are too high (Andrianaivo & Kpodar, 2011). To ensure that all sections of society can benefit from banking services, it is necessary to use technology to create channels to

[1] There is not a conflict of interest.

[2] Asst. Prof. Dr. Trabzon University, Beşikdüzü Vocational School, hilalok@trabzon.edu.tr, OI: 0000-0002-1454-3677, Contribution rates to the study 100 %.

reach unbanked individuals and branch networks (Bhargava et al., 2014). Information and communication technologies (ICT), particularly the Internet, act a crucial role in the economy, particularly in improving financial services (Akpa & Asongu, 2023). With the use of the Internet in all aspects of life and easier access to the Internet, the potential for access to the required financial resources has emerged. The Internet serves as an active catalyst for technology and innovation. At this point, it is increasingly becoming the central axis of the digital economy, supporting social and economic growth (Adeoye & Alenoghena, 2019). In this context, Akpa and Asongu (2023) argue that improving the provision of Internet services can increase the qualification of financial services and decrease the gap between clients and financial organizations. Therefore, using the Internet and mobile services has the probable to ease access to financial services presented by financial institutions.

Technological innovation is important in overcoming barriers and providing access to low-cost financial services in developing countries. Mobile banking applications are an encouraging element of financial inclusion, and using mobile devices facilitates financial inclusion by facilitating financial transactions (Falaiye et al., 2024). According to Nnaomah et al. (2024), promoting mobile money and digital payment systems is an important step towards financial inclusion in area where traditional banking substructure is inadequate. These digital platforms enable access to financial services for people except from the financial system and demonstrate the power of technology. In this context, Rumondang et al. (2020) emphasize that spreading cell phones can develop access to and utilize of financial services in the banking sector. Furthermore, they showed that internet penetration could also be essential in supporting branchless banking in developing countries.

Particularly in developing countries, infrastructure problems in providing Internet and mobile services and the effect of Internet-based services on financial inclusion are among the issues studied. Therefore, this article examines the impact of Internet and mobile infrastructure services, i.e., the utilize of digital technologies, on financial inclusion in the context of emerging European economies. Accordingly, the study's introduction is followed by a literature review. Then, the aim, dataset, and methodology used to analyse the study are mentioned. The subsequent section presents the findings acquired from the analysis. This study is finished with the conclusion part.

LITERATURE REVIEW

The literature continues to discuss the feature influencing financial inclusion. In the studies reviewed, the nexus between financial inclusion and Internet and mobile services was addressed in terms of both digital and information technologies. In this context, an essential part of the studies on this topic is listed.

Andrianaivo and Kpodar (2011) found that in African countries, the spread of ICTs - especially the spread of cell phones - contributes significantly to financial inclusion and economic growth. Evans (2012) reached a

similar conclusion in the African context and concluded a positive nexus between Internet and mobile phone utilize and financial inclusion. In other words, the author concludes that increasing Internet and mobile phone use increases financial inclusion. Diniz et al. (2012) also concluded that successful experiments with financial inclusion in emerging markets can be attributed to the utilize of ICT-enabled branchless banking. According to Lapukeni (2015), the number of mobile phone connections in Africa is growing faster than financial inclusion. Within this context, the development of ICT can increase the grade of financial inclusion via mobile financial services. When investigating the influence of technological infrastructure on financial inclusion in Ghana, Agyekum et al. (2016) found that higher internet density positively affect the degree of financial inclusion of households. Nwafor (2018) also analysed the nexus between internet density and financial inclusion in Nigeria and found that Internet density impacts financial inclusion. Shen et al. (2018) found the mediating influence of financial knowledge and internet intensity on the utilize of digital products. Their study concludes a significant and affirmative correlation among the utilize of digital financial products and financial inclusion in China.

Lenka and Barik (2018) examined the impact of mobile phone and internet usage on financial inclusion in SAARC countries. They identified a positive nexus between the growth in the grade of financial inclusion and the increase in mobile phone and internet services. Another paper that found a affirmative correlation among the Internet and financial inclusion is that of Adeoye and Alenoghena (2019) for Nigeria. In this context, the study recommends investing in a more appropriate and modern telecommunications and Internet infrastructure to reduce costs and increase the availability of the Internet. Mushtaq and Bruneau (2019) found that mobile phone penetration in low- and middle-income countries can promote financial inclusion. In conclusion, they found an affirmative nexus between ICT and financial inclusion. They also concluded that ICTs can contribute to reducing poverty and income inequality by promoting financial inclusion.

Another study by Hussein (2020) found that mobile phone and Internet use is affirmatively associated with financial inclusion. The author deduced that Egypt has the inferior degree of financial inclusion between Arab and African countries. Chatterjee (2020) found an affirmative correlation between financial inclusion and ICT in 41 countries. The author also found in the study that ICT can be utilized as a tool to enhancement the level of financial inclusion. In the study completed by Siddik et al. (2020) in the Bangladesh sample, it was determined that improved access to and utilize of mobile banking services positively influences the level of financial inclusion. Shen et al. (2020) also found in their Chinese study that there is no primary link between financial inclusion and internet use but a mediating effect through financial education.

Bayar et al. (2021), who researched access to financial institutions and financial markets, found that the widespread use of cell phones and the Internet positively influences financial inclusion in the short and long periods. Considering Wellalage et al. (2021), ICTs raise the grade of financial inclusion of entrepreneurs in Africa. Pradhan et al. (2021) concluded in their empirical study in 20 Indian states that there is a short- and

long-term nexus between information and communication substructure, financial inclusion, and economic growth. They also emphasized that there is a strong connection between the promotion of ICT substructure and financial inclusion scheme. They also noted that economic growth and financial inclusion will contribute to more investment in ICT.

Financial services offered through mobile phones and the Internet have influenced how individuals and institutions conduct financial transactions. In this context, Fernandes et al. (2021) encountered that financial services offered via digital platforms affect financial inclusion. Ajouz and Abuamria (2021) studied the impact of mobile payments on women's financial inclusion in Palestine. In general, the paper found that increasing mobile payments raises financial inclusion. Also, they concluded that the increased utilize of mobile payments improves women's financial situation. Yue et al. (2022) also found that the increasing utilization of digital finance increases participation in the credit market and facilitates access. Kouladoum et al. (2022) researched the nexus between digital technologies and financial inclusion for 43 sub-Saharan African regions. They concluded that the increase in digital technologies raises the financial inclusion rate. Fauzia et al. (2022) examined whether ICT and financial inclusion can create synergies and improve environmental quality. In this context, it was emphasized that problems need to be addressed jointly. The presence of a long- and short-term nexus between ICT and financial inclusion was found by Tsimisaraka et al. (2023) in the context of 10 countries. In their study, Akpa and Asongu (2023) look at the quality of governance and find that policies that improve governance capabilities can help to combine internet substructure to improve internet usage and thus increase financial inclusion. This paper emphasizes that the low quality of the Internet in sub-Saharan Africa hampers and hinders the development of financial services. Alraja et al. (2023), who found that digital applications have an adverse effect on access to financial services, examined OECD countries in their study. In this context, it proposes that measures should be developed to strengthen consumer confidence in financial services. Daud and Ahmad (2023) found in their study using the dynamic panel method for 84 countries from 2011-2017 that financial inclusion and digital technologies affirmative impact economic growth. They also determined that countries' income levels act an essential role in the impact of digital technologies on financial inclusion. At the same time, Daud et al. (2024) found that digital technologies increase the level of financial inclusion and have a significant effect on eliminating gender disparities. Naveenan et al. (2024), who glanced at the issue of digital inclusion in relation to health outcomes, found as a result of their study that digital inclusion plays a regulatory act in the impact of financial inclusion on health results in developing countries. Widyastuti (2024) encountered that digital financial literacy and demographic aspects for example age, income, and occupation are effective for digital financial inclusion in Indonesia. Mumtaz (2024), who looked at financial inclusion in terms of participation in agriculture, found that in Pakistani households, participation in agriculture was higher among those who used cell phones and smartphones and that financial inclusion increased

agricultural participation. Zou et al. (2024), in their paper conducted in 30 regions in China, found that digital finance increases economic resilience and is also present at the spatial level.

Studies conducted in the literature in various countries conclude that mobile phones, the Internet, mobile services and practices, which are generally considered indicators of digital technologies, are associated with and positively influence financial inclusion. It was also noted that the concept of digital finance, which in the literature guides to the consideration of digital applications in the financial sector, has been studied in relation to various economic variables.

This study concentrates on the impact of digital technologies on financial inclusion about Internet and mobile phone services. Its unique aspect is its focus on emerging European countries. The study developed more than one model and examined the impact of digital technologies on financial inclusion. However, it is diverse from the studies in the literature in terms of the years and variables examined.

AIM, DATA SET, METHOD

This paper investigates the effect of digital technologies on financial inclusion in emerging European countries from 2010 to 2019 using panel data analysis. According to the World Bank, all adults in the absence of a bank account live in developing countries. In this case, financial inclusion is seen as a critical factor in reducing poverty and increasing welfare. Therefore, considering the studies in the literature, emerging economies other than high-income countries in Europe were considered. In addition, since data from 12 different countries and 10 years were utilized in the study, panel data analysis was preferred. It was decided to use this method because panel data analysis allows the analysis of data from more than one country and more than one year. This way, findings for all observations regarding the relevant country groups and years can be analyzed, and comments can be made for all countries and years.

The method of estimating panel data models consisting of cross-sectional and time-dimensional data is called panel data analysis (Yerdelen-Tatoğlu, 2021, p.4). Models estimated with panel data are also called panel data regression models, and two basic approaches are used in estimating these models: fixed effects and random effects (Çınar, 2021, p.15). The fixed effects model has different values for each cross-sectional unit. Therefore, the fixed coefficient can be a fixed variable (Yerdelen-Tatoğlu, 2021, p.80). There may be cases where the units in the sample are randomly chosen, and differences between units can also be random. This is called "random differences" (Yerdelen-Tatoğlu, 2021, p.103). In this context, panel data analysis was utilized in the study because more than one country (unit) and more than one time (year) effect can be considered together, and the appropriate estimation approach was decided as a consequence of the tests.

The symbols of the variables and the data source of the data series used are in view in Table 1.

Table 1. Details of Variables

Symbol	Identifications	Sources	References
bank	Number of commercial bank branches per 100.000 adults	FAS / IMF	Tsimisaraka et al. (2023), Li et al.(2022), Kouladoum et al. (2022).
card	Number of debit cards per 1.000 adults	FAS / IMF	Honahan (2006), Espinosa-Vega et al.(2020)
fixed	Fixed broadband subscriptions per 100 people	ITU	Naveenan et al.(2024), Mushtaq & Bruneau (2019), Kouladoum et al. (2022).
Internet	The rate of people utilizing the Internet (%)	ITU	Naveenan et al. (2024), Mushtaq & Bruneau (2019), Lenka & Barik (2018), Kouladoum et al. (2022).
mobile	Active mobile broadband subscriptions per 100 people	ITU	Naveenan et al.(2024), Mushtaq & Bruneau (2019), Lenka & Barik (2018), Kouladoum et al. (2022).
population	Population growth (% annual)	WDI / WB	Evans (2012), Daud & Ahmad(2023), Daud et al. (2024)

**FAS: Financial Access Survey, IMF: International Monetary Fund, ITU: International Telecommunication Union, WB: World Bank, WDI: World Development Indicators*

When analysing Table 1, it becomes clear that the variables in the paper come from different data sources. The study uses the number of commercial bank branches per 100.000 adults –*bank*- and bank cards per 1.000 adults -*card*- to represent financial inclusion. The data reaches from the International Monetary Fund's Financial Access Survey.

In the paper, digital technologies were measured by indicators for information and communication technologies. Data on fixed broadband subscriptions per 100 people -*fixed*-, the rate of people utilizing the Internet -*Internet*-, and active mobile broadband subscriptions per 100 people -*mobile*- were used to represent digital technologies. The data reaches from from the International Telecommunication Union. Data on population growth -*population*- were gathered from the World Bank's World Development Indicators database. These are utilized in the study and were chosen founded on studies from the literature (Akpa & Asongu, 2023; Alraja et al., 2023; Al-Smadi, 2022; Bayar et al., 2021; Chatterjee, 2020; Li et al., 2022). The data for these variables are annual and cover 2010-2019. The emerging European countries that form the study sample are North Macedonia, Russia, Albania, Bosnia and Herzegovina, Montenegro, Bulgaria, Poland, Romania, Turkey, Hungary, Moldova and Serbia.

In this study, six different panel data models are constructed to search the effect of digital technologies on financial inclusion in a detailed empirical context. These models are as follows:

$$bank_{it} = \alpha_{it} + \beta_1 fixed_{it} + \beta_2 population_{it} + u_{it} \quad (1)$$
$$bank_{it} = \alpha_{it} + \beta_1 internet_{it} + \beta_2 population_{it} + u_{it} \quad (2)$$
$$bank_{it} = \alpha_{it} + \beta_1 mobile_{it} + \beta_2 population_{it} + u_{it} \quad (3)$$
$$card_{it} = \alpha_{it} + \beta_1 fixed_{it} + \beta_2 population_{it} + u_{it} \quad (4)$$
$$card_{it} = \alpha_{it} + \beta_1 internet_{it} + \beta_2 population_{it} + u_{it} \quad (5)$$

$$card_{it} = \alpha_{it} + \beta_1 mobile_{it} + \beta_2 population_{it} + u_{it} \quad (6)$$

The panel data models constructed in the study are numbered as (1), (2), (3), (4), (5) and (6). As seen in the models, *banks and card*s are considered dependent variables for representing financial inclusion, and digital technologies, *fixed internet, and mobile* are considered independent variables. The *population* is used as a control variable in all models. i denotes countries, and t denotes years in the models. α is the constant term, β_1 and β_2 are the coefficients, and u is the error term.

During the analysis process, the data series of the variables utilized in the study were analyzed utilizing descriptive statistics. The statistics belonging to the variables were examined, and the appropriate model form was decided. After determining the form of the models, the estimation process was started. The Hausman test was performed to determine the appropriate estimator approach in estimating the models. After determining the appropriate estimator, unit and time effects test, multiple linearity, heteroskedasticity, autocorrelation, and inter-unit correlation assumptions were tested within the content of panel data analysis.

FINDINGS

The variables' data are analyzed in detail before the paper proceeds with estimating the models. Table 2 displays the descriptive statistics.

Table 2: Descriptive Statistics

Variable	bank	card	fixed	internet	mobile	population
Observations	120	119	120	119	119	120
Mean	32.158	921.086	17.09	61.943	53.160	-0.201
Standard deviation	12.788	467.183	5.951	12.638	30.712	0.707
Minimum	14.199	295.519	3.579	32.3	2.926	-1.805
Maximum	91.896	2631.426	32.935	89.972	185.779	1.701

Table 2 shows the mean value, the standard deviation, the number of observations, and the minimum and maximum values of the data series of the variables. Analyzing the number of observations, it is visible that the number of observations for the card, the Internet, and the mobile phone is 119, with one year missing. In this context, the study data is available as an unbalanced panel data set due to missing data.

When analyzing Table 2, the difference in the scale between the minimum and maximum issues of the data series for the card variable is striking. In this context, the *card* is analyzed in logarithmic form. In the following sections of the study, the card is symbolized as *lncard.*

After the data series of the variables were examined in detail, the estimation process of the models began. Table 3 offers the results obtained from the estimation of the models and the test results regarding the models' assumptions.

Table 3: Results

Model/Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent Variable: bank			Dependent Variable: lncard		
fixed	-0.58*			0.031*		
	(0.26)			*(0.00)*		
internet		-0.19*			0.011*	
		(0.06)			*(0.00)*	
mobile			-0.07*			0.004
			(0.03)			*(0.00)*
population	7.40*	6.13*	8.26*	-0.21*	-0.12*	-0.25*
	(2.38)	*(1.99)*	*(2.64)*	*(0.06)*	*(0.02)*	*(0.07)*
Fixed Term	43.71*	45.49*	37.80*	6.13	5.96	6.45
	(4.35)	*(3.90)*	*(1.63)*	*(0.00)*	*(0.06)*	*(0.05)*
R^2	0.37	0.37	0.34	0.71	0.85	0.65
F test	9.20	21.57	9.27	21.87	189.17	17.37
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
LR test	196.29	180.84	190.43	250.21	338.82	244.56
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Hausman Test	8.46	6.68	10.94	18.58	9.34	15.09
	[0.01]	[0.03]	[0.00]	[0.00]	[0.00]	[0.00]
Modified Wald	3731.03	1075.76	40332.5	3083.09	286.37	1448
test	[0.00]	[0.00]	4	[0.00]	[0.000]	[0.00]
			[0.00]			
Durbin -Watson	0.93	0.97	0.94	0.43	0.79	0.46
LBI	1.50	1.56	1.50	0.97	1.25	0.88
Pesaran	-0.92	-1.08	-1.945	-1.48	-1.13	0.37
	[0.35]	[0.27]	[0.051]	[0.14]	[0.25]	[0.71]
Friedman	5.33	6.95	4.15	5.68	7.90	7,511
	[0.91]	[0.80]	[0.96]	[0.89]	[0.72]	[0.75]
Mean VIF	1 .03	1.01	1.00	1.03	1.01	1.00

***Note 1** :*, significant at 1% level*
***Note 2:** Values in parentheses show standard errors.*
***Note 3**: Square brackets explain probability values.*

The results of 6 different models and the issue of the acceptance tests are shown in Table 3. Accordingly, the models' mean-variance increment factor (VIF) was analyzed to investigate whether there is a multicollinearity issue between the independent variables in the models. According to the mean VIF values of the models in Table 3, there is no multicollinearity problem in the models. The presence of heteroscedasticity in the models was tested utilizing the modified Wald test. Consequence of this test expressed the presence of heteroscedasticity in all models. The Durbin-Watson and LBI tests were performed to check for autocorrelation. An autocorrelation was found in the test results. A further assumption is that the correlation between the units was tested using Pesaran and Friedman tests. The results of the Pesaran and Friedman tests for all models show no problem with the correlation between the units in the models. As a result, auto correlation and heteroscedasticity were found in all models.

Likelihood ratio (LR) tests were utilized to test for unit and time effects in the models. The test result is that only one unit effect (country) is found in all models. The Hausman test was used to determine the estimator for

the models. Consequence of the Hausman test, the estimator for fixed effects is consistent. Therefore, the estimator of Arellano, Froot, and Rogers, which is robust to autocorrelation and heteroscedasticity, is used with a fixed effects approach.

The independent variables, *fixed, Internet,* and *mobile*, have a statistically significant and negative impact on the *bank* at the 1% level according to the estimation consequences of the models (1), (2), and (3). A rise in the fixed by 1 unit decreases the bank by 0.58 units. An increase in the Internet and mobile leads to a decrease in the bank. In this direction, it can be said that there is a negative effect between the bank, which is the dependent variable in the models, and the independent variables *fixed, Internet,* and *mobile*. In addition, the population considered a control variable in the corresponding models has a statistically significant and positive effect on the bank at the 1% level. When analyzing the F-test results of the models, it is found that all models are significant at the 1% level. The R^2 value, which expresses the explanatory nature of the models, was calculated at 37% for models (1), (2) and 34% (3).

According to the estimation results of models (4), (5), and (6), *fixed, Internet*, and *mobile*, which are included as independent variables in the models, have a statistically significant and positive effect on *lncard* at the 1% level. Thus, an increase in *fixed, Internet*, and *mobile* increases *lnkart*, albeit to a small extent. In this direction, it can be said that there is a positive effect among the dependent variable –*lncard*- and the independent variables -*fixed, Internet, and mobile*-. The effect of population, considered a control variable, on the *lncard* variable is also statistically significant at the 1% level in the models. When analyzing the F-test results of models (4), (5), and (6), it is found that all models are significant at the 1% level. The R^2 values are calculated as 71% (in model 4), 85% (in model 5), and 65% (in model 6).

CONCLUSION

Physical distance, cost, and time pressure are the main obstacles to accessing financial products and services. With the concretion of digital technologies into the financial world, the banking sector's product range has diversified, offering customers faster access and lower costs. The fact that financial institutions offer products and services via the Internet, mobile infrastructures, and digital technologies can facilitate access to and utilization of financial services. From this perspective, the contribution of the use of the Internet and mobile technologies - in other words, digital technologies - to financial inclusion is the subject of this paper.

This paper aims to empirically research the effect of digital technologies on financial inclusion. This study analyzes the European emerging markets, including Turkey. The study covers 12 European countries and analyzed the term from 2010 to 2019. A panel data analysis is utilized in the study. In addition, six different panel data models are constructed in this study. The number of bank branches per 100.000 adults and debit cards per 1.000 adults are utilized as dependent variables in the models. These variables are often used in the

literature as indicators of financial inclusion. Digital technologies are measured by information and communication technologies. Data on fixed broadband connections per 100 people, active mobile broadband connections per 100 people and the rate of people who utilize the Internet are included in the models as independent variables. The population growth rate is used as a control variable.

In the study, models are estimated utilizing panel data analysis. As a consequence of the decision tests for the estimators, it is first established that the fixed effects approach is consistent. In this context, tests were performed on the assumptions of heteroscedasticity, autocorrelation, and correlation between units using the fixed effects approach. Consequence of the tests, problems with heteroscedasticity and autocorrelation were found in all models. Therefore, the estimator of Arellano, Froot, and Rogers, which is robust to heteroscedasticity and autocorrelation, is utilized to estimate the model.

One of the outcome of the models is that the number of bank branches per 100,000 adults decreases when the number of fixed broadband connections per 100 adults, active mobile broadband subscriptions per 100 people and the proportion of internet users increase. This shows that using mobile and Internet services reduces the need for physical access to banks. The intensive use of mobile and Internet services by private individuals has also enabled banks to offer their customers solutions via online or mobile applications instead of physical branches.

Further evidence for the estimation of the models is that the number of debit cards per 1.000 people increases with the number of fixed broadband subscriptions per 100 people, the number of active mobile broadband subscriptions per 100 people, and the proportion of Internet users. This result shows that the number of people with bank accounts and the number of bank accounts has increased with the use of mobile and internet services. Digital services for instance mobile phones and the Internet can increase the number of debit cards, as they can open accounts quickly and easily via the bank's mobile and online applications without time and location restrictions. This is also supported by the fact that the provision of bank cards is fast and inexpensive, thanks to online and mobile applications.

In this context, the study recommends improving digitalization policy by attaching importance to information and communication infrastructure in European countries that are in the position of emerging economies. At this point, raising awareness of digital technologies and promoting their use is essential. This way, digital products and services can be diversified and available to individuals. At this point, training programs on digital financial services should also be developed. Increasing the degree of financial inclusion, it is also important to develop strategies to enhance individuals' financial literacy and ability to use digital products. To this end, including financial and digital literacy programs in education curricula is important. Policymakers should play a supportive and encouraging role in projects that include digital innovations to improve the level of financial

inclusion.

In summary, this study issues empirical evidence that the utilize of digital technologies supports the goal of financial inclusion, i.e. providing individuals and institutions with fast and affordable access to the products and services of the financial system without time and location restrictions. The paper's results support the study's findings by Kouladoum et al. (2022) and Daud and Ahmad (2023).

The findings obtained from the study's empirical analysis reveal the study's theoretical contributions while also presenting practical contributions in drawing attention to the importance of digital applications such as the Internet and mobile technologies in accessing the financial system. Accordingly, investments should be encouraged to strengthen the infrastructure of digital technologies and increase awareness on the subject.

Future studies can examine the effect of digital technologies on financial inclusion in different countries or groups of countries, or empirical studies can be conducted with different indicative of financial inclusion.

In addition, the study's model can be reconsidered using different variables related to digital literacy, computer use, mobile banking, and e-commerce applications.

The study's results depend on the sample group, the period, and the indicators considered, which shows its limitations. The results may vary depending on the different samples, time periods, or variables.

REFERENCES

Adeoye, B.W., & Alenoghena, R.O.(2019).Internet usage, financial inclusion, and economic growth in Nigeria. *Ovidius University Annals, Economic Sciences Series*, 19(2).1-12. https://stec.univ-ovidius.ro/html/anale/RO/wp-content/uploads/2020/02/Section%20I/1.pdf

Agyekum, F., Locke, S., & Hewa-Wellalage, N. (2016). Financial inclusion and digital financial services: Empirical evidence from Ghana. *MPRA Paper*, 82885, https://mpra.ub.uni-muenchen.de/82885/1/MPRA_paper_82474.pdf

Akpa, A.F., & Asongu, S. A. (2023).The role of governance in the effect of the Internet on financial inclusion in Sub-Saharan Africa. *European Xtramile Centre of African Studies (EXCAS) Working Paper*, 23(4). http://dx.doi.org/10.2139/ssrn.4315622

Al-Smadi, M. O. (2022). Examining the relationship between digital finance and financial inclusion: Evidence from MENA countries. *Borsa Istanbul Review,* 23(2),464-472. https://doi.org/10.1016/j.bir.2022.11.016

Andrianaivo, M., & Kpodar, K. (2011). ICT, financial inclusion, and growth: Evidence from African countries, *IMF Working Paper*, 11(73), 1-45. https://doi.org/10.5089/9781455227068.001

Alraja, M.N, Alshubiri, F., Khashab, B.M., & Shah, M. (2023).The financial access, ICT trade balance, and dark and bright sides of digitalization nexus in OECD countries. *Eurasian Economic Review*, 13, 177–209. https://doi.org/10.1007/s40822-023-00228-w.

Ajouz, M. A. M., & Abuamria,F. M J. (2021). Does mobile payment promote financial inclusion among Palestinian women: A quantitative approach through structural equation modeling. *Journal of Islamic Finance*, 10(2), 67–78. https://journals.iium.edu.my/iiibf-journal/index.php/jif/article/view/597/268

Bayar, Y., Gavriletea, M. D., & Păun, D. (2021). Impact of mobile phones and internet use on financial

inclusion: empirical evidence from the EU post-communist countries. *Technological and Economic Development of Economy*, 27(3), 722–741. https://doi.org/10.3846/tede.2021.14508

Bhargava, M., Bhargava, S., & Bhargava, R. K. (2014). Information and communication technology (ICT): The financial inclusion enabler. *International Multidisciplinary Research Journal*, 4(8), 1-12. SSRN: https://ssrn.com/abstract=2502739

Chatterjee, A. (2020). Financial inclusion, information and communication technology diffusion, and economic growth: A panel data analysis, *Information Technology for Development*, 26(3), 607–635. https://doi.org/10.1080/02681102.2020.1734770

Çınar, M. (2021). *Panel veri ekonometrisi stata ve eviews uygulamalı*.(1th ed) Ekin Releases.

Daud, S. N. M., & Ahmad, A. H. (2023). Financial inclusion, economic growth and the role of digital technology, *Finance Research Letters*, 53, 103602. https://doi.org/10.1016/j.frl.2022.103602

Daud, S. N. M., Ahmad, H. & Trinugroho, I. (2024). Financial inclusion, digital technology, and economic growth: Further evidence, *Research in International Business and Finance*, 70, 102361. https://doi.org/10.1016/j.ribaf.2024.102361.

Diniz, E., Birochi, R., & Pozzebon, M. (2012). Triggers and barriers to financial inclusion: The use of ICT-based branchless banking in an Amazon county. *Electronic Commerce Research and Applications*, 11(5), 484-494. https://doi.org/10.1016/j.elerap.2011.07.006

Espinosa-Vega, M. Shirono, K. Villanova, H.C., Chhabra, E., Das, B., & Fan, Y. (2020). Measuring financial access-10 years of the ımf financial access survey. *International Monetary Fund***,** 20(8),1-44. https://www.imf.org/en/Publications/Departmental-Papers-Policy-Papers/Issues/2020/05/12/Measuring-Financial-Access-10-Years-of-the-IMF-Financial-Access-Survey-49298

Evans, O. (2012). Connecting the poor: The Internet, mobile phones and financial inclusion in Africa. *Digital Policy, Regulation and Governance*, 20(6), 568-581. https://doi.org/10.1108/DPRG-04-2018-0018

Fauzia, L.R., Trinugroho, I., & Suryanto. (2022). The financial inclusion-environmental quality nexus: Do information and communication technologies make a difference? *International Journal of Business and Society*, 23(3), 1588-1599. https://doi.org/10.33736/ijbs.5185.2022

Falaiye, T., Elufioye, O. A., Awonuga, K. F., Ibeh, C. V., Olatoye, F. O., & Mhlongo, N. Z. (2024). Financial inclusion through technology: A review of trends in emerging markets. *International Journal of Management & Entrepreneurship Research*, *6*(2), 368-379. https://doi.org/10.51594/ijmer.v6i2.776

Fernandes, C., Borges, M.R., & Caiado, J. (2021). The contribution of digital financial services to financial inclusion in Mozambique: An ARDL model approach, *Applied Economics*, 53 (3), 400-409. https://doi.org/10.1080/00036846.2020.1808177

Honohan, P. (2006). Household financial assets in the process of development, *World Bank Policy Research Working Paper* ,3965, https://doi.org/10.1093/acprof:oso/9780199548880.003.0013

Hussein, H. (2020). The impact of financial technology on financial inclusion: The case of Egypt. *Journal of Economics and Finance*,11(6).35-51. https://www.iosrjournals.org/iosr-jef/papers/Vol11-Issue6/Series-2/E1106023551.pdf

International Monetary Fund, Financial Access Survey, https://data.imf.org/?sk=e5dcab7e-a5ca-4892-a6ea-598b5463a34c&sid=1390030109571, (05.06.2023)

International Telecommunication Union, https://www.itu.int/en/Pages/default.aspx, (05.06.2023)

Kouladoum, J.C., Wirajing, M.A.K., & Nchofoung, T.N. (2022). Digital technologies and financial inclusion in Sub-Saharan Africa. *Telecommunications Policy*, 46, 102387.

https://doi.org/10.1016/j.telpol.2022.102387

Lapukeni, A. F. (2015). Financial inclusion and the impact of ICT: An overview. *American Journal of Economics*, 5(5): 495-500. http://article.sapub.org/10.5923.j.economics.20150505.09.html

Lenka, S. K., & Barik, R.(2018). Has the expansion of mobile phone and internet use spurred financial inclusion in the SAARC countries? *Financial Innovation*, 4(5),1–19. https://doi.org/10.1186/s40854-018-0089-x

Li, Z., Chen, B., & Lu, S. (2022). The impact of information and communication technology on financial inclusion—based on a global perspective. *AIMS Mathematics*, 7(12): 20930–20961. https://doi.org/10.3934/math.20221147

Mumtaz, M. Z. (2024). Financial inclusion, digital finance and agricultural participation. *Agricultural Finance Review*,2(3*)*, 84,393-113.https://doi.org/10.1108/AFR-10-2023-0132.

Mushtaq, R., & Bruneau, C. (2019). Microfinance, financial inclusion, and ICT: implications for poverty and inequality. *Technology in Society*, 59,1-19. https://doi.org/10.1016/j.techsoc.2019.101154

Naveenan, R.V., Liew, C.Y., & Kijkasiwa, P. (2024). Nexus between financial inclusion, digital inclusion and health outcomes: Evidence from developing economies. *Social Indicators Research*, 174, 367–4088. https://doi.org/10.1007/s11205-024-03391-y

Nnaomah, U. I., Aderemi, S., Olutimehin, D. O., Orieno, O. H., & Ogundipe, D. O. (2024). Digital banking and financial inclusion: a review of practices in the USA and Nigeria. *Finance & Accounting Research Journal*, 6(3), 463-490. https://doi.org/10.51594/farj.v6i3.971

Nwafor, M. C. (2018). Nexus between Internet penetration and financial inclusion in Nigeria. *International Journal of Research and Innovation in Social Science*, 2(10).220-225. http://eprints.gouni.edu.ng/984/1/Nexus%20between%20Internet%20Penetration%20and%20Financial.pdf

Pradhan, R. P., Arvin, M. B., Nair, M. S., Hall, J. H., & Bennett, S. E. (2021). Sustainable economic development in India: The dynamics between financial inclusion, ICT development, and economic growth. *Technological Forecasting & Social Change*, pp. 169, 1–19. https://doi.org/10.1016/j.techfore.2021.120758

Rumondang, I., Yusgiantoro, I. B., & Rofifa, J. S. (2020). Effects of information and communication technology on financial inclusion: Evidence across emerging and developing countries. *Otoritas Jasa Keuangan*, 1-32. https://www.ojk.go.id/id/data-dan-statistik/research/working-paper/Documents/OJK_WP.20.08%20.pdf

Shen Y., Hueng, C. J., & Hu, W. (2020). Using digital technology to improve financial inclusion in China, *Applied Economics Letters*, 27(1), 30–34. https://doi.org/10.1080/13504851.2019.1606401

Shen, Y., Hu, W., & Hueng, C. J. (2018). The effects of financial literacy, digital financial product usage, and internet usage on financial inclusion in China. *MATEC Web of Conferences* 05012 (228), 1–6. https://doi.org/10.1051/matecconf/201822805012

Siddik, M. N. A., Sun, G., Yanjuan, C., & Kabiraj, S. (2014). Financial inclusion through mobile banking: A case of Bangladesh. *Journal of Applied Finance & Banking*, 4(6), 109-136. https://www.scienpress.com/Upload/JAFB/Vol%204_6_7.pdf

Tsimisaraka, R.S.M., Xiang, L., Andrianarivo, A.R.N.V., Josoa, E.Z., Khan N., Hanif, M.S., K., A., & Limongi, R. (2023). Impact of financial inclusion, globalization, renewable energy, ICT, and economic growth on CO_2 emission in OBOR countries. *Sustainability*, pp. 15, 1–16. https://doi.org/10.3390/su15086534

Yerdelen-Tatoğlu, F. (2021). *Panel veri ekonometrisi: Stata uygulamalı* (6th ed). Beta Releases.

Wellalage, N. H., Hunjra, A. I., & Manita, R. Locke, S. M. (2021). Information communication technology and financial inclusion of innovative entrepreneurs. *Technological Forecasting & Social Change*, 163, 1-13. DOI: 10.1016/j.techfore.2020.120416

World Bank, World Development Indicators, (2023). https://databank.worldbank.org/source/world-development-indicators (05.06.2023)

World Bank, Financial Inclusion Overview, (2024). https://www.worldbank.org/en/topic/financialinclusion/overview (13.12.2024).

Widyastuti, U., Respati, D. K., Dewi, V. I., & Soma, A. M. (2024). The nexus of digital financial inclusion, digital financial literacy and demographic factors: lesson from Indonesia. *Cogent Business & Management*, *11*(1). https://doi.org/10.1080/23311975.2024.2322778

Yue, P., Korkmaz, A. G., Yin,Z., & Zhou, H. (2022). The rise of digital finance: Financial inclusion or debt trap? Finance Research Letters, 47, 102604**.** https://doi.org/10.1016/j.frl.2021.102604

Zou, X., Dai, W., & Meng, Ş. (2024). The impacts of digital finance on economic resilience, *Sustainability*, 16, 7305. https://doi.org/ 10.3390/su16177305

InTraders Academic Platform

InTraders Journal topics; international trade, tourism and economy based topics.

InTraders Conference topics based on Social Sciences and Education topics; Sociology, Psychology, Communication Studies, Journalism, Public Relations, Advertising, Social Work, Philosophy, Economics, Business Administration, Labor Economics, Human Resources, International, Finance, Econometrics, PoliticalScience and Public Administration, Law, Islamic Economics and Finance, Management Informatics Systems, Health Management, International Trade, Logistics, Distance Education, Higher Education,
Teaching and Learning, E-learning, Lifelong Learning

"We caress the souls of researchers."

InTraders Academic Platform

https://www.intraders.org

Autumn Conferences

https://www.intraders.org/october/

Winter Conferences

https://www.intraders.org/icse/

Spring Conferences

https://www.intraders.org/may/

Academic Journal

https://dergipark.org.tr/en/pub/intraders

Conference Alerts

https://www.conferencealertsintraders.com

InTraders International Trade Academic Journal, Volume 7, Issue 2

December 2024, e-ISSN-2667-4408

www.intraders.org