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Son On Yıldaki ÇKKV Yöntemlerinin Bibliyometrik Analizi: WASPAS, MABAC, EDAS, CODAS, COCOSO ve MARCOS

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ABSTRACT

In recent years, multi-criteria decision-making (MCDM) techniques have expanded the corpus of existing techniques and demonstrated their effectiveness with applications in various fields. In this study, bibliometric analysis was conducted to evaluate the research trend on new ranking-based MCDM methods in the last decade, namely WASPAS, MABAC, EDAS, CODAS, COCOSO, and MARCOS. The various keyword combinations are searched on the Web of Science and the Scopus databases. Bibliometric analysis is carried out in R with the Biblioshiny app for the bibliometrix package. In total, 1,215 related publications are analyzed. The sources, authors, countries, and publications are examined in terms of production and total citation, and the most frequent keywords with trend topics are obtained. The summaries of the findings are as follows: The number of publications has increased over the years for all the methods. The most cited studies belong to the authors of the methods and fuzzy implementations related to the methods. For the author's impact and productivity, Zavadskas and Pamučar stand out. Turkey and India rank in the top five in terms of the number of publications produced on all methods. China is the most cited country for the three methods. According to keyword analysis, different research topics such as sustainability, renewable energy, optimization, supplier selection, hydrogen production and transport are investigated through these methods and other techniques are utilized such as SWARA, AHP, TOPSIS, Best-Worst, DEMATEL, MAIRCA, and CRITIC.

Anahtar Kelimeler:

Bibliyometrik Analiz
WASPAS,
MABAC,
EDAS,
CODAS,
COCOSO,
MARCOS

Jel Kodları:
C02 C30 C44

ÖZET

Son yıllarda, çok kriterli karar verme (ÇKKV) teknikleri mevcut tekniklerin korpusunu genişletmiş ve çeşitli alanlardaki uygulamaları ile etkinliklerini göstermiştir. Bu çalışmada, son on yılda WASPAS, MABAC, EDAS, CODAS, COCOSO ve MARCOS olmak üzere yeni sıralama tabanlı ÇKKV yöntemlerine ilişkin araştırma eğilimini değerlendirmek için bibliyometrik analiz yapılmıştır. Çeşitli anahtar kelime kombinasyonları, Web of Science ve Scopus veritabanlarında aranmıştır. Bibliyometrik analiz, bibliometrix paketine ait Biblioshiny uygulamasıyla R programında gerçekleştirilmiştir. Toplamda 1.215 ilgili yayın analiz edilmiştir. Kaynaklar, yazarlar, ülkeler ve yayınlar üretim ve toplam atıf açısından incelenmiş ve trend konuları ile en sık kullanılan anahtar kelimeler elde edilmiştir. Bulguların özetleri şu şekildedir: Tüm yöntemler için yayın sayısı yıllar içinde artmıştır. En çok atıf alan çalışmalar, yöntemlerin ve yöntemlerle ilgili bulanık uygulamaların yazarlarına aittir. Yazar etkisi ve üretkenliği incelendiğinde Zavadskas ve Pamučar öne çıkmaktadır. Türkiye ve Hindistan, tüm yöntemlerde üretilen yayın sayısı bakımından ilk beşte yer almaktadır. Çin, üç yöntem için en çok alıntı yapılan ülkedir. Anahtar kelime analizine göre bu yöntemlerle sürdürülebilirlik, yenilenebilir enerji, optimizasyon, tedarikçi seçimi, hidrojen üretimi ve nakliye gibi farklı araştırma konuları araştırılmakta ve SWARA, AHP, TOPSIS, Best-Worst, DEMATEL, MAIRCA ve CRITIC gibi diğer yöntemler de bu çalışmalarda kullanılmaktadır.

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1. INTRODUCTION

Every moment of life entails making decisions that involve many participants, including people, groups, and institutions. With many decision criteria and various decision alternatives, multiple criteria decision-making (MCDM) is a crucial component of modern decision science (Toloie-Eshlaghy & Homayonfar, 2011). Researchers from several countries have studied MCDM approaches since the 1950s when the foundations of modern MCDM techniques were established, and new MCDM techniques have been developed (Zavadskas et al., 2014).

Applications for MCDM methods include social work, project management, business and financial management, transportation and logistics, environmental management, and many more fields (Toloie-Eshlaghy & Homayonfar, 2011). The criteria are weighted and/or the alternatives are ranked using MCDM methods. In the last decade, MOOSRA (Multi-objective Optimization on the Basis of Simple Ratio Analysis) (Das et al., 2012), WASPAS (Weighted Aggregated Sum Product Assessment) (Zavadskas et al., 2012), MAIRCA (MultiAtributive Ideal-Real Comparative Analysis) (Pamučar et al., 2014), MABAC (Multi-Attributive Border Approximation area Comparison) (Pamučar & Ćirović, 2015), EDAS (Evaluation based on Distance from Average Solution) (Keshavarz Ghorabaee et al., 2015), CODAS (COmbinative Distance-based ASsessment) (Keshavarz Ghorabaee et al., 2016a), SECA (Simultaneous Evaluation of Criteria and Alternatives) (Keshavarz Ghorabaee et al., 2018), COCOSO (COmbined COmpromise SOlution) (Yazdani et al., 2018), Stratified MCDM (Asadabadi, 2018), MARCOS (Measurement of Alternatives and Ranking according to COmpromise Solution) (Stević et al., 2020a), and DNMA (Double Normalization-based Multiple Aggregation) (Liao & Wu, 2020) have been introduced as novel MCDM methods for evaluation of performance scores and ranking of alternatives.

Due to the increasing number of publications in the literature, it has become almost impossible to keep up with all the research on the topic, field, or method of interest. Bibliometric analysis has been used in the literature to provide "a quantitative analysis of written publications", and covers a variety of categories of materials such as journal articles, books, theses, etc. (Ellegaard & Wallin, 2015, p.1810). The growth, usability, and accessibility of bibliometric software, scientific databases, as well as the interdisciplinary application of the bibliometric methodology, all contribute to the popularity of analysis (Donthu et al. 2021). Research carried out with bibliometric analysis can provide an overview of the subject area, so that knowledge gaps can be identified and new ideas for research can be shed light on (Donthu et al. 2021).

This study aims to provide a bibliometric analysis of the research on ranking-based MCDM methods introduced in the last decade. The lack of prior review research on these new approaches is the driving force for this study, which attempts to address the gap and demonstrate the current status of the research on these methods. Since the Web of Science (WoS) and Scopus databases are the main sources of bibliometric analysis (Zhu & Liu, 2020), the relevant keywords were decided based on the literature and were searched on these databases. For the research, MOOSRA, WASPAS, MAIRCA, MABAC, EDAS, CODAS, SECA, COCOSO, Stratified MCDM, MARCOS, and DNMA methods were searched with different possible combinations of keywords. According to the findings, MCDM methods with around a hundred or more publications were considered for the analysis, since it can be more appropriate to use a systematic literature review in examining studies under a hundred (Donthu et al. 2021). As a result, the total research output was 1,215; 407 publications for WASPAS, 204 publications for MABAC, 270 publications for EDAS, 134 publications for CODAS, 101 publications for COCOSO, and 99 publications for MARCOS.

The remainder of the article is structured as follows: The next section begins with an overview of bibliometric analysis and then presents a literature review of bibliometric research conducted on MCDM methods over the last decade. Then, the MCDM methods used in the analysis are briefly summarized. The methodology section provides detailed information about keyword searches, explains the research questions, and presents the flowchart of the methodology. Finally, the results of the analysis are given under each research question, and the findings are discussed in the conclusion section, with suggestions for future studies.

2. BIBLIOMETRIC ANALYSIS and MCDM METHODS

With the use of bibliometric techniques, researchers can "base their findings on aggregated bibliographic data produced by other scientists working in the field who express their opinions through citation, collaboration, and writing" (Zupic & Čater, 2015, p.430).

Bibliometric analysis has been applied in a variety of fields such as green supply chain management (Fahimnia et al., 2015), social entrepreneurship (Rey-Martí et al., 2016), knowledge management (Gaviria-Marin et al., 2019),

operations research and management science (Merigó & Yang, 2017), Covid-19 (Chahrour et al., 2020), transfer pricing (Kumar et al., 2021), blockchain applications in management (Tandon et al., 2021), sustainability and risk management (Nobanee et al., 2021), medical big data (Liao et al., 2018), Internet of Things in food safety (Bouzembrak et al., 2019), safety culture (Van Nunen et al., 2018), smart cities (Guo et al., 2019), artificial intelligence in health care (Guo et al., 2020), and review of some leading journals (Martínez-López et al., 2018; Gaviria-Marin et al., 2018; Donthu et al., 2020).

Among these fields, especially in decision-making research, MCDM related studies have been searched with bibliometric analysis. The bibliometric analysis of MCDM research is summarized in Table 1. The table shows that bibliometric research has usually focused on the applicability of MCDM approaches across a range of sectors, as opposed to particular methods. DEMATEL (Koca & Yıldırım, 2021), MACBETH (Ferreira & Santos, 2021), and AHP and TOPSIS (Zyoud & Fuchs-Hanusch, 2017) studies are the only examples of method-specific research.

Table 1. Summary of the Studies on Bibliometric Analysis of MCDM-Related Research in the Last Decade

Author(s)	Scope	Timespan	Database	#Publications
Basílio et al. (2022)	MCDM	1945-2021	WoS and Scopus	20861
Koca & Yıldırım (2021)	DEMATEL	1999-2020	WoS	1963
Ferreira & Santos (2021)	MACBETH	1994-2016	Scopus	192
de Souza et al. (2021)	MCDM in Research and Development (R&D) Project Portfolio Selection (PPS)	1970-2020	WoS and Scopus	66
Abdullah et al. (2021)	MCDM in managing water-related disaster events	2000-2020	WoS	149
Costa et al. (2021)	MCDM in personnel selection	1994-2020	Scopus	63
Minhas & Potdar (2020)	Decision support system in construction	2000-2016	WoS and Scopus	5418
Chowdhury & Paul (2020)	MCDM in corporate sustainability	2007-2019	Scopus, WoS, and Google Scholar	52
Morkūnaitė et al. (2019)	MCDM in heritage buildings	1994-2018	WoS	180
Chen et al. (2019)	ANP	1997-2018	WoS	1485
Yu et al. (2019)	Fuzzy optimization and decision making	2002-2017	Scopus	370
Yu et al. (2018)	MCDM	1977-2016	WoS	4464
Francik et al. (2017)	MCDM in agriculture	1979-2015	WoS	1355
Zyoud & Fuchs-Hanusch (2017)	AHP and TOPSIS	1976-2015	Scopus	AHP:10188; TOPSIS: 2412
Liu & Liao (2017)	Fuzzy decision	1970-2015	WoS	13901
Tramarico et al. (2015)	AHP in supply chain	1990-2014	WoS	116
Zopounidis et al. (2015)	MCDM in finance	2002-2014	Scopus	644
Guerrero-Baena et al. (2014)	MCDM in corporate finance	1980-2012	Scopus	347

Apart from the bibliometric analysis, the literature includes other review studies on MCDM methods' applications. Some focused on MCDM methods and applications in general (Zavadskas et al., 2014), while others examined MCDM applications in specific fields, such as sustainable engineering (Stojčić et al., 2019), sustainable renewable energy development (Kumar et al., 2017), corporate sustainability (Chowdhury & Paul, 2020), logistics performance evaluation (Chejarla et al., 2022), supplier selection (Yildiz & Yayla, 2015), construction (Zhu et al., 2021), energy policy and decision-making problems (Kaya et al., 2018), oncology (Adunlin et al., 2015), architecture and engineering (Ogrodnik, 2019), financial modeling (Almeida-Filho et al., 2021), health care (Khan et al., 2022), and Covid-19 pandemic (Sotoudeh-Anvari, 2022). There are also review studies based on a specific MCDM method, such as TOPSIS (Behzadian et al., 2012), ELECTRE (Govindan & Jepsen, 2016), SWARA and WASPAS (Mardani et al., 2017), VIKOR (Gul et al., 2016), and COPRAS (Stefano et al., 2015).

The information about the methods used in the study is summarized as follows:

- **WASPAS:** WASPAS (Weighted Aggregated Sum Product Assessment) is an MCDM method proposed by Zavadskas et al. in 2012. This method is an integrated method in which WSM (Weighted Sum Model) and WPM (Weighted Product Method) are considered together. In their study, it is emphasized that using two methods together instead of a single method would give more accurate and reliable results. Since WASPAS is a method in which WSM and WPM methods are used in an integrated way, the steps of these two methods are applied first. Then, the result is obtained according to the relative significance value given to both methods. Finally, alternatives are ranked according to these values (Zavadskas, 2012).
- **MABAC:** MABAC (Multi-Attributive Border Approximation Area Comparison) method is an MCDM method proposed by Pamučar and Ćirović in 2015. The basis of the method, unlike other MCDM methods, is based on calculating the distances of each alternate criterion function to the border proximity area. It has been observed that this method gives more consistent results than methods such as SAW, COPRAS, TOPSIS, and MOORA (Pamučar & Ćirović, 2015).
- **EDAS:** EDAS (Evaluation based on Distance from Average Solution), proposed by Keshavarz Ghorabaee et al. (2015), is an MCDM method in which distances from the mean are considered. This method is particularly useful when there are conflicting criteria. In MCDM methods such as TOPSIS and VIKOR, the best decision alternative is the closest to the positive ideal solution and the furthest from the negative ideal solution, while the distances from the mean value are considered in the EDAS method. Therefore, in this method, there is no need to calculate positive and negative ideal values. Two types of distances from the mean are calculated, which are positive distances from the mean (Positive Distance from Average) and negative distances from the mean (Negative Distance from Average) for each alternative. The ranking of alternatives is made according to the high positive mean solution and low negative mean solution. In other words, the alternative closest to the positive mean solution and furthest from the negative mean solution is the best alternative (Keshavarz Ghorabaee et al. 2015).
- **CODAS:** CODAS (Combinative Distance-based Assessment) is an MCDM method proposed by Keshavarz Ghorabaee et al. (2016a). In this method, unlike other methods, Euclidean and Taxicab distances from the negative ideal solution are considered. First, the Euclidean distance is used in the method. However, if the Euclidean distances of the two alternatives are very close to each other, the Taxicab distances are compared. In this case, the question of how to measure the degree of closeness of Euclidean distances comes to mind. In this context, degrees are set by a threshold parameter (Keshavarz Ghorabaee et al., 2016a).
- **COCOSO:** COCOSO (Combined Compromise Solution) is an MCDM method proposed by Yazdani et al. (2018). This method has emerged as a result of the integration of SAW (Simple Additive Weighting) and EWP (Exponentially Weighted Product) methods. In this method, utility values are calculated from different perspectives. Then, a compromise solution is obtained by combining the utility values of each alternative using an aggregation function (Yazdani et al., 2018).
- **MARCOS:** MARCOS (Measurement of Alternatives and Ranking According to COmpromise Solution) is one of the newest MCDM methods and was proposed by Stević et al. (2020). The basis of this method is based on defining the relationship between alternatives and reference values (ideal and anti-ideal solutions). Based on these relations, the utility functions of the alternatives are obtained, and a compromise ranking is obtained according to the ideal-anti-ideal solutions. Utility functions show the position of an alternative relative to the ideal and anti-ideal solution. Therefore, the best alternative is the closest to the ideal solution and at the same time, the furthest from the anti-ideal solution (Stević et al., 2020a).

3. METHODOLOGY

For the study, bibliometric analysis was conducted using Biblioshiny, an app providing a web interface for the bibliometrix package (Aria & Cuccurullo, 2017). This software tool is used due to its advantages with its user interface, Biblioshiny, and gaining more popularity in recent years compared to other tools (Moral-Muñoz et al., 2020).

The keywords in this study were determined by considering the MCDM-based bibliometric analysis studies conducted in the literature in recent years. First, the method's name and its abbreviation were selected as the search

strings. Then, in addition to these keywords, MCDM-related keywords were added to avoid unrelated studies from being included in the dataset in case the method's abbreviation is used in other fields.

Basílio et al. (2022) searched for MCDM-related keywords as "MULTI-ATTRIBUTE DECISION MAKING" OR "MADM" OR "MCDA" OR "MODM" OR "MCDM" OR "MULTICRITERIA" OR "MULTI-CRITERIA" OR "MULTIPLECRITERIA" in "articles, titles, abstracts, and keywords". Abdullah et al. (2021) searched for "MCDM" OR "MCDA" OR "Multi-criteria decision making" OR "Multi-criteria decision analysis" keywords and de Souza et al. (2021) searched for different MCDM combinations as "MCDM" OR "multicriteria decision making" OR "multi-criteria decision making" OR "multi criteria decision making" OR "multiplecriteria decision making" OR "multiplecriteria decision making" OR "multiple criteria decision making" OR "MCDA" OR "multicriteria decision analysis" OR "multi-criteria decision analysis" OR "multi criteria decision analysis" OR "multiplecriteria decision analysis" OR "multiple-criteria decision analysis" OR "multiple criteria decision analysis" OR "multicriteria decision aiding" OR "multi-criteria decision aiding" OR "multi criteria decision aiding" OR "multiplecriteria decision aiding" OR "multiple-criteria decision aiding" OR "multiple criteria decision aiding" in "titles, abstracts, and keywords".

By taking all these relevant searches into account, multiple combinations were searched on WoS and Scopus databases and the search strings were decided as follows:

- On WoS: (("Method's full name") OR ("Method's abbreviation")) AND ("MCDM" OR "MADM" OR "MCDA" OR "MODM" OR "multi* decision making" OR "multi* decision analysis" OR "multi* decision aiding") in Topic search (it searches the title, abstract, author keywords, and Keywords Plus), Language=English.
- On Scopus: (TITLE-ABS-KEY({Method's full name}) OR TITLE-ABS-KEY({Method's abbreviation})) AND (TITLE-ABS-KEY(MCDM) OR TITLE-ABS-KEY(MADM) OR TITLE-ABS-KEY(MCDA) OR TITLE-ABS-KEY (MODM) OR TITLE-ABS-KEY(multi* AND decision AND making) OR TITLE-ABS-KEY(multi* AND decision AND analysis) OR TITLE-ABS-KEY(multi* AND decision AND aiding)) AND LANGUAGE(ENGLISH)

After all the relevant searches were conducted on August 4, 2022, all the publications found in two separate databases were extracted in BibTex format with the full record and cited references' information for each method. These two separate datasets were merged in the R programming language by removing all duplicates. The bibliometrix package functions used for merging and cleaning were convert2df and mergeDbSources (Aria & Cuccurullo, 2022). At the last stage, the datasets of each method were checked manually and studies with missing information were removed from the data set.

Research questions are formed as follows (publications are defined as "publications on WASPAS, MABAC, EDAS, CODAS, COCOSO, and MARCOS methods" in the research questions):

- *RQ1: What is the trend of the publications over the years?*
- *RQ2: What are the most relevant and cited research components regarding countries, authors, and sources?*
- *RQ3: Which publications have received more interest in terms of total citations?*
- *RQ4: What are the most frequent keywords and trend topics in publications?*

Figure 1 depicts the methodology's workflow. The first three research questions (RQ1, RQ2, and RQ3) concern descriptive statistics regarding publications about trends, countries, authors, and sources. With keywords' statistics and trend topics' plots, the fourth research question is addressed.

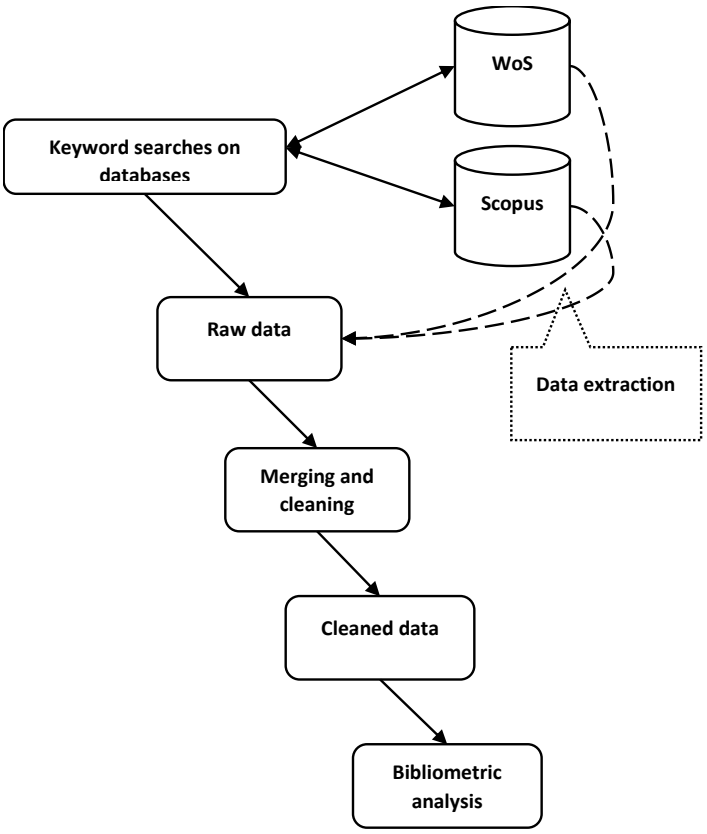

Figure 1. The Flowchart of the Methodology

4. RESULTS

The main information about the dataset is given in Table 2. Among the document types, the majority are articles (WASPAS for 86.73%, MABAC for 93.63%, EDAS for 90.37%, CODAS for 88.81%, COCOSO for 93.07%, and MARCOS for 91.92%). The average age of documents and average citations per document are lower for methods published in recent years, as expected. The highest annual growth rate belongs to the COCOSO method. WASPAS is the method by which the most publications and most different sources are produced.

Table 2. Main Information about Publications

Description	WASPAS	MABAC	EDAS	CODAS	COCOSO	MARCOS
Timespan	2012: 2022	2015: 2022	2015: 2022	2016: 2022	2018: 2022	2020: 2022
Documents	407	204	270	134	101	99
Sources	213	119	161	96	72	69
Annual Growth Rate %	57.34	71.14	81.94	81.71	161.83	87.08
Document Average Age	2.3	1.99	1.8	1.57	0.871	0.646
Average citations per doc	19.24	25.51	17.98	15.28	12.66	10.78
Document Type:						
Article	353	191	244	119	94	91
Conference paper	24	8	14	7	5	4
Others	54	6	12	8	2	6

4.1. RQ1: What is the trend of the publications over the years?

The year-wise frequency of publications on the methods is demonstrated in Figure 2. It should be noted that the data for 2022 does not include the publications for the whole year, as the data was drawn on August 4, 2022.

The first articles in the databases for all methods are published by the creators of the methods. Regarding the year of the first publications of all methods except MARCOS, there is only one publication. It is seen that there are 14 publications related to the method in 2020 when the MARCOS method was introduced. In addition, the number of publications conducted on all methods has increased over time, which shows an increasing interest in methods. There is a decrease in the publications related to the EDAS method only in 2019 compared to the previous year (2018:31; 2019:25), but the increase continued in the following years.

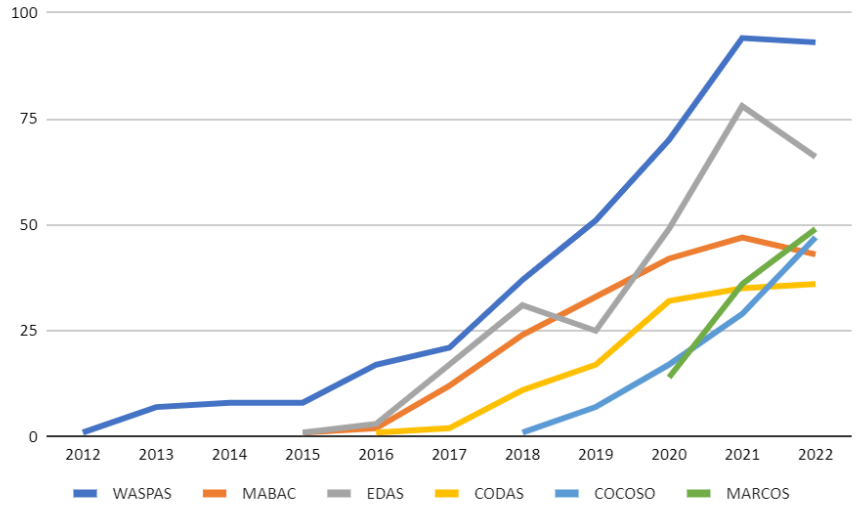

Figure 2. Annual scientific production

4.2. RQ2: What are the most relevant and cited research components regarding sources, authors, and countries?

The most relevant sources (the sources with the most publications on methods) are examined (Table 3). Symmetry-Basel is the most relevant source for WASPAS with 13 publications, and the third most relevant source for MABAC and CODAS. Decision Making: Applications in Management and Engineering is the most relevant source considering MABAC publications, second for CODAS, and third for MARCOS. The Technological and Economic Development of Economy ranks first as the most relevant source for EDAS. The Journal of Intelligent & Fuzzy Systems is the most relevant source for CODAS and the third for MABAC and EDAS. The Journal of Cleaner Production is the first on the list for COCOSO, second for WASPAS, and third for CODAS. Mathematics ranks first as the most relevant source for MARCOS.

To observe the most cited sources, total citations for the journals are examined (Table 4). The journals with the highest total citations are found to be the Journal of Cleaner Production for WASPAS and COCOSO, Expert Systems with Applications for MABAC, Informatica for EDAS, Economic Computation and Economic Cybernetics Studies and Research for CODAS, Computers & Industrial Engineering for MARCOS.

Table 3. Top Three Most Relevant Sources

WASPAS		MABAC		EDAS	
Sources	**f**	**Sources**	**f**	**Sources**	**f**
Symmetry-Basel	13	Decision Making: Applications in Management and Engineering	11	Technological And Economic Development of Economy	10
Applied Soft Computing	10	Expert Systems with Applications	8	Soft Computing	9
Journal of Cleaner Production	10	International Journal of Intelligent Systems	8	Journal of Intelligent & Fuzzy Systems	7
Sustainability	9	Journal of Intelligent & Fuzzy Systems	7		
		Symmetry-Basel	7		

CODAS		COCOSO		MARCOS	
Sources	**f**	**Sources**	**f**	**Sources**	**f**
Journal of Intelligent & Fuzzy Systems	5	Journal of Cleaner Production	5	Mathematics	6
Decision Making: Applications in Management and Engineering	4	Sustainability	4	Sustainability	5
Informatica (Netherlands)	4	Sustainable Cities and Society	4	Applied Intelligence	3
International Journal of Intelligent Systems	4	Axioms	3	Applied Soft Computing	3
Journal of Multiple-Valued Logic and Soft Computing	4	Expert Systems with Applications	3	Decision Making: Applications in Management and Engineering	3
Advances in Intelligent Systems and Computing	3	Ieee Access	3	Expert Systems with Applications	3
Ieee Transactions on Engineering Management	3	International Journal of Fuzzy Systems	3	Facta Universitatis-Series Mechanical Engineering	3
Journal of Cleaner Production	3			Socio-Economic Planning Sciences	3
Sustainability	3				
Symmetry-Basel	3				

Table 4. Top Three Most Cited Sources

WASPAS		MABAC		EDAS	
Sources	**TC**	**Sources**	**TC**	**Sources**	**TC**
Journal of Cleaner Production	526	Expert Systems with Applications	769	Informatica	408
Applied Soft Computing	431	Decision Making: Applications in Management and Engineering	459	Technological And Economic Development of Economy	286
Elektronika Ir Elektrotechnika	418	International Journal of Intelligent Systems	353	Journal Of Cleaner Production	186
CODAS		**COCOSO**		**MARCOS**	
Sources	**TC**	**Sources**	**TC**	**Sources**	**TC**
Economic Computation and Economic Cybernetics Studies and Research	268	Journal of Cleaner Production	190	Computers & Industrial Engineering	238
Decision Making: Applications in Management and Engineering	226	Management Decision	163	Decision Making: Applications in Management and Engineering	137
International Journal of Intelligent Systems	129	Artificial Intelligence Review	79	Mathematics	117

The top three most relevant authors with the most publications on methods are presented in Table 5. It is seen that Zavadskas, the author of the first articles in which all methods except MABAC and MARCOS methods are introduced, has contributed the most publications on the WASPAS, EDAS, and COCOSO methods. Pamučar, the author of the first article in which the MABAC method was published, is the most productive on this method and the CODAS method. The author with the most publications on the MARCOS method is Stević, the first author of the MARCOS article.

The authors' impact on methods is given considering total citations in Table 6. The highest total citations belong to the creators of the methods, as expected, but there is one exception. Pamučar, one of the creators of the MABAC and MARCOS methods, has received the highest total citations on MABAC, MARCOS, and CODAS. Zavadskas has received the highest total citations on the WASPAS, EDAS, and COCOSO methods.

Table 5. Top Three Most Relevant Authors

WASPAS		MABAC		EDAS	
Authors	**f**	**Authors**	**f**	**Authors**	**f**
Zavadskas E.	54	Pamučar D.	32	Zavadskas E.	24
Antucheviciene J.	30	Chakraborty S.	12	Turskis Z.	18
Turskis Z.	19	Stević Z.	11	Wei G.	14
CODAS		**COCOSO**		**MARCOS**	
Authors	**f**	**Authors**	**f**	**Authors**	**f**
Pamučar D.	15	Zavadskas E.	18	Stević Z.	19
Kahraman C.	10	Pamučar D.	11	Pamučar D.	13
Bolturk E.	7	Liao H.	10	Torkayesh A.	7

Tablo 6. Top Three Most Cited Authors

WASPAS		MABAC		EDAS	
Author	**TC**	**Author**	**TC**	**Author**	**TC**
Zavadskas E.	2992	Pamučar D.	1738	Zavadskas E.	1487
Antucheviciene J.	1594	Ćirović G.	706	Keshavarz Ghorabaee M.	1180
Turskis Z.	1298	Zavadskas E.	591	Turskis Z.	1112
CODAS		**COCOSO**		**MARCOS**	
Author	**TC**	**Author**	**TC**	**Author**	**TC**
Pamučar D.	426	Zavadskas E.	369	Pamučar D.	529
Zavadskas E.	361	Yazdani M.	302	Stević Z.	496
Antucheviciene J.	339	Turskis Z.	251	Puška A.	256

Table 7 shows the top five countries that produce the most publications on WASPAS, MABAC, EDAS, CODAS, COCOSO and MARCOS, with f representing the publication frequency. Turkey and India rank in the top five in terms of the number of publications produced on all methods. India ranks first in WASPAS and COCOSO methods. China is the country that produces the most publications in the MABAC and EDAS methods. For CODAS and MARCOS methods, Turkey ranks first.

Table 7. Top Five Most Relevant Countries

WASPAS		MABAC		EDAS	
Country	**f**	**Country**	**f**	**Country**	**f**
India	133	China	78	China	97
Iran	125	India	63	India	79
Lithuania	122	Serbia	53	Lithuania	72
Turkey	94	Turkey	28	Turkey	71
China	86	Lithuania	24	Iran	50
CODAS		**COCOSO**		**MARCOS**	
Country	**f**	**Country**	**f**	**Country**	**f**
Turkey	54	India	48	Turkey	40
India	45	China	31	Serbia	32
China	33	Serbia	27	India	22
Iran	27	Turkey	26	Vietnam	15
Serbia	24	Lithuania	25	Iran	12

The five most cited countries in the publications produced on WASPAS, MABAC, EDAS, CODAS, COCOSO and MARCOS are given in Table 8. The most cited country in WASPAS studies is Lithuania. China is the most

cited country for its studies on MABAC, EDAS, and COCOSO methods. Turkey is the most cited for the CODAS method, and Bosnia is the most cited country for MARCOS.

Table 8. Top Five Most Cited Countries

WASPAS		MABAC		EDAS	
Country	**TC**	**Country**	**TC**	**Country**	**TC**
Lithuania	2663	China	1957	China	1111
India	1022	Serbia	1384	Lithuania	984
Iran	958	India	522	Turkey	592
China	636	Bosnia	365	Iran	568
Turkey	547	Lithuania	317	Bosnia	402
CODAS		**COCOSO**		**MARCOS**	
Country	**TC**	**Country**	**TC**	**Country**	**TC**
Turkey	477	China	377	Bosnia	482
Serbia	282	Turkey	239	Turkey	179
China	258	Spain	175	India	89
Lithuania	239	India	147	Serbia	53
Iran	193	Serbia	127	Chile	42

4.3. RQ3: Which publications have received more interest in terms of total citations?

Among the studies on all methods, the most cited articles belong to the creators of the methods, as expected (Table 9). The other top-cited articles are about different applications of the methods, such as the second and third cited articles on WASPAS as an application in solar projects (Vafaeipour et al., 2014), and green suppliers' evaluation (Keshavarz Ghorabaee et al., 2016b). In addition, top cited articles for all the methods include fuzzy implementation of the methods (Peng & Yang, 2016; Keshavarz Ghorabaee et al., 2016b; Keshavarz Ghorabaee et al., 2016c; Kahraman et al., 2017; Keshavarz Ghorabaee et al., 2017; Pamučar et al., 2018a; Ecer & Pamucar, 2020; Peng et al., 2020; Stanković et al., 2020).

4.4. RQ4: What are the most frequent keywords and trend topics in publications?

The most frequently used keywords related to each method are given in the appendix (Appendix-A). Some preprocessing methods were used in this phase. As expected, it was observed that the name of the method and the MCDM keywords had high frequencies. Also, some similar words are treated as separate words due to different spellings (such as ahp and analytic hierarch process). For this reason, unnecessary words were cleaned with the dictionary named "remove.txt" and the frequencies of words with the same meaning were combined with another newly created "replace.txt" dictionary. There are two groups of unnecessary words or phrases in "remove.txt". The first group is the words related to the name of the method whose word cloud will be extracted. The second group includes MCDM-related words and other non-informative words (e.g., method, model, analysis, etc.). The first group is modified and extracted for each method, while the second group is the same for all methods.

- Example of remove.txt dictionary content for WASPAS method: waspas, weighted aggregated sum product assessment, sum product assessment, method, model, framework, group decision-making, decision making, decision-making, mcdm, multicriteria decision-making, multicriteria analysis, multi criteria decision-making, multi criteria decision making, multiple criteria, multicriterion decision makings, …, etc.
- Example of replace.txt dictionary content for all methods: ahp, analytic hierarchy process, \n system, systems, \n anp, analytic network process, \n …, etc. (a list of synonyms (each row) are merged into a single term (the first word contained in the row) and rows are separated by return separator (\n)).

Table 9. Top Three Most Cited Publications

	Authors (Year)	Source	Title	TC
WASPAS	Zavadskas et al. (2012)	Elektronika ir elektrotechnika	Optimization of weighted aggregated sum product assessment	418
	Vafaeipour et al. (2014)	Energy Conversion and Management	Assessment of regions' priority for implementation of solar projects in Iran: New application of a hybrid multi-criteria decision-making approach	177
	Keshavarz Ghorabaee et al. (2016b)	Journal of Cleaner Production	Multi-criteria evaluation of green suppliers using an extended WASPAS method with interval type-2 fuzzy sets	168
MABAC	Pamučar & Ćirović (2015)	Expert systems with applications	The selection of transport and handling resources in logistics centers using Multi-Attributive Border Approximation area Comparison (MABAC)	373
	Peng & Yang (2016)	International Journal of Intelligent Systems	Pythagorean fuzzy Choquet integral based MABAC method for multiple attribute group decision making	229
	Pamučar et al. (2018a)	Expert systems with applications	Modification of the Best–Worst and MABAC methods: A novel approach based on interval-valued fuzzy-rough numbers	189
EDAS	Keshavarz Ghorabaee et al. (2015)	Informatica	Multi-criteria inventory classification using a new method of evaluation based on distance from average solution (EDAS)	404
	Keshavarz Ghorabaee et al. (2016c)	International journal of computers communications & control	Extended EDAS method for fuzzy multi-criteria decision-making: an application to supplier selection	152
	Kahraman et al. (2017)	Journal of Environmental Engineering and Landscape Management	Intuitionistic fuzzy EDAS method: an application to solid waste disposal site selection	138
CODAS	Keshavarz Ghorabaee et al. (2016a)	Economic Computation & Economic Cybernetics Studies & Research	A new combinative distance-based assessment (CODAS) method for multi-criteria decision-making	224
	Mukhametzyanov & Pamucar (2018)	Decision making: applications in management and engineering	A sensitivity analysis in MCDM problems: A statistical approach	102
	Keshavarz Ghorabaee et al. (2017)	Journal of Business Economics and Management	Fuzzy extension of the CODAS method for multi-criteria market segment evaluation	84
COCOSO	Yazdani et al. (2018)	Management Decision	A Combined Compromise Solution (COCOSO) method for multi-criteria decision-making problems	163
	Ecer & Pamucar (2020)	Journal of Cleaner Production	Sustainable supplier selection: A novel integrated fuzzy best worst method (F-BWM) and fuzzy COCOSO with Bonferroni (COCOSO'B) multi-criteria model	104
	Peng et al. (2020)	Artificial Intelligence Review	Pythagorean fuzzy MCDM method based on COCOSO and CRITIC with score function for 5G industry evaluation	78
MARCOS	Stević et al. (2020a)	Computers & Industrial Engineering	Sustainable supplier selection in healthcare industries using a new MCDM method: Measurement of alternatives and ranking according to COmpromise solution (MARCOS)	238
	Stanković et al. (2020)	Mathematics	A new fuzzy MARCOS method for road traffic risk analysis	77
	Stević & Brković (2020b)	Logistics	A novel integrated FUCOM-MARCOS model for evaluation of human resources in a transport company	65

- The most often occurring method-related terms in publications related to the WASPAS approach are SWARA, fuzzy, AHP, TOPSIS, and Best-Worst. Other than methods, the terms sustainability, renewable energy, optimization, supplier selection, and sustainable supply chain management are frequently used.

- Best-Worst, fuzzy, TOPSIS, DEMATEL, EDAS, and MAIRCA are the most frequently used methods as keywords in MABAC papers. The most used keywords, besides techniques, are supplier selection, green supplier selection, logistics, risk evaluation, and geographic information system (GIS).
- Examining the EDAS method reveals that TOPSIS, fuzzy, Best-Worst, AHP, and entropy are repeated the most. It is acknowledged that publications are produced utilizing this methodology in the fields of sustainability, supplier selection, green supplier selection, and hydrogen production.
- The top three method-related keywords used in CODAS publications are fuzzy, sensitivity analysis and AHP. Other keywords that come up regularly are sustainability, supplier selection, and renewable energy.
- Fuzzy, CRITIC, Best-Worst, SWARA, and MARCOS are the COCOSO method's most often used method-related keywords. The keywords sustainability, supplier selection and optimization are at the top of the list of the most frequent words in publications.
- FUCOM, Best-Worst and CRITIC keywords are the most frequently used methods in MARCOS publications. The keywords transport, sustainability and supply chain management are also used more than other words.

Trend topics' plots are generated on Biblioshiny and demonstrated in the Appendix. The trends for the years after 2021, according to the WASPAS trend topics, include sustainability and wind energy. In the current year, the trending topic of hydrogen production has emerged. It has been noted that the topic of supplier selection has gained popularity for MABAC since 2020 and beyond, for CODAS between 2020 and 2021, and EDAS since 2019. Sustainability is a trend for COCOSO. Transport has become a trend for MARCOS recently.

Additionally, the methods vary from year to year. For instance, the WASPAS graph shows Fuzzy AHP in recent years, while MABAC is displayed as a trend between 2018 and 2019. In terms of MABAC, the DEMATEL and EDAS methods appear to be on the rise between 2017 and 2020, followed by the AHP method from 2018 to 2021 and TOPSIS from 2018 to 2020. The distribution for EDAS is as follows: TOPSIS is trending between 2019 and 2021, AHP is between 2017 and 2022, COPRAS is between 2018 and 2021, WASPAS and MABAC are between 2017 and 2020. Trending CODAS techniques include EDAS and AHP. The CRITIC technique is in vogue for COCOSO and MARCOS. In recent years, ENTROPY and FUCOM methods have become more popular for MARCOS.

5. CONCLUSION

Numerous researchers continue to use MCDM techniques in a wide range of fields. In addition to the techniques that have been in use for a long time, new techniques advance the discipline. The researchers working in the field can benefit from observing the development of these methods. Therefore, to contribute to the field, this study aims to conduct a bibliometric analysis on research in ranking-based MCDM methods introduced in the last decade. Relevant keywords are searched both in the WoS and Scopus databases. In total, 1,215 related publications are analyzed: 407 publications for WASPAS, 204 publications for MABAC, 270 publications for EDAS, 134 publications for CODAS, 101 publications for COCOSO, and 99 publications for MARCOS.

Research results show that the number of publications for all methods has increased over the years, that is, the interest in methods is on the rise. The highest annual growth rate belongs to the COCOSO method with 161.83%, followed by MARCOS, EDAS, CODAS, MABAC, and WASPAS, respectively.

The findings also highlight that other than the publications belonging to the authors of the methods, fuzzy implementations of the methods have received interest, which is cited a lot. In addition, the results reveal the most productive and cited authors, journals, and countries for each method, which is valuable knowledge for researchers in the field. The journals in which the articles are published differ according to the methods, so do the most cited journals. However, there are prominent names among the authors; Zavadskas and Pamučar are among the names that produce the most publications and are cited by methods. When the findings for the countries are examined, it is seen that India, China and Turkey stand out.

According to the most used keywords and trend topics, it is observed that different research topics (sustainability, renewable energy, optimization, supplier selection, hydrogen production, transport, etc.) and methods (SWARA, AHP, TOPSIS, Best-Worst, DEMATEL, MAIRCA, CRITIC, etc.) are applied in the publications.

The contributions of the current study to the literature can be listed as the MCDM methods and the databases included in the research. In this study, bibliometric analysis is used to assess new MCDM methods introduced in

the last decade that have not been examined before to the authors' knowledge (there is a review study related to WASPAS, see Mardani et al. (2017)). While most of the previous MCDM-focused bibliometric studies in the literature are carried out in a single database, the Web of Science and Scopus databases are considered together in this study.

Future research may also focus on a bibliometric study for newly discovered weighting based MCDM methods, such as the Full consistency method (FUCOM) (Pamučar et al., 2018b) and Level Based Weight Assessment (LBWA) (Žižović & Pamučar, 2019). A systematic literature review can also be conducted for other methods that are not included in the study (MOOSRA, MAIRCA, SECA, Stratified MCDM, and DNMA). Mixed methods can also be applied with these review techniques, such as content analysis with bibliometric indicators.

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Conceptualization, writing-original draft, editing – BA and SA, data collection, methodology, formal analysis – BA, Final Approval and Accountability – BA and SA

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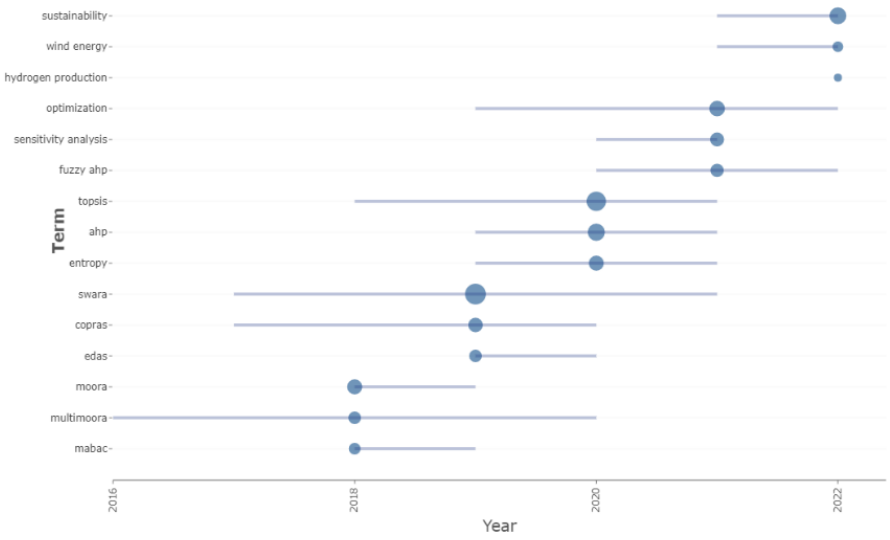
APPENDIX

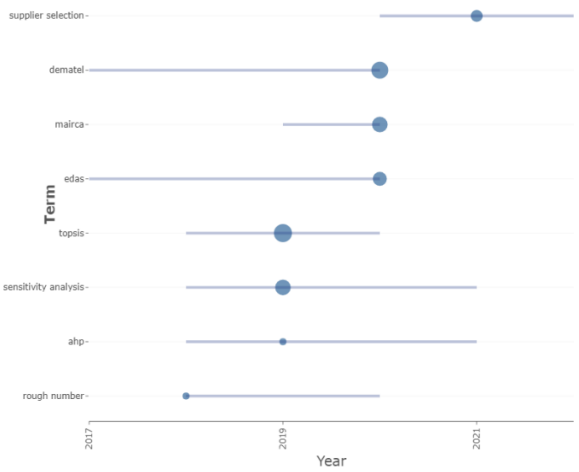
Appendix-A. Most Frequent Keywords

WASPAS		MABAC		EDAS		CODAS		COCOSO		MARCOS	
Terms	**f**	**Terms**	**f**	**Terms**	**f**	**Terms**	**f**	**Terms**	**f**	**Terms**	**f**
swara	38	best-worst	14	topsis	26	fuzzy	9	fuzzy	10	fucom	10
sustainability	31	fuzzy	14	fuzzy	18	sensitivity analysis	9	sustainability	9	best-worst	9
fuzzy	25	topsis	11	sustainability	15	ahp	8	critic	7	transport	9
ahp	24	dematel	10	supplier selection	12	sustainability	8	best-worst	6	sustainability	7
topsis	23	edas	9	best-worst	11	supplier selection	7	sustainable supply chain management	6	critic	6
renewable energy	19	mairca	9	ahp	10	edas	6	swara	6	entropy	5
best-worst	17	sensitivity analysis	9	entropy	9	aras	5	marcos	4	fuzzy	5
fuzzy ahp	17	fucom	8	copras	8	entropy	5	pythagorean fuzzy sets	4	supply chain management	5
entropy	16	supplier selection	8	critic	8	renewable energy	5	sensitivity analysis	4	topsis	5
copras	13	entropy	7	fuzzy ahp	8	site selection	5	supplier selection	4	uncertainty	5
optimization	13	waspas	7	uncertainty	8	software	5	ahp	3	circular economy	4
supplier selection	13	ahp	6	sensitivity analysis	7	best-worst	4	hesitant fuzzy linguistic term set	3	fuzzy ahp	4
fuzzy waspas	12	COCOSO	6	codas	6	critic	4	mabac	3	logistics	4
moora	12	green supplier selection	6	dematel	6	fuzzy codas	4	optimization	3	mabac	4
neutrosophic set	12	logistics	6	green supplier selection	6	material selection	4	q-rung orthopair fuzzy sets	3	sustainable supply chain management	4
critic	11	risk evaluation	6	hydrogen production	6	optimization	4	score function	3	swara	4
edas	11	critic	5	mabac	6	topsis	4	similarity measure	3	COCOSO	3
sensitivity analysis	10	gis	5	waspas	6	cloud computing	3	bonferroni	2	covid-19	3
mabac	9	rough numbers	5	aras	5	COCOSO	3	circular economy	2	fuzzy piprecia	3
sustainable supply chain management	9	vikor	5	renewable energy	5	covid-19	3	cloud service provider selection	2	health care waste management	3
covid-19	8	aras	4	swara	5	evaluation	3	covid-19	2	mairca	3
delphi	8	copras	4	wind energy	5	green supply chain management	3	edas	2	merec	3

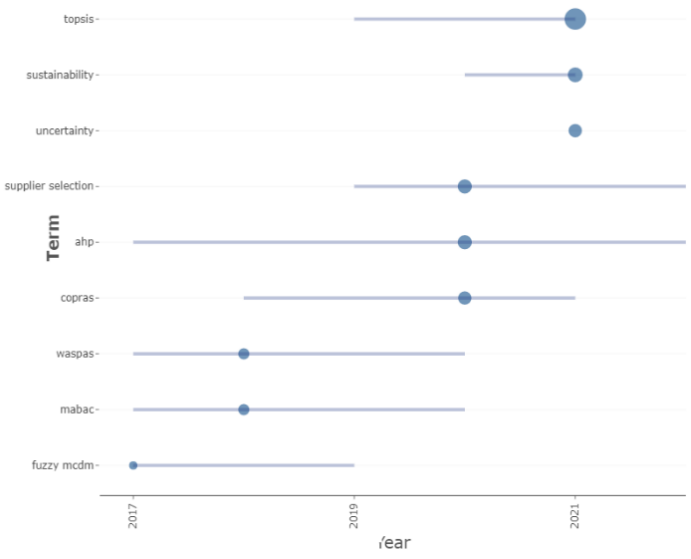
Appendix-B. WASPAS Trend Topics



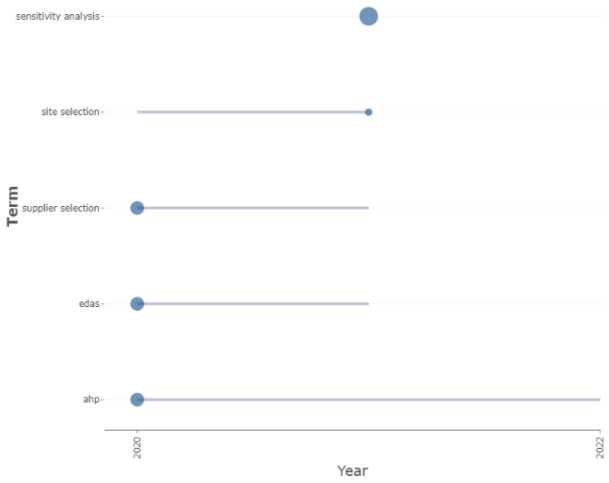
Appendix-C. MABAC Trend Topics



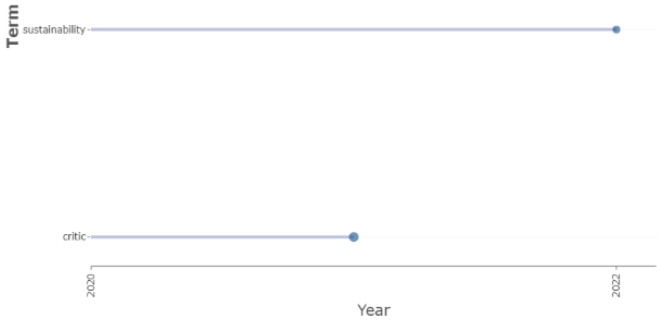
Appendix-D. EDAS Trend Topics



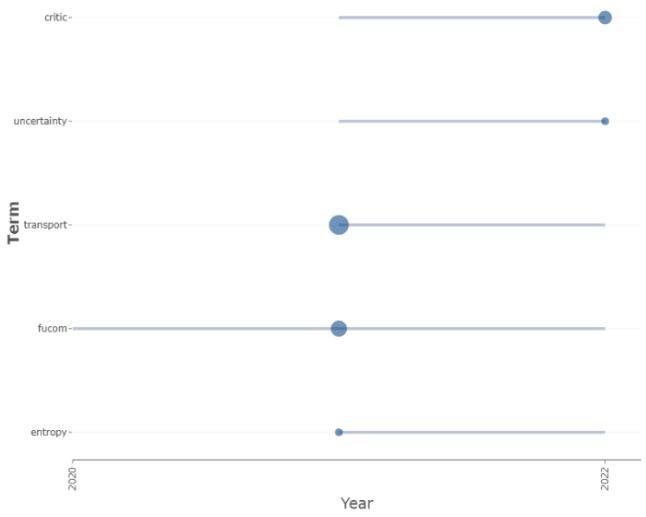
APPENDIX-E. CODAS Trend Topics



Appendix-F. COCOSO Trend Topics



Appendix-G. MARCOS Trend Topics



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The Effect of Bank Soundness Ratio on Profitability With Islamic Social Responsibility (ISR) Disclosure as Moderating Variable

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Jel Codes:
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ABSTRACT

This study aims to identify and examine the impact of the Bank's health ratio on the profits of Islamic commercial banks, taking into account Islamic social responsibility as a mitigating variable in Islamic commercial banks in Indonesia and Malaysia. The type of study used in this study was a descriptive quantitative approach measured using the data-driven panel method using the Software Statistical Package for the Social Sciences (SPSS) version 25.0. Methods for data collection using documentation methods. The study population consisted of Islamic commercial banks in Indonesia and Malaysia registered with OJK and BNM from 2017 to 2020. The results showed that NIM had a significant positive effect individually partially on profitability proxied by ROA. NPF has a significant negative effect on profitability proxied by ROA. Disclosure of Islamic Social Responsibility can significantly moderate and strengthen the effect of NPF on the ROA variable. Meanwhile, the CAR and GCG variable has no significant or partial impact on profitability. Disclosure of Islamic Social Responsibility can moderate the effect of CAR and NIM but has no effect on the ROA variable. Disclosure of Islamic Social Responsibility can moderate the influence of GCG but has no direct effect on ROA.

Anahtar Kelimeler:
Sorunlu Finansman, Sermaye Yeterlilik Oranı, Net faiz marjı, İyi Kurumsal Yönetim, İslami Sosyal Sorumluluk

Jel Kodları:
G34 L25

ÖZET

Bu çalışma, Endonezya ve Malezya'daki İslami ticari bankalarda İslami sosyal sorumluluğu düzenleyici bir değişken olarak dikkate alarak bankaların sağlamlık oranının kârlılıkları üzerindeki etkisini belirlemeyi amaçlamaktadır. Bu çalışmada SPSS 25.0 programı yardımıyla panel veri analizi yöntemi kullanılmıştır. Çalışmanın ana kütlesi 2017-2020 yıllarında OJK ve BNM'ye kayıtlı Endonezya ve Malezya'daki İslami ticari bankalardan oluşmaktadır. Analiz sonuçlarına göre; NIM'in kısmen ROA tarafından temsil edilen karlılık üzerinde pozitif bir etkiye sahip olduğu tespit edilmiştir. NPF, ROA tarafından temsil edilen karlılık üzerinde negatif bir etki yaptığı belirlenmiştir. Ayrıca NPF'nin ROA değişkeni üzerindeki etkisinde İslami Sosyal Sorumluluğun Açıklanmaları'nın önemli ölçüde düzenleyici bir etkisi söz konusudur. Bunun yanı sıra SYR ve GCG değişkeninin karlılık üzerinde anlamlı veya kısmi bir etkisi bulunmamaktadır. İslami Sosyal Sorumluluğun Açıklanmaları SHY ve NIM'in etkisini düzenleyici bir etkisi vardır ancak ROA değişkeni üzerinde etkisi bulunmamaktadır.

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1. INTRODUCTION

Currently, the growth of the sharia industry has grown rapidly throughout the world. Especially in the Islamic banking sector which is experiencing economic development and progress. One of the things that can be used as a benchmark for the progress of the country is banking which can affect economic activity. Based on its operational principles, banking includes sharia and conventional banking (Khasanah, 2016). Banking plays an important role in economic activity. Banks are responsible for collecting and distributing funds received from the community to improve people's living standards in an effective and efficient manner (Wiwoho, 2014). The main activities carried out by bank financial institutions include deposits, savings, and current accounts (Arinta, 2016). In addition, the banking sector plays a very strategic role in supporting the country's economic development, so the government needs to prepare various strategies for the banking sector (Sengkey et al., 2018). The year 2020 has brought tremendous challenges to the global economy.

The Covid-19 pandemic that hit the economy in early 2020 and lasted throughout the year, drastically reduced the economies of many countries, including Indonesia and Malaysia (Suksmonohadi and Indira, 2020). Global supply chains disrupted by the pandemic have pushed countries to optimize their various economic potentials. Growth in the Islamic economy and finance sector in the current pandemic situation can actually be seen as a new source of growth as well as development resilience in the midst of a pandemic. The current pandemic also shows the importance of microfinance and the role of the Islamic social sector to mitigate the increase in unemployment and poverty due to the recession. In addition, business strategies that can be carried out by optimizing digital technology are aimed at accelerating economic activities and preventing existing pandemic restrictions. Indicators from the Islamic economic and financial sectors are expected to contribute to national policy-making. The recovery and empowerment of sharia businesses in the sharia economic sector from the impact of the Covid-19 pandemic require support for financing from the sharia financial sector. The increase in the contribution of the sharia economy and finance to the national economic recovery expects synergy from various stakeholders, both from regulators, practitioners, and the wider community. As countries with the largest Muslim population, Indonesia and Malaysia have great potential in developing the world's Islamic financial market. This is also a factor that supports the improvement of the sharia industry, which has begun to grow and has a significant impact. Where the increase has been recognized by the international community. According to the Islamic Financial Development Index published by the Islamic Corporation for Private Sector Development (ICD), it is claimed that the Islamic financial industry in Malaysia ranks first in 2020 and Indonesia in second place out of 135 countries according to 5 top ratings. namely governance, quantitative development, awareness, knowledge, and corporate social responsibility. The Islamic Finance Development Index (IFDI) is a weighted index used to measure the overall development in the Islamic finance industry by conducting a performance assessment in accordance with its faith-based nature and objectives. (Islamic Finance Development Report, 2020).

		Indicator Value					
Country	Ranking	IFDI 2020	Quantitative Development	Knowledge	Governance	Awareness	CSR
Malaysia	1	111	94	185	86	149	41
Inconesia	2	72	27	181	67	60	23
Bahrain	3	67	38	68	88	103	38
United Arab Emirates	4	66	31	67	79	91	60
Saudi Arabia	5	64	59	52	41	50	119
Jordan	6	53	14	75	51	29	99
Pakistan	7	51	18	80	74	53	31
Oman	8	45	14	46	56	73	25
Kuwait	9	43	48	13	53	48	42
Qatar	10	38	28	19	53	52	29
Brunei	11	36	13	44	51	51	9

Figure 1. Top IFDI Market And Global IFDI for 2020

The rapid growth of Islamic banking indicate that the public has given a good and positive response isang labhan Islamic (Rahayu and Cahyani, 2014). Under this public trust, Islamic banks must carry out their duties in a trustworthy manner and disclose their responsibilities in an accountable manner. One of the qualities of Islamic banks can be seen in financial performance. Fahmi (2013) reveals that the financial performance of a bank is an

analysis to find out to what stage the company conducts a precise and accurate financial transaction using financial rules. An important indicator that can measure the financial performance of a bank is profitability. According to Kasmir (2014), profitability is used to better rank a company's ability to generate revenue. Therefore, profitability is a certain measure of a bank's financial performance, where ROA is the goal of company management by maximizing shareholder value, optimizing various levels of profit, and minimizing existing risks. If the bank has a high ROI, then it has a good opportunity to drive growth to add value to the company. As the banking regulator in Indonesia, Bank Indonesia prioritizes the value of the bank's profits in terms of assets. This is because most of these assets come from public funds (third party funds). Based on research conducted by Tristiningtyas (2013), Mawaddah (2015), Yundi and Sudarsono (2018) state that the performance of a company is mostly measured based on financial ratios during a certain period. The return on investment shows the bank's ability to manage its funds to be channeled into the financial sector, which is potential, safe and in accordance with Islamic law, as well as the effectiveness of the bank, which can be used as a benchmark for the bank's health.

Therefore, the soundness of the bank also reflects the good or bad financial performance of the bank. According to POJK No 4/POJK.03/2016 in assessing the noise of commercial banks, there are two parties that conduct an analysis of the noise of banks, such as the Financial Services Authority as a supervisory authority for financial institutions and banks, which conduct self-assessment of the noise of their banks. In addition to banks, the Financial Services Authority, as the supervisory authority that performs the supervisory tasks of financial service providers, including banks, is obliged to pay attention to the health of banks. The researchers measure health levels using four factors in a bank's risk-based rating method, namely the risk profile, by measuring credit risk using the *non-performing credit ratio* (NPLs). The profitability ratio (profit) uses the ratio between the *return on total assets* (ROA) and the *net interest margin* (NIM). The capital factor (capital) uses the Capital Adequacy Ratio (CAR). *Good Corporate Governance* takes advantage of the results of the Bank's self-assessment. In order to fulfill its responsibilities to society, Islamic Banks fully disclose information to information users, namely shareholders and other stakeholders (Rahayu and Cahyani, 2014). One form of liability for Islamic banking is the disclosure of CSR-related information. Corporate social responsibility is the company's concern for all non-commercial interests (Lestari, 2013). At the same time, the disclosure of corporate social responsibility (CSR) in the Sharia industry can use the starting point, apparently, the Islamic Social Responsibility Index (SRI). The Islamic Social Responsibility Index is one of the CSR reporting standards in accordance with Islamic principles. This index includes cases related to Sharia-based CSR disclosure based on the AAOIFI (Islamic Financial Institutions Accounting and Auditing Organization) definition, which was first clarified by Haniffa (2002).

Although the disclosure of ISR in Islamic financial institutions is not mandatory because there are no specific standards related to regulations governing social responsibility in Islamic banking, the discussion on CSR has been listed in the Qur'an in QS. Al-Baqarah [2]: 205, where it is explained that maintaining and caring for the environment is very important to do because Allah does not like any damage (Yusuf, 2010). Several previous studies have shown that the level of ISR exposure in Islamic banks around the world is still relatively low. Various external and internal factors can influence the exposure of ISRs by Islamic banks. The low level of ISR exposure by Islamic banks suggests that social responsibility is not a serious problem in some Islamic banks. (Hassan and Saaffrey Harahap, 2010). Disclosure of Islamic Social Reports (ISR) conducted by a company can enhance a good image and trust of stakeholders. Therefore, stakeholders will be more interested in investing, which will lead to an improvement in the company's financial performance (Aryanti et al., 2017).

This study was conducted to analyze the impact of the bank's reliability on profitability. Unlike the studies conducted in several previous studies. This study analyzes the strength of banks using the NPF, CAR, NIM and GCG ratios and adds Islamic Social responsibility as a mitigating variable with samples in Indonesia and Malaysia listed on the Indonesian Stock Exchange and the Malaysian Stock Exchange between 2017 and 2020. This is done because Indonesia and Malaysia are the countries with the largest Muslim populations in Southeast Asia and have almost the same culture, both of which have very rapid development. This study is important because previous studies have still limited the disclosure of KSO information to conventional banks and public companies, although there are studies that discuss ISR, the results of conducted studies are contradictory to factors that can affect the level of exposure to Islamic social reports. In addition, this study uses a different sample from previous studies and this study uses more recent data than previous studies.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1. Legitimacy Theory

According to Mousa and Hassan (2015) the concept of legitimacy is important to be applied in order to analyze a relationship between the company and the environment. Legitimacy is a corporate governance system designed to support communities, governments and individuals. This theory is a link between organizations or companies that are in line with the values of the community itself, where all parties are expected not to get a loss so that all parties get the benefits (Mousa and Hassan, 2015). This legitimacy theory explains that every company must be able to carry out its operational activities on the basis of social values and norms that have been applied and are a tradition in society. This activity is carried out to be able to take trust and good judgment in the surrounding environment so that the company continues to run properly. Therefore, it is important to disclose information in the company clearly and transparently in an annual report and to disclose social and environmental responsibilities within the company itself.

2.2. Fundamental Theory

According to Brigham and Philip (2004), Fundamental theory is based on national and global economic conditions. Financial information related directly or indirectly can be used as research indicators. One form of fundamental analysis is the use of three top-down analysis methods, namely:

a) Review and understand the state of the economic environment in relation to the business being evaluated.
b) To study possible changes in the industry in relation to the company.
c) Review the company for evaluation, including key competition strategies, governance, regulation and other related factors.

2.3. Bank Soundness

In Dhamawi (2011), the power of the bench, the power of the people, the owners of this group, the delegation of the administration, the industry that benefits from banking services, and the people who are the organizers of the bank. A healthy bank is a bank that can properly perform its functions, in which case it can protect the trust of the public, especially its customers, and act as an intermediary. Able to fulfill its commitments and develop the resources the owner has entrusted to management. Public confidence in the use of Islamic banking products is still relatively low, considering that many people still prefer conventional banks. Therefore, it is necessary to improve the socialization of the public regarding Islamic banking, both in terms of existence and products. Then, the soundness of the bank needs to be assessed so that the public knows the bank's financial performance. Bank health, in this case, is useful for assessing bank performance in implementing prudential principles, compliance with Sharia law, compliance with applicable regulations, and risk management in banking. Assessment of these aspects can be done with a quantitative or qualitative assessment. In this study, researchers will conduct research on bank health using the application of bank performance assessment, namely the risk profile factor (risk profile) which measures credit risk using the *Non-Performing Financing* (NPF) ratio, the profitability factor (earnings) using the *Net Interest Margin* (NIM) ratio, secondly, capital factors use the Capital adequacy ratio, and *Good Corporate Governance* factors using the results of the bank's self-assessment.

2.3.1. Non-Performing Financing (NPF)

According to Bank Indonesia's regulations, one of the commercial risks of banks is credit risk, also known as *Non-Performing Financing* due to the borrower's default on its obligations. Criminal financing by Islamic banks is called unprofitable financing (NPF). Unrealized Financing (NPF) is a debt that is difficult to repay due to internal reasons, i.e., intentional factors or external issues, i.e., events beyond the creditor's control. Thus, non-profit investment (NPF) is the ratio measured by non-profit financing compared to the funding provided by Islamic banks. So, if the MFN share increases, the risk of a fall in search of profit, in turn, will be even greater.

2.3.2. Capital Adequacy Ratio (CAR)

CAR (Capital Adequacy Ratio) is a C*apital Adequacy Ratio* (CAR) that indicates a bank's ability to provide funds used to eliminate the possible risk of loss. According to Kasmir (2012), the valuation is based on capital held by one of the banks. One estimate is the CAR (Capital Adequacy Ratio) method, which is by comparing capital with risk fair assets (RWA). CAR is one of the variables used to measure the strength of the bank. If the value of the bank's car is high, the bank is in a good position and vice versa. The high rate of CAR in banks also indicates that the profitability of the bank is increasing, and at the same time the state of health of the bank is good.

2.3.3. Net Interest Margin (NIM)

According to Darmawi (2012), *Net Interest Margin* (NIM) is the difference between all interest income on bank balances and all interest costs on funds received. NIM is a metric that can be used to measure a bank's performance in earning net interest income from productive assets. Muljono (1999) states that when a bank owns more than 2% of NIM, the bank may be in a healthy state. The higher the bank's net interest margin, the higher the interest income on productive assets, making it less and less likely to get the bank into trouble.

2.3.4. Good Corporate Governance (GCG)

According to POJK No. 55/POJK.03/2016 on the implementation of good corporate governance by commercial banks, "Banks are required to regularly self-assess the adequacy of governance implementation and prepare implementation reports." When assessing GCG factors, researchers will use the results of the bank's self-assessment. *Good Corporate Governance* (GCG) is a system whose existence is more than a formality, and the presence of corporate governance is believed to be very influential in adding value to a company (Andika and Rahman, 2018). The better a company performs, the more convincing it will be to investors, and the greater its ability to generate high profits.

2.4. Corporate Social Responsibility (CSR)

Corporate Social Responsibility (CSR) is a mechanism that refers to achieving a balance where a company is able to contribute to and align with the company's goals (financial) and non-financial goals in order to be socially and environmentally responsible to the surrounding environment. Communities and other stakeholders take responsibility by and large (Kiliç et al., 2015). According to ISO 2600, corporate social responsibility is the responsibility of an organization for the impact of its decisions and activities on society and the environment in the form of transparent and ethical behavior that is consistent with the common good, sustainable development and respect for stakeholder laws and regulations. International standards of conduct and integration into the overall organization and respect for human rights.

2.5. Islamic Society Report (ISR)

Global awareness of the role of business in society has increased over the past decade (Khaled et al., 2011). More generally, the role of companies includes elements of social responsibility and accountability not only in traditional but also in Sharia (Ghazali, 2007). According to AAOIFI Corporate Social Responsibility in the Islamic concept, all activities carried out by Islamic financial institutions are to fulfill their religious, legal, economic and moral obligations as financial intermediaries (Othman and Thani, 2009).

2.6. Profitability

Profitability is a measure of a company's ability to generate profits or earnings by looking at the total number of assets the company has. Profitability is also a description of a company's performance based on how efficient and effective the company's operations are in generating profits. The performance of company management can be described in terms of profitability (Widiawati and Raharja, 2012). Companies with higher profits tend to get involved in politics. Therefore, these companies are encouraged to disclose increasingly detailed information in their annual reports in order to minimize political costs and present the company's financial health to the public (Widiawati and Raharja, 2012).

2.7. Previous studies

A study analyzing the impact of bank health on profitability using Islamic Social Reports. This study examines the health of banks using the ratios of NPF, CAR, NIM, and GCG, and adds ISR as a moderator to the samples from Indonesia and Malaysia. According to previous research by Agustin and Darmawan (2018), Agustin and Darmawan (2018) stated that one of the most important things to maintain a bank is to increase and maximize operational banking activities as measured by improving the bank's financial performance. Furthermore, Research by Tristiningtyas (2013), Mawadda (2015), and Yundi and Sudarsono (2018) shows that a company's performance is mainly measured by its financial indicators over a specific period and that the soundness of a bank is also a reflection of how good or bad its financial performance is. bench.

In addition, according to Pramana and Mustanda (2016) the higher the company's profitability, the greater the social disclosures made by the company, Hence, it is hoped that the disclosure of the ISR will also be greater to increase investor confidence in investing capital and persuade the public to channel their funds and fund Islamic

banks to increase the profitability of Islamic banks. So this shows the relevance of the influence between the soundness of the bank and the disclosure of ISR.

However, several previous studies have shown that the level of ISR disclosure by Islamic banks globally remains relatively low. Various external and internal factors can influence the disclosure of ISR by Islamic banks. The low level of ISR disclosure by Islamic banks suggests that social responsibility is not a major concern for some Islamic banks (Hassan and Syafri Harahap, 2010).

2.8. Hypothesis Development

2.8.1. Impact of *Non-performing Financing* (NPF) on Profitability

Non-performing financing (NPF) is a financing risk in Islamic banking. Non-performing financing (NPF) is a financial indicator that refers to the credit risk faced by Islamic banking. Because some customers do not meet their obligations to the bank. If in a bank there are many arrears in credit payments by debtors, the bank cannot get back the capital that has been issued. This will affect the soundness of the bank and reduce the level of public trust. This is consistent with the underlying theory of indicators used to measure the health of banks. Studies by Astutik (2017), Zubaidah and Hartono (2019) and Yusuf (2017) show that NPF has an impact on the profitability of Islamic banks. The relationship between two variables is inverse or negative.

H_1: Non-performing financing (NPF) negatively affects profitability

2.8.2. Effect of *Capital Adequacy Ratio* (CAR) on Profitability

The C*apital Adequacy Ratio* (CAR)) is a capital ratio that accounts for a bank's allocation of funds for business development purposes and its ability to absorb risk exposure and banking losses. This high ratio leads to better capitalization (Maharani, 2011). That is, the higher the CAR ratio indicates a bank has large capital to develop its business activities. This shows that the profit to be obtained by the bank will also increase along with the increase in capital that can be used to develop the bank's business. Banks must provide capital above 8% of risk-weighted assets (RWA). This is consistent with the underlying theory of indicators used to measure the health of banks. According to Bilian and Purwanto (2017), Fajari and Sunarto (2017) and Suryani (2018) showed that CAR did not affect ROA.

H_2: Capital Adequacy Ratio (CAR) has a positive impact on profitability

2.8.3. Effect of Net Interest Margin (NIM) on Profitability

Net interest margin (NIM) is a component of profitability and is used to assess how much net interest income a bank earns. This is consistent with the basic theory that a company's financial performance is measured by the financial indicators included in its financial statements. Most of the bank's income still comes from interest income, which means that the increasing NIM ratio indicates the better the bank's management, because they can get large interest from their productive assets (Martharini, 2012). This research is supported by research (Sukma Kartika Dewi and Yadnyana, 2019), (Gunawan, 2018), and (Ardiansyah, 2020) showed that NIM had a positive effect on ROA.

H_3: Net interest margin (NIM) has a positive impact on profitability.

2.8.4. Impact of *Good Corporate Governance* (GCG) on Profitability

Good Corporate Governance (GCG) is a system whose existence is more than just a formality, and the existence of corporate governance is believed to be very influential in enhancing corporate value (Andika and Rahman, 2018). According to Bank Indonesia in PBI No. 11/33/PBI/2009, *Good Corporate Governance* (GCG) is the management of a bank that adopts the principles of transparency, accountability, responsibility, professionalism and fairness. The implementation of GCG has the aim of providing an increase in the performance of a company, namely profitability. So the principle of GCG is applied. Due to the success achieved, the profitability of the company can be increased. Research by Rizky Fadhillah (2012), Rima and Ahmad (2018), and Prasodjo (2015) supports this, noting that GCG has a positive effect on profitability.

H_4: Good corporate governance (GCG) has a positive impact on profitability.

2.8.5. Disclosure of Islamic Social Responsibility (ISR) as a moderating variable can strengthen or weaken *Non-Performing Financing* (NPF) on Profitability

Legitimacy theory states that every company must operate on the basis of social values and norms that prevail in society. This is intended so that the company gets a good image and trust from the community itself (Mousa and

Hassan, 2015) Companies can increase profitability by increasing the value of *Return On Assets* (ROA) as this attracts investors to invest in their stocks, and companies can also gain public confidence in doing banking not only for profit, but also by doing social Activities are in accordance with the principles of Sharia law. In order to increase the value of the *Return On Assets* (ROA) and reduce the financing risk rate, it is called *Non-Performing Financing* (NPF) in Islamic banks. Because high financing problems lead to the decline of the bank's profitability, careful analysis is required when financing, so that the financing rate of return is high. to improve bank profitability. Therefore, it is necessary to disclose the ISR as a medium to convince investors and the general public who are channeling funds to Islamic banks that Islamic banks are able to reduce the risk of *non-performing financing* and thus gain an increased chance of profit sharing. Therefore, it is assumed that disclosing Islamic social responsibility can mitigate the impact of bad money, whose profitability is determined by the return on investment.

H_5: Disclosure of Islamic Social Responsibility (ISR) can moderate the relationship between Non-Performing Financing (NPF) on Profitability

2.8.6. The Effect of Disclosure of *Islamic Social Responsibility* (ISR) as a Moderating Variable Can Strengthen or Weaken the *Capital Adequacy Ratio* (CAR) on Profitability

Capital Profitability is a factor most important for the growth and development of the bank, as well as an effort to maintain public trust in the bank. *Capital Adequacy Ratio* (CAR) is a capital adequacy ratio that serves to accommodate the risk of loss that may be faced by the bank. If the CAR value is high, the bank is able to finance operational activities and make a large contribution to profitability. With increased profitability, it will also have a good impact on the disclosure of Islamic Social Responsibility (ISR).

Based on the legitimacy theory of previous research results, companies must clearly state information in annual reports regarding the disclosure of social and environmental responsibilities in their business. This is because CSR disclosure using the ISR index will provide a good reputation and public trust in the company. CSR disclosure using the ISR index can also be considered by stakeholders in making decisions that will increase the value of the company. According to Pramana and Mustanda (2016), the higher the company's profitability, the greater the social disclosures made by the company, so it is hoped that the disclosure of ISR will be even greater so that it can increase investor confidence in investing their capital and convince the public to channel their funds and finance Islamic banks so that will increase the profitability of Islamic banks. Therefore, it is suspected that the disclosure of Islamic Social Responsibility can moderate the C*apital Adequacy Ratio* (CAR) with profitability as a proxy for *Return on Assets* (Pramana and Mustanda, 2016).

H_6: Disclosure of Islamic Social Responsibility (ISR) can moderate the relationship between Capital Adequacy Ratio (CAR) to Profitability.

2.8.7. The Effect of Disclosure of Islamic Social Responsibility (ISR) as a moderating variable can strengthen or weaken *Net Interest Margin* (NIM) on Profitability

According to the theory of legitimacy, legitimacy is a corporate governance system for communities (society), governments, individuals and social groups. The rationale for this theory is that an organization or business will continue to exist if the community recognizes that the organization works for a value system that corresponds to that of the community itself (Mousa and Hassan, 2015). Companies need Islamic Social Responsibility (ISR), which is a form of social responsibility based on Shariah principles, to enhance the reputation or image of the banking industry. avoid things that are prohibited such as usury, gharar and maysir and can improve banking performance due to environmental and social preservation efforts that will later get Allah's blessing. With the disclosure of ISR carried out by Islamic Banks, it is expected to be able to convince investors to invest and make people more confident to channel their funds or carry out financing at Islamic Banks, From the perspective of net interest rate, increases the net interest income that contributes to the bank's profit. Margins (NIM).

H_7: Disclosure of Islamic Social Responsibility (ISR) can moderate the relationship between Net Interest Margin (NIM) and Profitability.

2.8.8. The impact of Islamic Social Responsibility (ISR) disclosure as a moderator variable can strengthen or weaken the impact of good corporate governance (GCG) on profitability

Good corporate governance (GCG) is a system whose existence is more than a formality, and the existence of corporate governance is believed to have a large impact on a company's value creation (Andika and Rahman, 2018). GCG is one of the factors that can have an influence on profitability. The relationship between GCG and

profitability can be seen in the company's performance. GCG is also a concept created to increase accountability and transparency in a company with the hope of ensuring that the company can perform its duties and responsibilities as efficiently as possible. With the implementation of GCG, it can also create a sense of trust and at the same time provide protection to the public (customers). Also, in this case, the company must disclose CSR using the ISR index (i.e. Islamic Bank) in order for the company to gain a good reputation and public trust. Stakeholders may also consider using the ISR index to disclose CSR when making decisions that add value to the company. This is consistent with the theory of legitimacy, which states that legitimacy is a system of corporate governance designed to stand with the community (society), the government, individuals and community groups.

H_8: Disclosure of Islamic Social Responsibility (ISR) can moderate the relationship between Good Corporate Governance (GCG) and Profitability.

3. METHODOLOGY

3.1. Type of Study

The type of data used in this study is quantitative data. The data source used is secondary data. This study uses secondary data obtained from annual reports, financial reports, and CSR reports in Indonesian and Malaysian Islamic Banking which were obtained from each website, which amounted to 31 samples of Islamic banks in Indonesia and Malaysia. Data collection from several companies from 2017 to 2020. However, after carrying out a casewise diagnostics test to detect outlier data which makes the data abnormal due to extreme values (too high and too low) with a standard deviation of 3.00, it was found that 44 data are outlier data so trimming or deletion of sample data must be carried out so that the results of observations final score was 80.

3.2. Research Methods

The data analysis techniques used in this study were descriptive analysis and regression analysis. The regression analyses used were linear regression analysis and moderated regression analysis. The following is the regression equation used:

$$Y= \alpha + \beta X1 + \beta X2 + \beta X3 + \beta X4 + e \ldots \quad (i)$$

$$Y = \alpha + \beta 1\ X1 + \beta 2\ X2 + \beta 3\ X3 + \beta 3\ X4 + \beta 4Z + \beta 5\ X1\ *Z + \beta 6\ X2\ *Z + \beta 7 \ldots \quad (ii)$$

Y : Profitability (ROA)

α : Constant

β : Variable Regression Coefficient

X1 = Non-Performing Financing (NPF)

X2 = Capital Adequacy Ratio (CAR)

X3 = Net Interest Margin (NIM)

X4 = Good Corporate Governance (GCG)

Z = Disclosure of Islamic Social Responsibility (ISR)

*X1 *Z = Interaction between Non-Performing Financing (NPF) and ISR*

*X2 *Z = Interaction between Capital Adequacy Ratio (CAR) and ISR*

*X3 *Z = Interaction between Net Interest Margin (NIM) and ISR*

*X4 *Z = Interaction between Good Corporate Governance (GCG) and ISR*

β1, β2, β3, β4, β5, β6, β7 = Multiple regression coefficient

e : Error

Next, the tests used to test the hypothesis are the F-test (ANOVA) and t (partial), if the level of significance is greater than 0.05, the hypothesis is not supported, i.e. the variable is not significant independently of the dependent variable, but if the level of significance is greater than 0.05, the hypothesis is not supported Less than 0.05, the hypothesis is supported, which means that the independent variables have partial/simultaneous effects. significantly affect the dependent variable.

Table 1. Variables and their Measurements

Variables	**Profitability**
Profitability	ROA =Net Income/Total Assets
Non-Performing Financing	NPF =Total Non-Performing Financing/Total Financing
Capital Adequacy Ratio	CAR =Capital/Risk Weighted Assets
Net Interest Margin	NIM = Net Interest Income/Average Earning Assets

Table 2. Assessment Weight of Good Corporate Governance (GCG)

No.	**Factor**	**Weight**
1	Implementation of the Duties and Responsibilities of the Board of Directors	10%
2	Implementation of the Duties and Responsibilities of the Board of Commissioners	20%
3	Completeness and Implementation of Committee Duties	10%
4	Handling Conflicts of Interest	10%
5	Implementation of the Bank's Compliance Function	5%
6	Implementation of the Internal Audit Function	5%
7	Implementation of External Audit Function	5%
8	Implementation of Risk Management Including Internal Control System	7,5%
9	Provision of Funds to Related Parties*and*Provision of Large Funds (*large exposure*)	7,5%
10	Transparency of Financial and Non-Financial Conditions, Implementation Report Governance and Internal Reporting	15%
11	Bank Strategic Plan	5%
	Total	**100%**

Source: Attachment SE OJK No.14/SEOJK.03/2017

4. RESULT

4.1. Descriptive Test Statistics

Descriptive statistics provide an overview or description of data resulting from the mean, standard deviation, maximum and minimum values (Ghozali, 2016). The results of the descriptive statistical analysis were determined by examining the independent variables (bad finance, equity ratio, net interest margin, good corporate governance), dependent variables (return on assets) and moderator variables (Islamic social responsibility), namely:

Table 3. Test Results Descriptive Statistics

	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
ROA	80	,0002	,1119	,010009	,0129467
NPF	80	,0000	,0530	,018076	,0159428
CAR	80	,0000	14,6080	,549230	2,2179738
NIM	80	,0000	,3596	,041469	,0393544
GCG	80	,0125	,0273	,018598	,0038876
ISR	80	,2500	,8125	,574999	,1769275

As can be seen from the above table, for the dependent variable *Return on Assets* (ROA), the minimum value is 0.0002 and the maximum value is 0.1119. The mean of this dependent variable is 0.0100 and the standard deviation is 0.0129. The standard deviation value of this variable represents the change in the observed data because the standard deviation value is greater than the mean. You can also see that for the independent variable *Non-Performing Financing* (NPF), the minimum value is 0.0000 and the maximum value is 0.530. The independent variable has a mean of 0.1000 and a standard deviation of 0.0159. For this variable, the standard deviation value is less than the mean, indicating that the observed data are homogeneous. For the next variable, *Capital Adequacy Ratio* (CAR), the minimum value is 0.0000 and the maximum value is 14.6080. The CAR variable has a mean of 0.5492 and a standard deviation of 2.2179. The standard deviation value for this variable also indicates that the observed data varies because the standard deviation value is greater than the mean. Then

the variable *Net Interest Margin* (NIM) has a minimum value of 0.0000, a maximum value of 0.3596, an average value of 0.0414, and a standard deviation of 0.0393. Standard deviation values less than the mean also indicate that the observed data are homogeneous. Additionally, the *Good Corporate Governance* (GCG) variable has a minimum value of 0.0273 and a maximum value of 0.0125. The mean is 0.0185 and the standard deviation is 0.0038. Standard deviation values less than the mean also indicate that the observed data are homogeneous. Then there is the moderator variable, *Islamic Social Responsibility* (ISR), with a minimum value of 0.2500, a maximum value of 0.5749 means, and a standard deviation of 0.1769. The standard deviation value which is smaller than the mean value also indicates that the observed data is homogeneous.

4.2. F-Test Results

F Test Aims to determine whether or not there is an effect of variable X (independent) on variable Y (dependent) simultaneously (together). The basis for decision making is significance < 0.05 so it can be said to have a significant effect. This test can be done if in a research model there are two or more independent variables.

Table 4. Results of F-Test

Regression Model	F	Sig
Multiple Regression Analysis (i)	178,383	0,000
Moderation Regression Analysis (ii)	85,808	0,000

Table 5. Coefficient of Determination Test Results Model 1

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,951[a]	,905	,900	,0040979

Note: Predictors: (Constant), GCG, CAR, NIM, NPF

Based on the table above, it can be seen that the *R Square* value *is* 0.905 or 90.5% then, it can be concluded that the variable x affects the variable Y simultaneously.

Table 6. Coefficient of Determination Test Model 2

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
2	,958[a]	,917	,906	,0039650

Note: Predictors: (Constant), GCG*ISR, NIM, CAR, NPF, GCG, NPF*ISR, ISR, NIM*ISR, CAR*ISR

According to the table above, analyze the interaction between the data variables NPF, CAR, NIM, GCG and ISR and the independent variables (NPF, CAR, NIM, GCG) and the moderator variable (ISR) on ROA This variable adds the independent variable to the dependent variable After adding the moderator variable, the initial effect of the dependent variable increased from 90.5% to 91.7%.

4.3. Result of t-test

A partial test was performed to partially test the effect of the independent variable on the dependent variable. The test was performed using multiple regression analysis with a 95% confidence level or 5% alpha.

Table 7. Results of t-test for Model 1

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	T	Sig.
(Constant)	-0,0021	,002		-,877	,383
NPF	-0,1377	,030	-,170	-4,655	,000
CAR	-0,0001	,000	-,019	-,532	,597
NIM	0,3057	,012	,929	25,733	,000
GCG	0,1076	,122	,032	,885	,379

Note: Dependent Variable: ROA

Table 8. Summary

Variable	T Calculate	Sig Value	Significance	Conclusion
NPF	-4.655	0.000	0.05	Significant Influence
CAR	-0.532	0.597	0.05	No Significant Influence
NIM	25.733	0.000	0.05	Significant Influence
GCG	0.885	0.379	0.05	No Significant Influence

According to the test results presented in the test results in the above table, it can be seen that the t-score of the NPF variable is -4.655, and the significance value is 0.000, indicating that the effect is significant. The t-count for the CAR variable is -0.532 with a significance value of 0.597. The t-count for the NIM variable is 25.733 with a significance value of 0.000. The GCG variable has a value of 0.885 and a significance value of 0.379. Therefore, according to the t-test results in Table 7, it can be concluded that the multiple regression model in the first study model is as follows:

$$Y = -0,0021 - 0,1377X1 – 0,0001X2 + 0,3057X3 + 0,1076X4$$

$$ROA = -0,0021 - 0,1377(NPF) – 0,0001(CAR) + 0,3057(NIM) + 0,1076(GCG)$$

Table 9. T-test Results for Model 2

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	,004	,011		,369	,713
NPF	,096	,126	,119	,765	,447
CAR	,001	,011	,125	,064	,949
NIM	,124	,145	,376	,850	,398
GCG	-,239	,476	-,072	-,503	,617
ISR	-,010	,018	-,132	-,528	,599
NPF*ISR	-,400	,199	-,345	-2,014	,048
CAR*ISR	-,001	,019	-,152	-,078	,938
NIM*ISR	,276	,226	,574	1,217	,228
GCG*ISR	,616	,750	,195	,821	,414

Note: Dependent Variable: ROA

As can be seen from Table 5, the coefficient of determination or R-squared value for the first test (without the use of moderators) was 0.905 or 90.5%. As can be seen in Table 6, the R-squared value in the second test was 0.917 or 91.7% (using Islamic social responsibility disclosure as a moderator). This suggests that there is an impact that can enhance Islamic social responsibility disclosure. According to the test results in Table 9 above, the significance value of the interaction between the NPF variable and ISR is 0.048, which is less than the alpha value of 0.05, and the conclusion of the disclosure variable "Islamic social responsibility" can be drawn. Can significantly reduce and amplify the effect of NPF on the ROA variable, but the significance value of CAR variable interaction of 0.938 is greater than the alpha value of 0.05, which means that the disclosure variable “Islamic social responsibility” can reduce the impact of CAR, but not on ROA variable, significantly. Among the variables of interaction significance for the NIM variable, the ISR was disclosed as 0.228, with an alpha value greater than 0.05, the ISR variable mitigated the effect of NIM, but was not significant for the ROA variable. Then the significance value of the GCG variable is 0.379, greater than 0.05, which means that the ISR variable is able to moderate the effect of GCG but is not significant on the ROA variable**.**

The t-test in the second research model (Moderated Regression Analysis) is:

$$Y = \alpha + \beta1\ NPF + \beta2\ CAR + \beta3\ NIM + \beta3\ GCG + \beta4Z + \beta5\ NPF\ *Z + \beta6\ CAR\ *Z + \beta7\ NIM\ *Z + \beta8\ GCG\ *Z$$

5. DISCUSSION

5.1. Non-Performing Financing (NPF) on Profitability

A test analyzing the impact of non-performing financing (NPF) on profitability as measured by return on assets (ROA) revealed a partially or individually significant relationship between non-performing financing (NPF) and

return on assets (ROA). NPF variable is less than 0.05, as can be seen from the t-counts in Table 4.9, which has a value of -4.655 and a significance value of 0.000. This means that the NPF variable has a significant negative effect on the ROA variable partly or alone. It can also be assumed that if all variables other than *Non-Performing Financing* are held constant, then every 1% increase in distressed financing reduces ROI by 4,655. That is, if the bad financing rate is high, there is a high financing risk, so the bank's ROI falls because it does not repay both the instalments and the financing profits provided. Therefore, the value of *Non-Performing Financing* in Islamic banks must be maintained at the limit set by Bank Indonesia, namely 5%, this is done because *Non-Performing Financing* will reduce profitability caused by uncollectible funds. which will then result in a bank not being able to carry out financing on its productive assets. This poses a risk of difficulty in repaying the debtor with a high amount so that it can affect the performance of a bank. In this case, Bank Indonesia has taken precautionary measures to maintain the stability of the bank based on the theory of legitimacy, where the relationship between organizations or companies is in line with the values of the community itself, and parties are not expected to suffer losses, but benefit from all parties (Mousa and Hassan, 2015). Furthermore, according to basic theory, the ratio can be used to measure the soundness of a bank. The significant impact of unproductive financing (NPF) on return on investment in this study is consistent with Yusuf (2017), Almunawwaroh Marlian (2018), Zubaidah and Hartono (2019), but unlike the Lemiyana and Litriani (2016), Astutik (2017) studies, which say they do not affect the return on total assets, this is because the distressed financing in Indonesian Islamic banks is not very high in nominal terms.

5.2. Capital adequacy ratio (CAR) Affects Profitability

The analysis test of the impact of variable capital adequacy ratio (CAR) represented by return on assets (ROA) on profitability shows that the relationship between variable capital adequacy ratio (CAR) and return on assets (ROA) can be obtained from Table 4.9. It can be seen from the t-count that its value is 0.532, and the significance value of the CAR variable is 0.597 greater than 0.05, which means that the CAR variable has no partial or single pair against the ROA variable. The results of this study are in line with the fundamental theory where the financial performance of a company is measured using the financial ratios contained in the financial statements which can later provide information regarding the company so that investors can make decisions regarding the distribution of their investment funds. The significant effect of *Capital Adequacy Ratio* (CAR) on investment return in this study is consistent with the study by Suhandi (2019) and Husein Fajri Muttaqin (2017) that *Capital Adequacy Ratio* (CAR) has no effect on investment return (ROA). It can be interpreted that if the bank does not use its capital properly and effectively to generate profits, the capital will have no effect on the profits to be obtained.

5.3. Net Interest Margin (NIM) has an Effect on Profitability

Tests analyzing the effect of net interest margin (NIM) on profitability as determined by the return on investment (ROA) have shown that there is a partially or individually significant relationship between net interest margin (NIM) and return on investment (ROA). The t value in Table 4.9 is 25.733, and the significance value of the NIM variable is 0.000, which is less than 0.05, indicating that the NIM variable has a significant positive effect on the ROA variable partially or alone.

Net Interest Margin (NIM) can sometimes have a significant positive impact on Islamic banks' *Return on Asse*ts (ROA). This suggests that the effect of NIM is consistent with ROA. Where the Islamic bank's *Net Interest Margin* falls, it will also reduce the Islamic bank's *Return On Assets*. This reduces the bank's ability to generate profits as the bank's ability to manage productive assets to generate net interest income decreases. Based on the results of this study, it is in line with the fundamental theory where financial statement analysis is very important because by analyzing financial statements it is possible to estimate the state or position and direction of a company (Brigham and Philip, 2004). The significant impact of *Net Interest Margin* (NIM) on investment returns in this study is consistent with previous studies by Muhammad Laksono (2017), Nugroho (2020), Setyarini (2020). So it can be concluded that the decrease in NIM during the study period will affect the decrease in ROA (Ali and Roosaleh, 2017; Setyarini, 2020; Arief Yuswanto Nugroho, 2020).

5.4. Good Corporate Governance (GCG) Affects Profitability

A test analysis of the impact of *Good Corporate Governance* (GCG) variables on profitability as measured by *Return on Assets* (ROA) shows that there is a partially or individually significant association between the *Good Corporate Governance* (GCG) variables, as can be seen from the t-count values in Table 1. 0.885 in 4.9, where the significance value of 0.379 for *Good Corporate Governance* (GCG) is greater than 0.05, which means that the GCG variable has no component to the ROA variable or individually significant effects.

Based on the understanding of GCG which can be interpreted as a regulatory system to increase added value to the company's stakeholders. A set of rules governing the relationship of rights and obligations among

shareholders, management, creditors, government, employees, and other internal and external stakeholders, or the system of governance and control of a company, consistent with a theory of legitimacy where the theoretical legitimacy is A system of corporate governance designed to support communities, governments, and individuals and their activities to gain the trust and good judgment of those around them.

The results of this study show that GCG has no significant effect on profitability as a company's financial performance. This may be due to inconsistent results provided by Return on Assets (ROA). The long-term nature of GCG makes it impossible to measure success in the short or short-term, while the return on assets (ROA) cycle is short-term. The results obtained can be used directly as a benchmark for corporate decision-making.

The significant impact of *Good Corporate Governance* (GCG) on ROA in this study is consistent with the research by Hapsari (2018) and Widia Ayuning (2021) that the negative impact of GCG on Indonesian banking companies is negligible (Lestari et al., 2021).

5.5. Effect of *Islamic Social Responsibility* Disclosure *Moderates Non-Performing Financing* on Profitability

In the fifth hypothesis, Islamic Social Responsibility (ISR) can reconcile Performance Financing (NPF) to profitability as indicated by Return on Assets (ROA) is acceptable. According to the test results performed, it can be seen that the significance value of the interaction of the variable Non-performing Financing (NPF) and Islamic Social Responsibility (ISR) is 0.048, which is less than the alpha value of 0.05, it can be concluded that the variable Islamic Social Responsibility (ISR) can mediate and strengthen the relationship between non-performing financing (NPF) and profitability based on return on assets (ROA). This is due to Islamic banks' non-performing funds not exceeding the 5% limit set by Bank Indonesia, which may affect the profitability of the bank. If the value of NPFs decreases, profit increases, otherwise the profit will decrease after the growth of NPFs. Disclosure of *Islamic Social Responsibility* (ISR) of NPFs based on Bank Indonesia's 5 percent regulation or the cost of unproductive financing at low-cost Islamic banks encourages investors to invest in Islamic banks because investors believe in the bank's ability to handle financial matters. This is consistent with a sound theory that explains that every company must perform operational tasks based on social values, and is usually applied to society to trust and assess the environment so that the company can continue to function properly. Based on this, it can be concluded that disclosure of information about research institutes can reduce and strengthen the *non-performing financing* (MFN) of the profits of Islamic banks.

5.6. Effect of *Islamic Social Responsibility* Disclosure Capital Adequacy Ratio (CAR) on Profitability

The sixth hypothesis, according to which *Islamic Social Responsibility* (SRI) can mitigate the ratio of the adequacy of the expected *Return on Assets* (ROA) *of profits* (ROA), is rejected. Based on the square R adjusted in the first research model, the variable x that affects the variable y is 0.900, and in the second research model, the adjusted R square is 0.906, which shows an effect that can improve ISR exposure, in accordance with the concept of legitimacy theory where the relationship should be between the company and the environment is important to do so that all parties are not expected to get a loss so that all parties get the benefit. However, the results of the tests carried out can determine the importance of the interaction of the *Capital Adequacy Ratio* (CAR). *Islamic Social Responsibility* (ISR) is 0.938 more than the value of 0.05, so the sixth hypothesis is rejected.

Because if the bank does not use its capital properly and effectively to generate profits, then the capital has no effect on the profits to be obtained. Furthermore, CAR did not have a significant impact during the review period, which may be due to the attitude of bank management that the CAR level in Islamic banking remains in accordance with the compliance set by Bank Indonesia (BI). This causes Islamic banking to not optimally utilize the capital owned (Widyaningrum and Septiarini, 2015). The possibility of moderating ISR on the effect of CAR on profitability (ROA) although not significant because high levels of capital adequacy and profitability are not accompanied by high budgeting of CSR funds as well. This finding is in line with research (Kurniawansyah and Mutmainah, 2013) which states that ISR disclosure practices by Indonesian banking companies are still low, while the average CAR and ROA of companies are high. In addition, companies, in this case, are still not required to carry out sharia social reporting, *Islamic Social Reporting* (ISR), which is still *voluntary*, may cause unequal distribution of each company in making ISR disclosures so that they get less than optimal results.

5.7. Effect of *Islamic Social Responsibility* Disclosure *Moderates Net Interest Margin* (NIM) on Profitability

The seventh hypothesis is based on the fact that *Islamic Social Responsibility* (ISR) can moderate the *Net Interest Margin* (NIM) on earnings as a proxy for *Return On Assets* (ROA). Based on the adjusted R-squared in the first search model, the variable that influences x and y is 0.900 and in the second search model the adjusted R-squared is 0.906, this indicates an influence that can strengthen the ISR exposure, in line with the theory of legitimacy that

says that legitimacy is corporate governance oriented to societies (companies), governments, individuals and social groups. The theory is based on the idea that an organization or business will continue to exist when society recognizes that the organization works for a value system that is proportional to the social value system (Mousa and Hassan, 2015). However, the results of the test carried out can reveal the significant value of the *Net Interest Margin* (NIM) with *Islamic Social Responsibility* (ISR) of 0.228 more than the alpha value of 0.05, so it can be concluded that the seventh hypothesis.

Net interest margin (NIM) is the ratio of *net interest income* earned in bank management and capital goods management. The higher the ratio, the higher the interest on the bank's way of withdrawing and the less likely the bank is to run into problems. Therefore, the more volatility indicated by a bank's *Net Interest Margin* (NIM), the higher the bank's income (ROA), which means financial performance will improve or increase. Conversely, if the change in *Net Interest Margin* (NIM) is reduced, the bank's profitability (ROA), i.e. the company's productivity, decreases. In this case, there may be other factors that influence the moderating of ISR, among others, namely people who are not too focused on disclosure of ISR but focus on profit rather than on the performance of corporate social responsibility. When making financial decisions, investors usually do not pay too much attention to the information on the ISR in the annual reports of Indonesian listed banks. The type of banking unit that does not have a direct impact on natural resources is also a minor factor in the impact of ISR disclosure on financial decisions. Since the period in this study is limited to only four years, the effect of publishing the ISR on the financial result cannot be explained.

5.8. Effect of *Islamic Social Responsibility* Disclosure *on* Moderating *Good Corporate Governance* (GCG) on Profitability

The eighth hypothesis argues that Islamic *Corporate Social Responsibility* (ISR) can moderate *Good Corporate Governance* (GCG) on profitable business, as determined by *Return On Asset* (ROA), is rejected. Based on the adjusted R-squared in the first research model, the variable x developing the y variable is 0.900 and in the second research model, the adjusted R-squared div is 0.0.900 din. clear information in the annual report about the disclosure of social and environmental responsibilities in banks. This is because disclosure of CSR using the ISR index will develop a good reputation and public trust in the company, so it has the potential to develop partnerships with other companies. However, the results of the performed tests show that the t-count value is 0.821 with an interaction importance value of 0.414, see an alpha value of 0.05, so that it can be concluded hypothew.

This suggests that the costs applied to the ISR may affect, but not significantly, the profit management operations of assets held for profit, so it does not have a significant impact on the company to improve its performance. Markets cannot use ISR disclosure information to make economic decisions.

6. CONCLUSIONS AND RECOMMENDATIONS

Based on the above research findings and a discussion of the impact of bank trust on profitability and *Islamic Social Responsibility* (ISR) as a median variable in Islamic banking listed on the Indonesian and Malaysian stock exchanges in 2017-2020, it can be concluded that default financing and *net interest* rate effects *return on assets* represent, while equity ratio and good governance do not affect profitability, but using moderate variables in this study it can be concluded that Islamic corporate social responsibility can moderately increase the relationship between default and profitability, while Islamic corporate social responsibility can not set the credit rating, *net interest* rate differential, *good corporate governance* with profitability.

Based on the results of this research, the researcher makes suggestions for new researchers who want to study related phenomena, namely:

1. For further research, you can add additional variables that do not exist in this study, such as control variables or intervening variables.
2. For further research, it is possible to add observation time to get better and more significant observations.
3. For the government, this research is expected to help provide an overview of what policies should be made and conduct good socialization so as to increase corporate awareness in good corporate social responsibility disclosure.

AUTHORS' DECLARATION

This paper complies with Research and Publication Ethics, has no conflict of interest to declare, and has received no financial support.

AUTHORS' CONTRIBUTIONS

Conceptualization, writing-original draft, data collection, editing – OMCL, methodology, formal analysis – AW and KA, Final Approval and Accountability – L

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Holographic Organizations: Thinking Organizations Like A Brain

Holografik Organizasyonlar: Organizasyonları Bir Beyin Gibi Düşünmek

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ABSTRACT

The brain is fully capable of functioning for the most important purposes of the human body. It consists of separate cells that carry the same information and allow this information to be transferred seamlessly to neighbouring cells. The flexible structure of the brain results in the ability to self-organize. The metaphor of thinking of organizations as a brain compares the organization to a set of functions that process and even learn information over the long term as the brain does. The metaphor of thinking as a brain addresses the collective intelligence of employees in all departments of an organization. Employees in all departments of the organization use the organized wisdom of management, the pratical knowledge of employees and the experience of management to create a learning organization. This study provides a brief theoretical understanding of the organization-as-brain metaphor, holographic organizations, and the principle of the whole into the parts. The study also addresses the application of the whole to the parts, from organizational processes, organizational DNA and holistic leadership.

Anahtar Kelimeler:
Örgütsel DNA,
Beyin Metaforu,
Holografik Örgütler,
Holistik Liderler

Jel Kodları:
M00, M1, M10

ÖZET

Beyin, insan vücudunun en önemli amaçları için tamamen işlevseldir. Aynı bilgiyi taşıyan ve bu bilginin komşu hücrelere sorunsuz bir şekilde aktarılmasını sağlayan ayrı hücrelerden oluşur. Beynin esnek yapısı, kendi kendini organize etme yeteneği ile sonuçlanır. Organizasyonları bir beyin olarak düşünme metaforu, organizasyonu beynin yaptığı gibi uzun vadede bilgiyi işleyen ve hatta öğrenen bir dizi fonksiyonla karşılaştırır. Beyin olarak düşünme metaforu, bir organizasyonun tüm departmanlarındaki çalışanların kolektif zekasına hitap etmektedir. Organizasyonun tüm departmanlarındaki çalışanlar, yönetimin organize bilgeliği, çalışanların pratik bilgileri ve yönetimin deneyimi ile öğrenen bir organizasyon oluşturmak için kullanılmaktadır. Bu çalışma, beyin olarak organizasyon metaforu, holografik organizasyonlar ve bütünün parçalara ayrılması ilkesi hakkında kısa bir teorik anlayış sağlar. Çalışma ayrıca, örgüt süreçlerinden bütünün parçalara uygulanması, örgütsel DNA ve holistik liderlik gibi konularına değinilmiştir.

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1. INTRODUCTION

Employees are living beings who come together to share an organization's vision. Every employee has a unique perspective towards his organization. Each employee shares the responsibility of the whole, not his own part. However, the component parts of every organization are not the same. Each presents the whole picture from a different perspective. When you collect the parts of a hologram, the image of the whole does not change, but rather the image becomes denser. When employees in an organization share a common vision, the vision fundamentally does not change, it becomes more alive and more real in the sense of a mental reality that employees can only dream of achieving.

According to Morgan (1997: 100), organizational performance is significantly affected by the parts forming the whole in the brain metaphor. Considering the brain, the most important organ of the body, as an information processing system, it is possible to see organizations as brains. The brain fulfils five different roles: system control, information translator, collective information library, informative link and understanding the overall picture that separates small pieces of information. These five important factors of the brain help organizations to analyse the available information, determine the appropriate strategy based on data collection and make decisions.

The principle of decomposition of the whole into parts is an integral part of holographic organizational design and the application of this principle to organizations affects the organizational culture, leadership, teamwork, the future of work, the organization's strategy and information system. The principle of the whole into parts also increases the efficiency of the organization and is essential for the organization. In holographic organizations, the brain metaphor teaches how we should learn, how to process knowledge and how important intelligence is and how an organization should work. In short, it provides a frame of reference for both understanding and evaluating modern organizations (Morgan, 1997: 100). This study provides a brief theoretical understanding of the organisation-as-brain metaphor, holographic organisations and the principle of the decomposition of the whole into parts, as well as the application of the whole to parts from organisational processes, organisational DNA and holistic leadership.

2. ORGANIZATIONAL DNA

The universal feature of living organisms is to store, use and transmit all the genetic information necessary for the maintenance of their functions. It is genes that ensure the flow of genetic information between generations. If it is assumed that organizations are a living organism just like people, it can be said that each organization has its own unique cultural structure. Because organizations consist of people with different cultural backgrounds.

DNA (Deoxyribonucleic Acid) is one of the most basic concepts of the biology discipline and is a biomolecule that carries the characteristics of all living beings such as the formation, development, characteristics, reproduction and end of life (Çandır, 2005: 48). With this idea, DNA, which is an important phenomenon for living things, has also been considered for organizations. The DNA biomolecule in living things is the place where the necessary codes and information about all the features of living things are stored for a long time in order for them to survive. DNA consists of genes that carry the codes of biological processes that take place in the lives of living things. In this respect, as in people, organizations have to store and information about all their characteristics and experiences from the past to the last day. In this case, it has led to the emergence of the concept of "Organizational DNA" (Esmer, 2020: 16).

The fact that the discipline of business management has an electrical characteristic, metaphors are frequently used when explaining or researching business management events. For this reason, the concept of business DNA is a metaphor taken from the discipline of biology and genetics and used to explain the issues related to businesses (Koçel, 2018: 461).

The human body consists of networks with a hierarchical order. Cells make up tissues, tissues make up organs, organs make up systems, and systems make up the body. New capabilities emerge at each stage, and gradually each subsystem becomes equipped to perform its function. When the hierarchical situation in organizations is compared with the system of the human body, a high degree of similarity is observed. Expressing the entire organization as a system and other hierarchical subsystems, and that cells and organs form subsystems of a living organism, are in harmony with the systems approach, which is considered as a biological metaphor (Morgan, 1997: 51-54). The central nervous system in living organisms is similar to the role of top management in organizations. The central nervous system in living organisms receives and interprets the messages in the organism, coordinates the activities to be done, ensures the safety of the body and makes decisions about the whole body (Baskin, 1998: 8).

Organizations are like social organisms. Like living organisms, organizations are born, grow, develop, mature, age and die. Some organizations may have short or long lives, just like human life. Organizations that closely follow technological developments and can create a good organizational culture ensure the continuity of their sustainability and have a longer life span. However, the lifespan of organizations that do not create this is short.

Organizations within a social system can be considered as the cells of the social system. Just as each cell that makes up an organism has the same DNA, it can be accepted that the organizations that make up the social system have the same essence. The core DNA of an organization is expressed as its shared vision, mission, cultural structure and managerial structure. Organizations fulfil their duties with their employees. Each employee comes to the organization with different knowledge, skills, values and beliefs. Therefore, each organization has a corporate culture and based on this, there are differences in the management structure. The fact that an employee has the core DNA of the organization is realised by the adaptation of that employee to the organization. To the extent that the employee adopts the philosophy, vision, mission and corporate culture present in the core DNA of the organization, he/she integrates with the organization (Ball, 1997).

As an advanced organism, the human being is governed by the brain. Although the brain decides what to do, how to do it and when to do it, it is the DNA of its constituent cells that carries out the management function of this managerial organ. In this context, the management of an organization within a social system and the management of a cell of an organism can be related as a metaphor. Metaphor is a tool of perception (Arnett, 1999). Understanding an organization's DNA helps us understand and know how to achieve agility and authenticity in a rapidly changing world (Bonchek, 2016). In short, it is important and valuable for organizations to understand their DNA for their own sustainability.

Organizational DNA is a figurative term that refers to the key factors that define the character of an organization and help explain its performance. Organizational DNA is also a system that seeks to discover the organization by identifying its strengths and weaknesses as well as identifying solutions (Nafei, 2015: 118). An organization has four basic building blocks that define its unique characteristics. These basic building blocks are decision, structure, motivators and knowledge (Booz, 2005: 1; Çandır, 2005: 100).

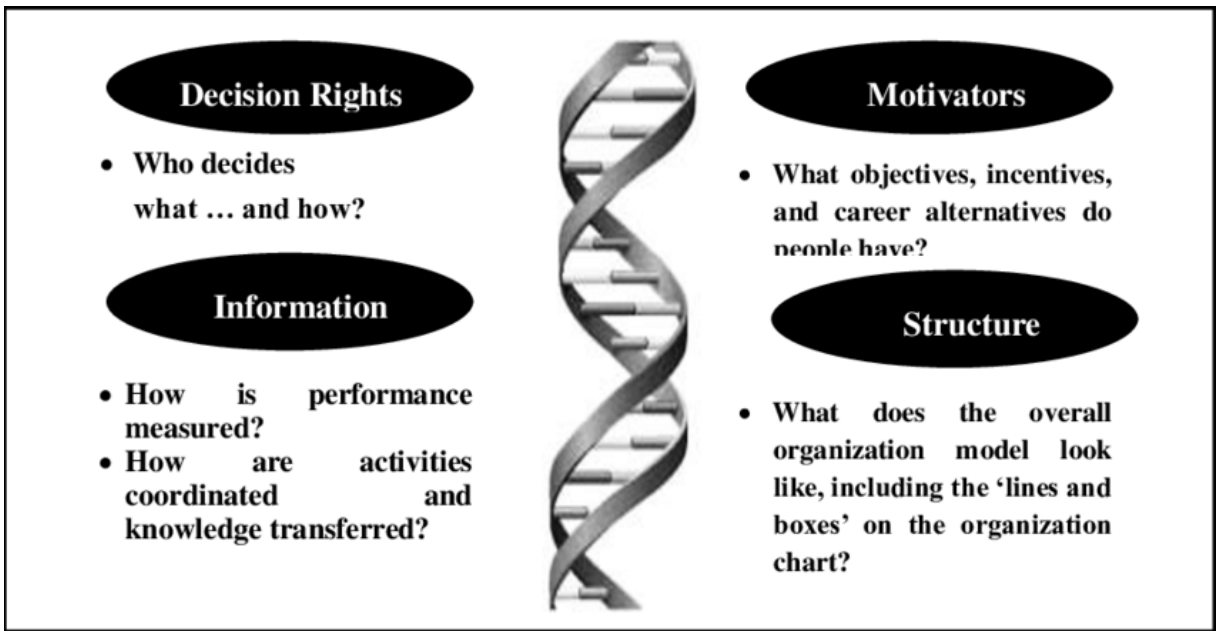

Figure 1. The four building blocks of organizational DNA
Source: (Nafei, 2015: 119).

The first of the four building blocks of organizational DNA, the decision, determines who is authorised to make which decisions. Structure, what does the hierarchy of the organization look like? How do the lines and boxes fit together in the organization's structure chart? How many layers are there in the hierarchy and how many reports does each layer receive? Motivators look for answers to questions such as what goals, incentives and career alternatives people have. Knowledge, on the other hand, is one of the most difficult tasks of modern business and one of the most undervalued contributions to creating competitive advantage through high performance (Kaipa and Milus, 2006: 9).

3. ORGANIZATION METAPHORS

Each of the eight organizational metaphors used by Morgan (1998), who has conducted studies on organizational metaphors, deals with the organization with different characteristics. These eight metaphors of Morgan are as follows (Uğurlu, 2011: 120; Manuti and Giancaspro, 2021: 115-116). In this study, the metaphor of organizations as brains - the brain metaphor among the organizational metaphors was examined.

4. ORGANIZATIONS AS BRAIN- BRAIN METAPHOR

Living systems have the ability to respond to and adapt to their environment. One of the fundamental concepts underlying organizations as brains is information processing. Organizations are information systems, communication systems and decision-making systems. In the machine metaphor, organizations are quite routine (Morgan, 1986: 81).

Bureaucracies tend to concentrate information and decision-making in the closed spaces of the hierarchy. However, since organic systems work on interdependencies, communication and decision-making are expected to be better networked. Thinking of the organization as a brain is related to the assumption that the organization is purposeful and rational, in a state of flexibility and creative activity. The aim is to create new forms of organizations that are capable of intelligent change and that radiate brain characteristics (Mullins, 2005: 32-33).

The brain metaphor, which reveals the importance of the brain's information processing system, is an information translator. It is a collective knowledge library. It is an informative link and breaks down data. These actions performed help organizations to develop strategy, analyse information and make correct decisions and can depict to the organization what is going on around (Morgan, 1997: 100).

5. ORGANIZATIONS AS HOLOGRAPHIC BRAINS

Hologram means that each of the parts in the system contains all the characteristics of the whole. In holographic systems, if one or more of the parts fail to fulfil their functions, the remaining parts can be reorganised and ensure the continuation of the system since they have the characteristics of the whole. An organization with this capability can process large amounts of information and shape this information for different purposes. It can also turn different perspectives into an advantage for itself. In holographic organizations, members of the organization are open to challenges and can find ways of organizing for urgent needs. Organizations structured in this way will be able to survive in any situation (Morgan, 1998:117-119; Morgan, 1989: 56; Argyris and Schon, 1978; Bach, 1989). Figure 2 shows some design principles of holographic organizations.

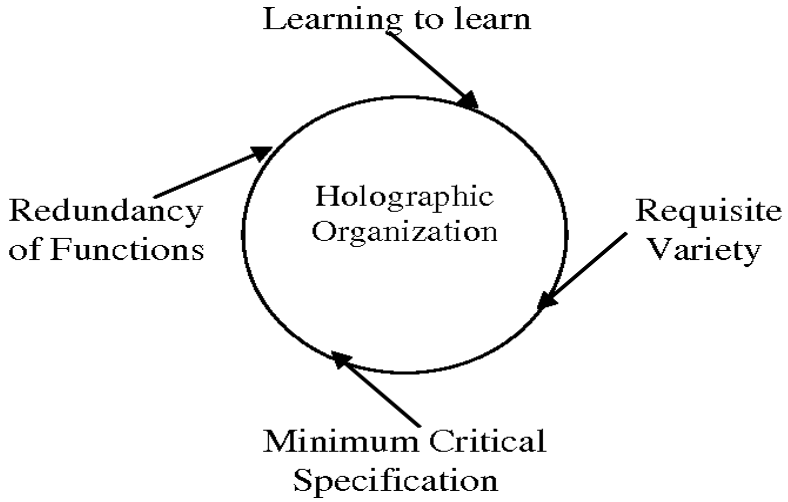

Figure 2. Principles of Holographic Design
Source: (Morgan, 1986: 99; Morgan, 1989: 53).

Redundancy: The focusing of all members of an organization on a large number of tasks in order to create a certain degree of specialisation and allow for generalisation. Each individual or team has a wider range of knowledge and skills than is required for the immediate task. This gives flexibility to the organization. To balance

the level of redundancy, the second principle, necessary diversity, comes into play (Morgan, 1998; Drucker, 1988; Hoda, 2011; Kramer et al., 2021).

Requisite variety: The principle of necessary diversity, the principle of necessary diversity, must match the challenges posed by the environment. All factors of an organization must incorporate the critical dimensions created by the environment. Each member of the organization acquires broad management and decision-making functions by learning to multitask and adapt to environmental factors. Functional redundancy is necessary because a single person in the organization will find it difficult to cope with all the factors in a given environment. By creating redundancy within the limits of the principle of necessary diversity, organizations can develop in a cellular way around self-organizing groups with the necessary skills and abilities to deal with the environment in a holistic and integrated way (Huber, 1984; Morgan, 1989; Morgan, 1998; Zoethout, 2006; Andriani, 2001; Balijepally et al., 2014).

Minimum critical specification: This policy provides sufficient control of groups or systems to perform their tasks. Leadership and facilitation skills are used to inform employees within the organization about the process. The minimum critical specification principle is borrowed from a bureaucratic system. However, it need not be bureaucratic in terms of function. By not assigning designated positions and providing a space where all members take turns leading and leading, employees have the opportunity to bring a variety of styles and views to the group. Employees generate new ideas. This principle requires constant thinking. But it keeps differentiation to a minimum so that group members can learn to focus on their tasks or goals without repeating unnecessary constructs (Morgan, 1989; Morgan, 1998; Goldman et al., 1999; Bellini et al., 2016; Ren et al., 2016).

Learning to learn: Learning to learn is to minimize chaos in the process. Organizations avoid predetermined rules. It is up to the participants to monitor their learning capacities, their development, their results and in general the direction of the processes they are involved in. Learning to learn is based on a cyclical system of enquiry that goes from single loop to double loop. At the single loop level, objects are analysed as they are without framing the context. The double loop level reframes the problem in context and allows more variables to be introduced into the environmental mix. In a holographic organization, it is necessary to create a culture of learning and self-regulation to make the most of the combined work between the four interrelated principles (Bateson, 1979; Morgan, 1989; Goldman et al., 1999; Hoda, 2011; Beck et al., 2003).

It is defined as the reflection and representation of the whole in its constituent parts or components. In this context, a holographic organization is a self-organizing organization with an extraordinary memory in which information is stored and processed in many parts or subsystems at the same time as a necessity of being everywhere (Balcı, 2006). The basic principles that must be followed in order for these organizations to form and survive are explained respectively.

6. THE PRINCIPLE OF THE WHOLE INTO THE PARTS

This principle is realised by focusing on culture, information systems, structure and roles in the organization. More precisely, this principle envisages that the vision, values and culture of the organization should be conveyed to all employees; that all employees should have access to all information about the organization; that expanding organizational structures should be designed; and that the roles of employees should be broadly defined and employees should gain skills in multiple areas (Morgan, 1998).

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When all parts of an organization, be they individuals, teams or departments, share their vision of the perspectives of the organization, the responsibility for the whole appears to be the purpose, goals, objectives, vision and a common purpose among the parts to achieve organizational success. Sharing the vision is crucial for learning organizations. In organizational learning, the energy among employees increases and focus is achieved. It increases cohesion among employees and builds confidence and courage to do what is needed for the vision (Reed, 2006). Thanks to the principle of the whole into the parts, the growth of the organization increases in parallel (Senge, 1994). The principle of dividing the whole into parts creates the capacity to be a problem solver in the employees within the organization and increases their ability to cope with any changes that occur inside or outside the organization (Döş, 2013).

7. HOLISTIC LEADERSHIP

Holism is defined as a theory in which the universe, and nature in particular, is correctly viewed in terms of interacting wholes that are more than just the sum of fundamental particles (Yaraş and Boydak Özan, 2019). Therefore, to be a holistic leader, one must not only understand and lead others from this perspective, but also understand oneself in terms of how one's own internal interactive aspects create a whole greater than oneself. Holistic leadership is being able to lead from the mind, heart and soul. Holistic leadership is applying a methodology that encompasses a developmental systemic approach to influence others as leaders, followers and the environment. Holistic leadership should reflect a journey towards transformation at individual, team and organizational/community levels (Orlov, 2003).

The leader's field dynamics, awareness and capacity include the potential field of holistic leaders. Holistic leadership is a methodology that focuses on systemic development that affects the self as a leader, others as followers, and the environment (Orlov, 2003). Taggart (2009) presents a holistic leadership model which he calls holistic leadership, a holistic approach to leadership. This model includes components such as organizational teaching, personal mastery, reflection, inquiry, management, visionary and strategic action, results orientation, thought leadership, power sharing, collaboration and nurturing.

Holistic leadership, similar to the participative leadership of action research and appreciative inquiry, represents change that strives to be inclusive and is based on a strong commitment. Holistic leadership optimises strengths. It builds on strengths to create an environment of transformation. In holistic leadership, artificial intelligence and action research, the leader does not control the goals. He allows a process of emergence to shape the outcome. The leader is an active participant. This participation, not control, forms the basis of Collin's fifth level of leadership (Collins, 2001) and the understanding of the high-performance organization (Collins, 2005).

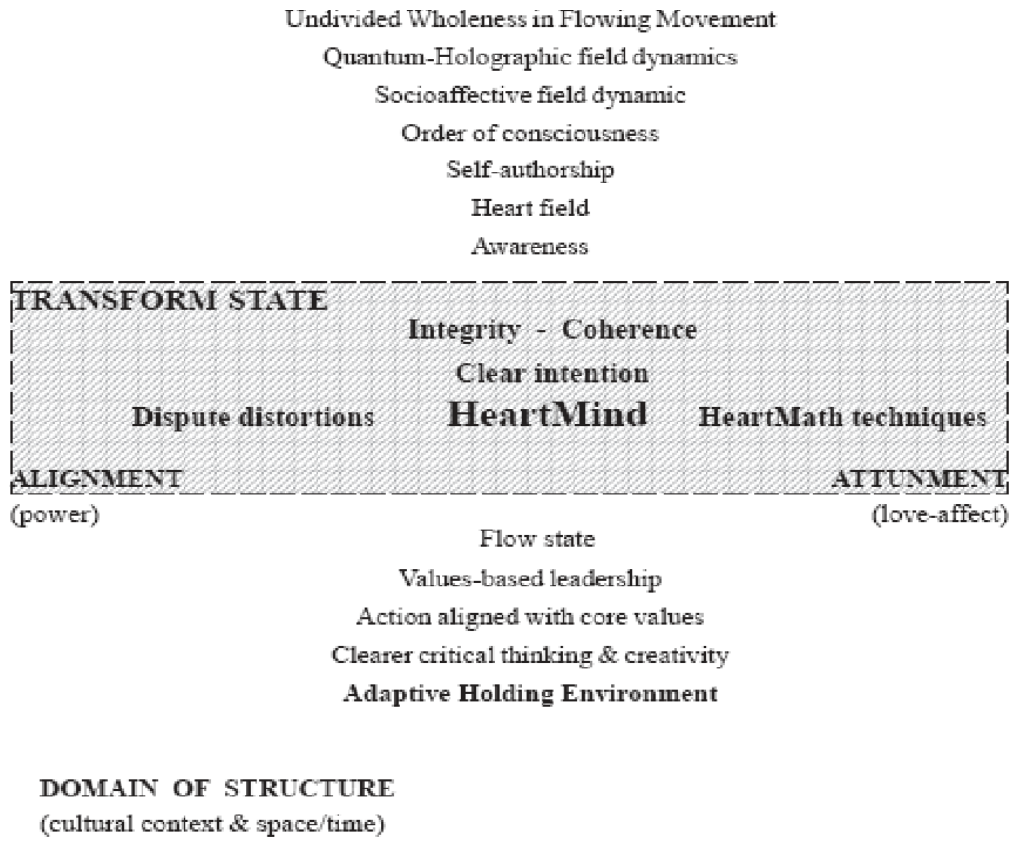

Figure 3. Holographic Leadership Theoretical Model
Source: (Byars, 2009: 136).

Figure 4 represents three descriptive dimensions of holistic leadership (Self (nurturing), Spirit (aligning) and Service (contributing)) and three corresponding leadership types (Self leadership, Authentic Leadership and Legacy Leadership). Each leadership type has three dimensions. Self-leadership represents the preparatory stage on the path to holistic leadership and includes self-motivation, self-mastery and self-creativity. Authentic

leadership involves self-awareness informed by an internalised moral perspective expressed as unity and purity in thought, speech and action. It implies the use of spirit through emotional intelligence and discretionary enquiry guided by a strong moral compass. Service leadership offers the pursuit of meaning and fulfilment through selfless service that results in a leader's lasting legacy. At each level, the various dimensions of holistic leadership are presented in a dialectical manner, emphasising their opposites on one level while at the same time highlighting their creative harmony based on synthesis. Throughout, leadership presents an opposition between self and other, each claiming its own true superiority. The holistic leadership paradigm recognises and builds on this inherent dialectic and seeks its resolution in the subordination of the good of the self for the good of others (Dhiman, 2017: 9; Quatro et al., 2007).

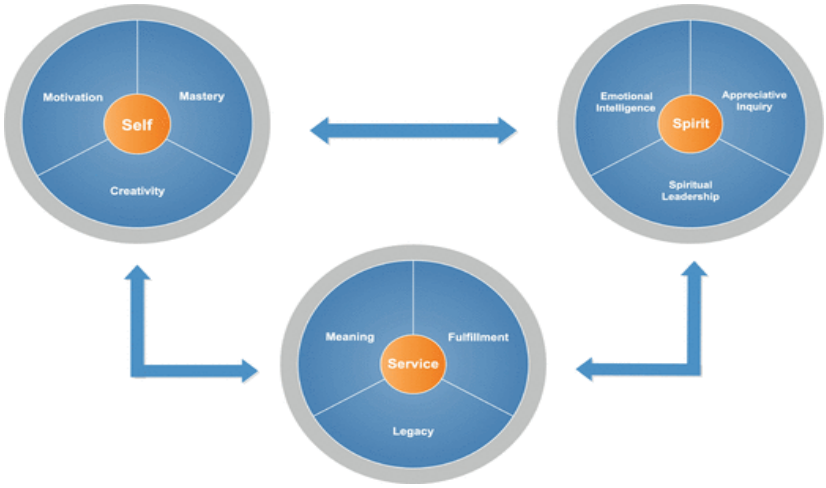

Figure 4. Holistic leadership framework
Source: (Dhiman, 2017: 9).

Holistic leadership is based on the understanding that leaders should bring their whole selves to their roles. It is a concept that is not only about the skills, processes and approaches of holistic leaders to their work, but also about their character, values and mindset.

8. CONCLUSION AND DISCUSSION

The brain can fully capable of functioning for the most important purposes of the human body. It consists of separate cells that carry the same information and allow this information to be transferred seamlessly to neighbouring cells. The flexible structure of the brain results in the ability to self-organize.

The brain metaphor, which is one of the important metaphors in understanding and explaining organizations, has an approach that examines organizations by likening them to the human brain. Organizations receive, process and store information as a brain. Organizations are systems that depend on information, communication and decision-making processes. Organizations create their own sense of identity (Koç Başaran, 2017; Döş, 2013).

Organizations are systems dependent on information, communication and decision-making. Organizations create their own sense of identity and develop ways of acting from an incomplete and evolving picture of the world around them. The brain metaphor suggests that organizations are structures made up of active participants who think, learn, gather knowledge and apply it in various ways. When participants in an organization learn and assimilate knowledge, changes occur in the ontology and function of the organization. This process of change is similar to the processes that affect the brains of living beings. One of the most important implications of the brain metaphor is that when employees in an organization learn and assimilate knowledge, it makes a difference to the existence and functioning of the organization and allows employees to develop their skills.

The principle of the whole into the parts establishes a strong link between the emergence of teamwork capabilities, information systems and organizational performance. Learning within the organization usually takes place through the dissemination of knowledge among team members. This enables employees to easily reach the goals, vision and mission of the organization. The principle of the whole into parts is important because it is generalised

and specialised in the organization. The principle of dividing the whole into parts helps employees to see the organization from different angles and perceptions. Organizational DNA is important for holographic structure and holistic teamwork. Organizational DNA also helps organizations to achieve common culture, vision, values and goals among all employees, units, teams, departments and the whole.

The holographic organization concept promotes teamwork in the organization, provided that the team consists of cohesive and skilled professionals. Teamwork collaborates to achieve competence that enhances organizational productivity, improvement of employee performance and organizational growth. Holographic organizations are organizations that can adapt to rapid changes in the environment, learn quickly, adapt, keep pace with change and process information. The result is innovative organizations that achieve results in the most efficient and proactive way.

Holographic organizations give employees and constituents the chance to actively participate in key governance functions such as vision framing and providing transparent accountability. Holographic organizations allow time and a strong sense of trust to be built between all members. The multiplicity of roles and functions creates enormous flexibility for the organization. The holographic organization is based on a culture of mutual trust, compromise and commitment to developing the capacities of employees (Mackenzie, 1991: 9-13). According to Ilkhani and Rohani (2021), holographic organizations have results on increasing self-management and affecting knowledge centres within the organization. Holographic organizations are also among the suggestions that a knowledge centre can be established using employee empowerment, shared values for the organization, participative leadership, employee self-actualisation and creative thinking. According to Hassan et al. (2016), employees in holographic organizations have new thinking patterns by continuously developing their internal capabilities.

Holographic leadership offers a unique set of guidelines for leadership and change. Holographic leadership also recognises the power of each individual employee within the organization. Because each employee has their own vision. Holographic leadership endeavours to provide each employee with an environment for their own development in harmony with the whole.

AUTHORS' DECLARATION

This paper complies with Research and Publication Ethics, has no conflict of interest to declare, and has received no financial support.

AUTHORS' CONTRIBUTIONS

All sections are written by the author.

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A Research on the Effects of Sustainability Reports Published in the Banking Sector on Financial Performance

Bankacılık Sektöründe Yayınlanan Sürdürülebilirlik Raporlarının Finansal Performansa Etkileri Üzerine Bir Araştırma

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ABSTRACT

In studies comparing sustainability performance and financial performance, it is seen that banking is generally excluded from the sample. The main purpose of this study is to analyze the effect of the statements made within the scope of the sustainability report in the banking sector on the financial performance of banks. 9 banks that were included in the BIST Sustainability Index at least once between 2010 and 2020 were included in the analysis. Environment, human resources, product responsibility and society as areas of sustainability; Return on assets and equity and net interest margin were determined as financial performance criteria. In the study, in which non-parametric statistical tests and Panel data analysis were used, public-private status and bank sizes were used as dummy variables. As a result, it has been found that the sustainability report disclosures have a significant effect only on the return on assets, while the sustainability report disclosures do not have a significant impact on the return on equity and net interest margin. In addition, when the effect of the sustainability report disclosures on the profitability of assets is examined in terms of its dimensions, it has been determined that the statements made regarding the environmental and human resources dimensions have a negative effect on the return on assets.

Anahtar Kelimeler:

Bankacılık,

Finansal performans,

Sürdürülebilirlik Performansı,

Sürdürülebilirlik Raporlaması

Jel Kodları:

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ÖZET

Sürdürülebilirlik performansı ile finansal performansı karşılaştıran çalışmalarda bankacılığın genel olarak örneklem dışında tutulduğu görülmektedir. Bu çalışmanın temel amacı, bankacılık sektöründe sürdürülebilirlik raporu kapsamında yapılan açıklamaların bankaların finansal performansı üzerindeki etkisinin analiz edilmesidir. 2010-2020 yılları arasında BIST Sürdürülebilirlik Endeksi'ne en az bir kez dahil olan 9 banka analize dahil edilmiştir. Sürdürülebilirlik alanları olarak çevre, insan kaynakları, ürün sorumluluğu ve toplum; Finansal performans kriterleri olarak aktif ve özkaynak karlılığı ve net faiz marjı belirlenmiştir. Parametrik olmayan istatistiksel testlerin ve Panel veri analizinin kullanıldığı çalışmada kukla değişken olarak kamu-özel durumu ve banka büyüklükleri kullanılmıştır. Sonuç olarak, sürdürülebilirlik raporu açıklamalarının sadece aktif karlılığı üzerinde anlamlı bir etkiye sahip olduğu, özkaynak karlılığı ve net faiz marjı üzerinde ise sürdürülebilirlik raporu açıklamalarının önemli bir etkisinin olmadığı tespit edilmiştir. Ayrıca sürdürülebilirlik raporu açıklamalarının varlıkların karlılığına etkisi boyutları itibarıyla incelendiğinde, çevre ve insan kaynakları boyutlarına ilişkin yapılan açıklamaların aktif getirisini olumsuz etkilediği tespit edilmiştir.

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1. INTRODUCTION

Uncontrolled, rapid growth and consumption in the World jeopardize the sustainability of the generations after us. Because of that, the importance that the developed societies attached to sustainability issues like environmental consciousness and social responsibility and their awareness show a huge increase in recent years.

The totally profit oriented mind that the capitalism is forcing is being tried to balance by the concept of sustainable development for human being to maintain its development and to protect own wealth. In the report of World Commission on Environment and Development named "Our Common Future," it was emphasized that the concept of sustainable development should imply limits, and these limitations should be imposed by social organizations about environmental resources and present state of technology and by the ability of the biosphere to absorb the effects of human activities[1]. After that, the concepts of sustainability and development started to be used together for the first time in the united nations environment and development conference in Rio De Janerio in the year 1992 (Özmehmet, 2008: 5).

After the concept of sustainable development gained recognition, the sustainability of companies became a current issue. And the issue that the usual financial reports which are prepared by companies are not sufficient for the sustainability of companies, came into view, because these reports like balance sheets, and income statements only give information about financial situation. The concept of institutional sustainability came up after this situation. It is targeted to create a long-term and permanent significance with institutional sustainability by customizing decision making mechanism of companies in three ways as economic, environmental, and social, which encompasses all shareholders (Aras et al., 2018: 48). The first performance reporting in these three aspects is used under the name of institutional sustainability is stated by n (Elkington, 1997: 34). According to this report, the economic achievement should be parallel to environmental and social progress, and this relationship should be managed in a corporate way.

After the concept of institutional sustainability is bandied about, different kinds of sustainability reporting methods started to show up. According to the KPMG's report that published in 2013, 78 once of the biggest 100 companies are following any kind of sustainability report (KPMG, 2013: 65). The most known and the common used one is the sustainability report which is prepared by the Global Reporting Investment (GRI).

Global Reporting Investment is an independent establishment, and they identify subjects and standards for companies to help them understanding and expressing themselves about sustainability issues as environment, human rights and corruption. GRI has led reporting on sustainability issues untill the end of 90$^{th.}$ (GRI, 2016: 23). As it is one of the most comprehensive guidebook and ensures the participation of shareholders widely, it became the most preferred sustainability report all over the World (Lozano & Huisingh, 2011:101).

The concept of sustainability has gained importance in the middle of 2000$^{th.}$. After the companies in BIST 30 Index were started to evaluate for BIST Sustainability Index in November of 2014, it became an important indicator for investors and the other shareholders.

The aim of this study is to determine the effect of declaration, which is made in the scope of sustainability reports in the Turkish banking sector on financial performance of banks. As we explained before, GRI reporting is the most widely used method in Turkey, in our study the banks which are publishing GRI reports in BIST Sustainability Index were selected for our sample.

2. LITERATURE REVIEW

There are lots of publications about sustainability performance in literature. However, after the beginning of 2000 by the progress in corporate sustainability awareness, much more companies started to publish sustainability reports. Afterwards indexes based on sustainability were established in national stock markets and the studies on sustainability performance turned to a different way.

The finance companies are mostly excluded in studies about sustainability performance as you see in Table 1. According to the table, when we check methods and results of publications, we see that Burhan & Rahmanti (2012), Madorran & Garcia (2016) could not find a relationship between sustainability performance and financial performance by the method panel data. Fernandez (2016), Soytaş et al. (2017), Düzer & Önce (2018) and Önder

[1] http://www.un-documents.net/our-common-future.pdf (Access Date: 01.10.2022)

(2018) found a positive relationship between sustainability performance and financial performance by the method panel data.

When we direct our attention to subtitles of sustainability, Düzer & Önce (2018) found a positive relationship between economic sustainability performance and financial performance in their study.

Table 1. Studies on Sustainability Performance

No	Authors	Publication Name	Date	Sample	Methods
1	Annisa Hayatun N. Burhan Wiwin Rahmanti	The Impact Of Sustainability Reporting On Company Performance	2012	32 firms in Indonesian Stock Market	Panel Data Analysis
2	Pérez-Calderón E., Milanés-Montero P. Ortega-Rossell F. J.	Environmental Performance and Firm Value: Evidence from Dow Jones Sustainability Index Europe	2012	122 firms in European Dow Jones Sustainability Index	Cluster Analysis
3	Priyanka Aggarwal	Impact of Sustainability Performance of Company on its Financial Performance: A Study of Listed Indian Companies	2013	20 firms India NIFTY 50 Index	Panel Data Analysis
4	Sibel Fettahoğlu	Relations between corporate social responsibility and financial performance: An application in Istanbul stock exchange	2014	16 firms in BIST in Turkey	Panel Data Analysis
5	Mercedes Rodriguez-Fernandez	Social responsibility and financial performance: The role of good corporate governance	2016	121 firms in Madrid Stock Exchange	Panel Data Analysis
6	Cristina Madorran, Teresa Garcıa	Corporate Socıal Responsıbılıty And Fınancıal Performance: The Spanısh Case	2016	35 firms in IBEX in Spain	Panel Data Analysis
7	Paula Santis, Andrei Albuquerque, Fabiane Lizarelli	Do sustainable companies have a better financial performance? A study on Brazilian public companies	2016	Brazilian Stock Exchange firms (BM&FBOVESPA)	Cluster Analysis
8	Mehmet Ali Soytaş Meltem Denizel Damla Durak Uşar İris Ersoy	Corporate sustainability investments and financial Performance relationship in Turkey	2017	214 firms in BIST in Turkey	Panel Data Analysis
9	Murat Düzer, Saime Önce	Effect of disclosures on sustainability performance indicators on financial performance: An application in BIST	2018	GRI reporting 30 firms in BIST	Panel Data Analysis
10	Şerife Önder	Impact Of Sustaınabılıty Performance Of Company On Its Fınancıal Performance: An Empırıcal Study On Borsa Istanbul (BİST)	2018	33 firms in BIST in Turkey	Panel Data Analysis

*There is no finance company in the sample of studies.

Madorran & Garcia (2014), Düzer & Önce (2018) and Önder (2018) found a positive relationship between environmental sustainability performance and financial performance but Aggarwal (2013) found a negative relationship between environmental sustainability performance and financial performance in their studies. Burhan & Rahmanti (2012) found a relationship between sustainability performance and financial performance and Fettahoğlu (2014) could not find a relationship between social sustainability performance and financial performance, Önder (2018) found a positive relationship between social sustainability performance and financial performance in their studies. Publications about sustainability and banks are summarized in Table 2. According to the table, we see that Multi-Criteria Decision-Making Models and statistical comparison methods were used to compare banks, on the other hand; panel data analysis was used to find out the effect of relations between sustainability and banks.

Table 2. Studies on Sustainability and Banking

No	Authors	Publication Name	Date	Sample	Methods
1	Kılıç, M., Kuzey, C. Uyar, A	The Impact of Ownership and Board Structure on Corporate Social Responsibility (CSR) Reporting in the Turkish Banking Industry	2015	25 banks operating in Turkey	Panel Data Analysis
2	Sonia Rebai, Mohamed Naceur Azaiez , Dhafer Saidane	A multi-attribute utility model for generating a sustainability index in the banking sector	2016	3 biggest banks in France	AHP
3	Ayşenur Altınay Barış Kaki Ali Kestane Mustafa Soba Ömer Dinçer Eser Şık	The effects of sustainability index on banking sector share center values, an investigation on the BIST sustainability index	2017	4 banks in BIST Sustainability Index in Turkey	Pearson Correlation Analysis, Paired t-test
4	Güler Aras Nuray Tezcan Özlem Kutlu Furtuna	Comparison of corporate sustainability performance of conventional and participation banking with TOPSIS method	2017	7 banks operating in Turkey	TOPSIS
5	Utku Şendurur ve Fatma Temelli	Comparison of participation and conventional banks which are operating in Turkey in terms of sustainability	2018	5 participation and 7 conventional banks operating in Turkey	t-test
6	Amina Buallay	Is sustainability reporting (ESG) associated with performance? Evidence from the European banking sector	2018	235 banks operating in European Union	Panel Data Analysis
7	Łukasz Matuszak Ewa Rózanska	A Non-Linear and Disaggregated Approach to Studying the Impact of CSR on accounting Profitability: Evidence from the Polish Banking Industry	2019	18 banks operating in Poland	Panel Data Analysis
8	Eriana Kartadjumena Waymond Rodgers	Executive Compensation, Sustainability, Climate, Environmental Concerns, and Company Financial Performance: Evidence from Indonesian Commercial Banks	2019	39 commercial banks operating in India	Panel Data Analysis

When we check the studies in which panel data analysis was used to find out relations between sustainability performance and financial performance, we see that Buallay (2018) found a positive relationship in general, Matuszak & Rózanska (2019) couldn't find a relationship in general and Kartadjumena & Rodgers (2019) found a negative relationship in general. As you see, these studies couldn't find a common relationship between sustainability performance and financial performance in the banking sector. And also the number of the studies are still too less.

3. MODEL, DATA AND METHODOLOGY

The studies about sustainability in the finance sector is limited in literature. And most of the studies excluded finance sector from their samples (Soytaş et al. 2017; Burhan & Rahmanti, 2012; Aggarwal 2013). The reason for this is that the responsibilities of finance sector concerning pollution and labor safety are less in contrast to other sectors. And also the financial performance indicators of the finance sector are different than other sectors. Because of that, the finance sector and the other sectors should not be in the same samples. But finance sector has an important role on assigning social and environmental politics of industries (Kılıç et al., 2015: 360). Although the studies on the sustainability performances in banking sectors are increasing, it seems still unsatisfactory.

3.1. Data Set and Sample Size

In the study, 9 banks included in the BIST Sustainability Index were included in the analysis. Banks that were included in the BIST Sustainability Index at least once between 2010 and 2020 were included in the sample. Borsa İstanbul decides which companies will be included in the BIST Sustainability Index as a result of the evaluation of Borsa İstanbul companies according to international sustainability criteria by Ethical Investment Research Services Limited (EIRIS), with which it has a contract since the establishment of the Sustainability Index in BIST in 2014[2].

The first sustainability report of banks was published by Akbank in 2010 in relation to 2009. Akbank, the pioneer of the sustainability report, was followed by TSKB in 2010. The other 7 banks started their sustainability reporting very late compared to these two banks and started to publish reports generally in the same period as the establishment of the BIST Sustainability Index in 2014. Therefore, the year 2009, when Akbank started to publish its sustainability report, was taken as a starting point for the sample. The reason for taking the date of 2020 for the last sustainability report is that the purpose of the research is to measure the effect of the statements made by the banks on the financial performance of the banks, and because the banks' sustainability reports are published in the earliest February-March of the next year, and in June at the latest, the financial data is the data of the next year of the banks. is necessity. Since the last balance sheet we have belongs to 2021, the last sustainability report statements of the banks for 2020 were used in the study. Therefore, data on sustainability reports between 2009-2020 and financial statements between 2010-2021 were used for analysis.

In the study, 2 public banks and 7 private banks are included. Public banks are Halkbank and Vakıfbank, while private banks are İşbank, Garanti Bank, TSKB, Akbank, Şekerbank, Albaraka Türk Bank and Yapı Kredi Bank.

Table 3. Groups of Banks According To Types and Asset Sizes

Types		**Asset Sizes**		
Public	Private	0-180 Billions	180-250 Billions	250-320 Billions
2	7	2	4	3

3.1.1. Dependent Variables

Accounting-based financial indicators were used as dependent indicators of the study. These are the return on assets (ROA) and equity (ROE) ratios, which are generally used to measure bank performance as indicators of the financial performance of banks, and the net interest margin (NIM) (Telli, 2016: 71-72). Ratios related to financial performance were obtained from the annual reports of banks. In addition, the total average financial performance indicators of banks between the years 2009-2021 are presented in Table 4. According to the table, the three financial performance indicators of Return on Assets decreased similarly from 2009 to 2015, then a short increase, then the return on assets decreased until 2018, then followed a flat course until 2021; Return on Equity declined until 2018, then followed a fluctuating course; Net Interest Margin, on the other hand, increased in 2020 and then decreased again in 2021.

Table 4. Financial Indicators of Banks Between 2010-2021

Financial Performance Values	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
ROA	0,023	0,018	0,018	0,016	0,014	0,011	0,014	0,015	0,013	0,010	0,010	0,010
ROE	0,183	0,159	0,150	0,157	0,125	0,108	0,134	0,143	0,129	0,096	0,105	0,139
N. Interest Marjin	0,041	0,035	0,039	0,037	0,035	0,035	0,035	0,037	0,041	0,040	0,042	0,037

3.1.2. Independent Variables

The independent variables of the study are the performance values prepared using the sustainability reports of the banks. These performance values are divided into 4 main groups. These performance values are environment, human resources, product responsibility and society.

The following scoring model was used while calculating the performance values for the fields of environment, human resources, product responsibility and society from the sustainability reports of banks (Dinçer, 2011: 73). About these 4 groups;

[2] www.borsaistanbul.com (Access Date: 12.09.2022).

If there isn't any explanation – Point 0
If there is a partial explanation or a full explanation – Point 1

While calculating these performance values, which we accept as the independent variable of our application, calculations were made according to certain rules. Banks used different versions of the GRI reporting method in different years between 2009 and 2020. Although these versions of GRI contain similar questions in essence, the number of questions belonging to the groups we have determined is different. As the study was scored according to the number of questions pertaining to environment, human resources, product responsibility, and society in each version, separate scores emerged for each bank. To overcome this problem, the scores calculated for the sustainability areas of the banks are divided by the number of questions of the calculated GRI version. The quanta of these areas are shown in Table 5.

Table 5. Number of Criteria for GRI Versions

	GRI VERSIONS		
SUSTAINABILITY AREAS	**GRI 3.1**	**GRI G4**	**GRI 2016**
1- Environmental Performance Values	18	19	22
2- Human Resources Performance Values	15	13	19
3-Customer Confidentiality Performance Values	6	6	6
4- Community Performance Values	2	2	2
TOTAL PERFORMANCE VALUES	**41**	**40**	**49**

Table 6 shows the proportional averages of the sustainability reports statements made by banks between 2009 and 2020. According to the table, the statements made in the environmental field showed a fluctuating increase until 2013 on average, then after experiencing a decrease in 2014, it rose again in 2015 and followed a black fluctuating course until 2020 in the following years. When the disclosures in the fields of human resources, customer privacy and society are analyzed, it has shown a fluctuating increase from 2009 to 2015, and after reaching the highest level in 2015, it decreased volatilely.

Table 6. Evaluation Table of Banks' General Sustainability Reports Between 2009-2020

Reporting Year	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Environmental Performance Values	0,033	0,041	0,027	0,087	0,164	0,108	0,161	0,113	0,144	0,127	0,150	0,127
Human Resources Performance Values	0,024	0,051	0,030	0,100	0,197	0,177	0,275	0,184	0,190	0,184	0,218	0,227
Customer Confidentiality Performance Values	0,011	0,011	0,005	0,030	0,049	0,041	0,067	0,052	0,045	0,036	0,036	0,032
Community Performance Values	0,003	0,003	0,003	0,014	0,025	0,022	0,036	0,020	0,026	0,014	0,018	0,014
General Performance Values	0,070	0,106	0,065	0,230	0,434	0,348	0,539	0,370	0,405	0,361	0,422	0,399

3.2. Hypotheses

This study accorporates two main hypotheses and these hypotheses have sub-hypotheses. These were given below. The horizontal dependency test for determining the stationarity tests in the panel data series did not yield results in STATA and eViews programs because of the unbalanced panel. Based on this result, Im, Peserane and Shin-W test (IPS), ADF-Fisher Chi-square test and PP-Fisher Chi-square tests, which are suggested unit root tests for unbalanced panels, were used to determine the stationarity of the series (www.stata.com- 20.09.22). The study consists of two main hypotheses, A and B, and sub-hypotheses, as indicated by the subheadings below:

A) Hypotheses for testing whether performance indicators in sustainability reports differ according to banks' public/private status and asset size.

H1a: *The level of knowledge that banks declare about the environment regarding performance indicators in their sustainability reports differs according to the state of being public/private.*

H1b: *The level of knowledge that banks disclose about human resources regarding performance indicators in their sustainability reports differs depending on whether the banks are public/private.*

H1c: *The level of knowledge that banks disclose about product liability for performance indicators in their sustainability reports differs according to the state of being public/private.*

H1d: *The level of knowledge that banks disclose about the society regarding the performance indicators in their sustainability reports varies according to the public/private status of the banks.*

H2a: *The level of knowledge that banks declare about the environment regarding the performance indicators in their sustainability reports varies according to the asset size of the banks.*

H2b: *The level of knowledge that banks disclose about human resources regarding performance indicators in their sustainability reports varies according to the asset size of the banks.*

H2c: *The level of knowledge that banks declare about product liability for performance indicators in their sustainability reports varies according to the asset size of the banks.*

H2d: *The level of knowledge that banks disclose about the society regarding the performance indicators in their sustainability reports varies according to the asset size of the banks.*

B) Hypotheses to understand whether the performance indicators in the sustainability reports have an impact on the financial performance of banks

H3: *The level of knowledge that banks declare about performance indicators (environment, human resources, product responsibility, society and total sustainability) in their sustainability reports has a positive effect on the return on assets (ROA) of banks.*

H3a: *Considering the Public/Private status of banks, the level of knowledge they disclose regarding performance indicators (environment, human resources, product responsibility, society and total sustainability) in sustainability reports has an impact on the return on assets (ROA) of banks.*

H3b: *When the asset sizes of the banks are taken into consideration, the level of knowledge they declare about the performance indicators (environment, human resources, product responsibility, society and total sustainability) in the sustainability reports has an impact on the return on assets (ROA) of the banks.*

H4: *The level of knowledge that banks declare about performance indicators (environment, human resources, product responsibility, society and total sustainability) in their sustainability reports has a positive effect on the return on equity (ROE) of banks.*

H4a: *Considering the Public/Private status of banks, the level of knowledge they disclose regarding performance indicators (environment, human resources, product responsibility, society and total sustainability) in sustainability reports has an impact on the return on equity (ROE) of banks.*

H4b: *When the asset sizes of the banks are taken into consideration, the level of knowledge they declare about the performance indicators (environment, human resources, product responsibility, society and total sustainability) in the sustainability reports has an impact on the return on equity (ROE) of the banks.*

H5: *The level of knowledge that banks declare about performance indicators (environment, human resources, product responsibility, society and total sustainability) in their sustainability reports has a positive effect on the banks' net interest margin (NFM).*

H5a: *Considering the Public/Private status of banks, the level of knowledge they disclose regarding performance indicators (environment, human resources, product responsibility, society and total sustainability) in sustainability reports has an impact on the banks' net interest margin (NFM).*

H5b: *Considering the asset sizes of the banks, the level of knowledge they declare about the performance indicators (environment, human resources, product responsibility, society and total sustainability) in the sustainability reports has an impact on the net interest margin (NFM) of the banks.*

3.3. Methods

This section consists of two parts. In the first part, tests for sustainability performance and public/private situation of banks and bank size were determined. Secondly, panel data models were determined to determine the relationship between sustainability performance and financial performance of banks.

In Table 9, considering the public/private situation of banks, it is seen that there are 2 public banks and 7 private banks in the sample. Public banks are Halkbank and Vakıfbank, while private banks are Yapı Kredi, İşbank, Garanti Bank, Akbank, TSKB, Şekerbank and Albaraka Türk Bank.

Cluster Analysis Method was used to determine bank sizes. While applying the method, the average of the 2009-2021 values of the total assets in the balance sheets of the banks was used as the size criterion. When the number of groups was requested to be determined by the method during the analysis, the number of groups was determined as 3 for ease of evaluation by us, since the method created a single group using the TwoStep algorithm. Vakıfbank and Halkbank were included in the second group, and Garanti and İşbank in the third group. In our study, in order to define these groups in terms of size, the first group was named "Small", the second group "Medium", and the third group "Large". The results of the analysis results and average asset sizes are shown in Table 7.

Table 7. Distribution of Banks in the Scope of Analysis by Asset Size

BANKS	2009-2021 AVERAGE ACTIVE SIZES	CLUSTERING ANALYSIS RESULTS	GROUP NAME
YAPIKREDİ	₺280.547.344,77	2	Middle
GARANTİ	₺325.003.320,08	3	Big
AKBANK	₺293.231.877,92	2	Middle
VAKIFBANK	₺296.832.080,38	2	Middle
HALKBANK	₺296.893.652,77	2	Middle
İŞBANKASI	₺402.104.322,54	3	Big
TSKB	₺27.807.236,85	1	Small
ŞEKERBANK	₺25.806.578,08	1	Small
ALBARAKA	₺34.592.525,38	1	Small

i. Determining the Test to be Used for the Analysis of Sustainability Performance Disclosures by Public/Private Situation

In the study; In order to analyze whether the sustainability performance statements of banks differ depending on whether the banks are public or private banks, first of all, a normality test was conducted using SPSS for the performance values of the sustainability fields. The test results are shown in Table 8.

Table 8. Normality Test Results for Sustainability Performance Values

	Environmental	Human Resources	Product(s)	Community
N	63	63	63	63
Distortion	0,044	-0,488	-0,162	-0,388
Kurtosis	-0,761	-0,207	-1,267	-1,603

As seen in Table 8, since the kurtosis and skewness values of our data sets for sustainability performance values are between -2 and +2 values, it is accepted that our data show a normal distribution (George, D., & Mallery, M., 2010: 114). . Since our data showed a normal distribution, T-Test, one of the parametric tests used to determine the difference between two independent groups, was used to analyze whether the sustainability performance statements differ according to whether the banks are public or private banks.

ii. Determination of the Test to be Used for the Analysis of Sustainability Performance Disclosures by Asset Size

As can be seen in Table 10, since our data show a normal distribution, the One Way Anova Test, one of the parametric tests used to determine the difference between the averages of more than two independent groups, was used to analyze whether the sustainability performance statements differ according to the asset size of the banks.

3.3.1. Unit Root Tests

In the study, panel data analysis will be used to analyze the effect of banks' sustainability performance statements on return on assets. When performing panel data analysis, first of all, the stationarity of the variables to be used in the analysis should be examined. Unit root tests are used to test for stationarity. EViews 12 Student Version Lite statistical program was used to test the stationarity of the panel data and the first generation unit root tests Im, Peserane and Shin-W test (IPS), ADF-Fisher Chi-square test and PP-Fisher Chi-square tests were used. In the unit root tests we use, the test hypotheses in general are as follows:

H0: Series contain unit root (not stationary).
H1: Series do not contain unit root (stationary).

If the p values of these tests are less than 0.05, the H0 hypothesis is rejected and it is accepted that the sei does not contain a unit root, that is, it is stationary (Im et al., 2003, p:55).
The results of the unit root tests used in the study are shown in Table 9 below.

Table 9. Unit Root Test Results

METHODS	lm	Pesaran		ADF			PP		
SUSTAINABILITY AREAS	Normal Series	Difference 1	Difference 2	Normal Series	Difference 1	Difference 2	Normal Series	Difference 1	Difference 2
Environmental	-	-		-	+		+	+	
Human Resources	-	-		-	+		-	+	
Product Res.	+			+			-		
Community	+			+			+		
ROA	-	+		+			+	+	
ROE	+			+			-		
Net Interest Margin	-	-	-	-	-	+	-	-	+

"+ : Stable", " - : Not static"

Stationary or not, the criterion of stationarity of variables in at least 2 out of 3 tests was taken into consideration. As seen in Table 12, the variables of Product Responsibility, Society and Return on Equity Equity were stationary in the normal series; Environment, Human Resources and Return on Assets 1. They became stationary after their differences were taken; Net Interest Margin variable, on the other hand, became stationary after taking the 2nd difference. In the next stages, analyzes will be made with the first difference of the Environment, Human Resources and Asset Profitability variables and the second difference of the Net Interest Margin variable in order to get rid of the regression problems arising from the unit root.

3.3.2. Selecting the Panel Data Model

At this stage, Hausman and Breusch-Pagan LM tests will be applied to determine which of the Panel data models, Pooled Regression, fixed effects and random effects panel data methods, which we have explained in detail in the analysis methods section above, is more suitable for our analysis (Greene, 2003: 301). First, the Hausman test was applied to compare the fixed effects method with the random effects method for the model. It tests whether there is a statistically significant difference between the Hausman test and the regression coefficient estimates made by the models. The test hypotheses in the Hausman test are as follows:

H0: Random effects model is suitable
H1: Fixed effects model is suitable.

The results of the Hausman test are shown in the summary table is shown in Table 10 below.

Table 10. Hausman Test Results

		Test Sta.	**p Opt.**	Model to be used
Model 1	ROA	4,87	0,30	Random Effects Model
Model 2	ROE	5,89	0,21	Random Effects Model
Model 3	NET INTEREST MARGIN	1,38	0,85	Random Effects Model

As summarized in Table 10, the random effects model was assigned to the fixed effects model for all three of the panel data models established to determine the relationships between ROA, return on equity, net interest margin and environment, human resources, product responsibility and society variables according to the Hausman Test. The most suitable model was chosen.

According to the Hausman test results, after it was determined that the random effects method is a more suitable model than the fixed effects method for all three models, the Breusch-Pagan LM test was applied to compare the Pooled Regression and random effect methods for the models. The test hypotheses of the Breusch-Pagan LM test are as follows;

H0: Pooled regression model is suitable.
H1: The random effects model is suitable

The results of the Breusch-Pagan LM test are shown in the summary table is shown in Table 11 below.

Table 11. Breusch-Pagan LM Test Results

		Test Sta.	p Opt.	Model to be used
Model 1	ROA	1,11	0,29	Pooled Regression Model
Model 2	ROE	0,43	0,51	Pooled Regression Model
Model 3	NET INTEREST MARGIN	2,06	0,15	Pooled Regression Model

As summarized in Table 11, the Pooled Regression model for all three of the panel data models established to determine the relationships between return on assets, return on equity and net interest margin and environment, human resources, product responsibility and society variables according to the Breusch-Pagan LM Test. It was accepted that it was a more appropriate model at the 5% significance level compared to the Pooled Regression model. Pooled Regression models that we have determined according to the results of the Breusch-Pagan LM Test are formulated below.

ROA: $ROA_{it+1} = \alpha + \beta_1 ENV_{it} + \beta_2 HR_{it} + \beta_3 PL_{it} + \beta_4 CI_{it} + \varepsilon_{it}$

With this model, the effects of environment, human resources, product responsibility and society variables on active profitability will be analyzed.

ROE: $ROE_{it+1} = \alpha + \beta_1 ENV_{it} + \beta_2 HR_{it} + \beta_3 PL_{it} + \beta_4 CI_{it} + \varepsilon_{it}$

With this model, the effects of environment, human resources, product responsibility and society variables on return on equity will be analyzed.

NIM: $NIM_{it+1} = \alpha + \beta_1 ENV_{it} + \beta_2 HR_{it} + \beta_3 PL_{it} + \beta_4 CI_{it} + \varepsilon_{it}$

With this model, the effects of environment, human resources, product responsibility and society variables on the net interest margin will be analyzed. The meanings of symbols and abbreviations in the model equations are given below.

4. FINDINGS

This stage consists of two parts. In the first part, it was tested if the declarations of sustainability reports, which are published by banks about environment, human resources, product liabilities and community involvement differ according to the types and the sizes of banks, by non-parametric statistical tests as Mann-Whitney U and Kruskal Wallis. In the second part, the effect of these sustainability declarations' performance on return on assets, return on equity and net interest margin was analyzed separately with pooled regression panel data analysis. The models in which only the sustainability performance values are independent variables were analyzed first, then the dummy variables (types and sizes of banks) were added to the models and analyzed again.

4.1. Hypothesis Tests

Hypothesis 1: Sustainability performance of the banks differs according to the types of banks.

To test H_1 Mann-Whitney U test was applied. The hypothesis was rejected according to the test result in Table 5, because the p-value of total sustainability is 0,054, and it is not significant at 0,05 significance level.

Table 12. Statistical Data by Public/Private Status Distribution

Sustainability Areas	Public/Private	Average	Std. Deviation	Min.	Maks.
ENV	Public	0,1361	0,0771	0,03	0,23
	Private	0,1950	0,0740	0,08	0,35
	General	0,1828	0,0778	0,03	0,35
HR	Public	0,2482	0,0579	0,18	0,37
	Private	0,2696	0,0725	0,08	0,37
	General	0,2652	0,0699	0,08	0,37

	Public	0,0419	0,0350	0,00	0,10
PL	Private	0,0639	0,0342	0,00	0,12
	General	0,0594	0,0352	0,00	0,12
	Public	0,0253	0,0200	0,00	0,05
COM	Private	0,0287	0,0214	0,00	0,05
	General	0,0280	0,2099	0,00	0,05

Hypothesis 2: Sustainability performance of the banks differs according to the sizes of banks to test H_2 Kruskal-Wallis test was applied. The hypothesis was accepted according to the test result in Table 6, because the p-value of total sustainability is 0,012, and it is significant at 0,05 significance level.

Table 13. Independent Sample T-Test Results

Sustainability Areas		ENV	HR	PL	COM
Levene's	F	0,425	0,768	0,018	0,875
Test	sigma	0,517	0,384	0,892	0,353
T-Test	sigma	0,014	0,329	0,044	0,608
	(double sided)	0,024	0,273	0,057	0,597

Hypothesis 3: Sustainability performance of the banks has favorable effects on return on assets (ROA) of bank

Table 14. Sustainability Performance Disclosures

Dependent Variable: ROA
Total Panel Observations: 47
Panel Data Status: Unbalanced
Method: Pooled Regression Method
White cross-section standard errors & covariance (d.f. corrected)

Independent Variables	**Coef.**	**Std. Error**	**t sta.**	**p value**
Environment	0,0058	0,0078	0,7472	0,46
Human Resources	-0,0046	0,0080	-0,5763	0,57
Product Liability	0,0109	0,0158	0,6904	0,49
Community Involvement	-0,0030	0,0257	-0,1170	0,91
Constant Term (C)	-0,0010	0,0008	-1,1848	0,24
R^2	0,03			
F statistic	0,38			
p value of F statistic	0,82			
Breusch-Pagan / C-W test value	0,20			
Durbin-Watson Test value	0,40			

** Statistically significant at %5 significance level.

When the statistical data summary on Table 14 is examined, the p value of the F statistic, which shows the significance of our panel data model, is above the significance level of 0.05 and shows that our model is not significant since it is 0.82. In addition, the fact that the R2 value of our model is 0.03 is another indicator that it is not sufficient to explain the change in the return on assets with the changes in the independent variables. When the results of the Breusch-Pagan Cook-Weisberg and White tests are examined, the fact that the two values (0.20-0.40) are greater than 0.05 indicates that there is no heteroscedasticity in our model. The Durbin-Watson value, with the value of 2.18, shows that our model does not have autocorrelation.

According to these results; The hypothesis "H3: The level of knowledge that banks declare about performance indicators (environment, human resources, product responsibility, society and total sustainability) in their sustainability reports has a positive effect on the bank's return on assets (ROA)" is rejected. Hypothesis 3a: Sustainability performance of the banks affects return on assets (ROA) of banks when we add types of banks as a dummy variable. To test H_{3a} Pooled OLS Regression Model is used for Panel data analysis.

Table 15. The Effect of Sustainability Performance with Type of Banks on Return on Assets

Dependent Variable: ROA
Total Panel Observations: 47
Panel Data Status: Unbalanced
Method: Polled Regression Model

Independent Variables	**Coef.**	**Std. Error**	**t sta.**	**p value**
Environment	0,0069	0,0078	0,8837	0,38
Human Resources	-0,0052	0,0080	-0,6461	0,52
Product Liability	0,0016	0,0174	0,0930	0,93
Community Involvement	0,0023	0,0259	0,0869	0,93
Type of Banks	-0,0014	0,0011	-1,2435	0,22
Constant Term (C)	0,0011	0,0019	0,5959	0,55
R^2	0,07			
F statistic	9,62			
Breusch-Pagan / C-W testi değeri	0,67			
White Test Value	0,59			
Durbin-Watson value	2,21			

** Statistically significant at %5 significance level.

When the statistical data summary on Table 15 is examined, the p value of the F statistic, which shows the significance of our panel data model, is above the significance level of 0.05 and is 0.69, which shows that our model is not significant. In addition, the fact that the R2 value of our model is 0.07 is another indicator that it is not sufficient to explain the change in the return on assets with the changes in the independent variables. When the results of the Breusch-Pagan Cook-Weisberg and White tests are examined, the fact that the two values (0.67-0.59) are greater than 0.05 indicates that there is no heteroscedasticity in our model. The Durbin-Watson value, with the value of 2.21, shows that our model does not have autocorrelation.

According to these results; "H3a: Considering the state of being Public/Private, the level of knowledge that banks disclose regarding performance indicators (environment, human resources, product responsibility, society and total sustainability) in their sustainability reports has an impact on the bank's return on assets (ROA)" hypothesis is rejected. The new analysis made by adding the size of the banks to the panel data model is shown in Table 16.

Table 16. The Effect of Sustainability Performance with Size of Banks on Return on Assets

Dependent Variable: ROA
Total Panel Observations: 47
Panel Data Status: Unbalanced
Method: Polled Regression Model

Independent Variables	**Coef.**	**Std. Error**	**t sta.**	**p value**
Environment	0,0059	0,0079	0,7513	0,46
Human Resources	-0,0051	0,0082	-0,6174	0,54
Product Liability	0,0074	0,0192	0,3864	0,70
Community Involvement	-0,0052	0,0268	-0,1927	0,85
Size of Banks	0,0003	0,0011	0,3256	0,75
Constant Term (C)	-0,0015	0,0018	-0,8397	0,41
R^2	0,04			
F Sta.	0,32			
F Sta ve p value	0,90			
Breusch-Pagan / C-W test value	0,24			
White Test value	0,61			
Durbin-Watson test value	2,17			

** Statistically significant at %5 significance level.

When the statistical data summary on Table 16 is examined, the p value of the F statistic, which shows the significance of our panel data model, shows that our model is not significant since it is above the 0.05 significance level and 0.90. In addition, the fact that the R2 value of our model is 0.04 is another indicator that it is not sufficient to explain the change in the return on assets with the changes in the independent variables. When the results of the Breusch-Pagan Cook-Weisberg and White tests are examined, the fact that the two values (0.24-0.61) are greater than 0.05 indicates that there is no heteroscedasticity in our model. The Durbin-Watson value, with the value of 2.17, shows that our model does not have autocorrelation.

According to these results; "H3b: Considering the asset sizes of the banks, the level of knowledge they declare about the performance indicators (environment, human resources, product responsibility, society and total sustainability) in the sustainability reports has an impact on the bank's return on assets (ROA)" hypothesis is rejected.

Table 17. Significance Values of Panel Data Analysis

	Hypothesis	Hypothesis res.	ENV	HR.	PL	COM
ROA	H3	REJECT	NO	NO	NO	NO
A)Public/Private	H3a	REJECT	NO	NO	NO	NO
B) Bank Size	H3b	REJECT	NO	NO	NO	NO
Equity Profitability	H4	REJECT	NO	NO	NO	NO
A)Public/Private	H4a	REJECT	NO	NO	NO	NO
B) Bank Size	H4b	REJECT	NO	NO	NO	NO
Net Interest Margin	H5	ACCEPT	NO	(-)	NO	NO
A)Public/Private	H5a	ACCEPT	NO	(-)	NO	(+)
B) Bank Size	H5b	ACCEPT	NO	(-)	NO	(+)

5. CONCLUSION

When the public or private status of the banks is taken into account, it has been concluded that only the environmental, product responsibility sustainability report statements differ according to whether the banks are public or private. It is seen that the averages of the environmental sustainability statements of private banks and the averages of the environmental sustainability statements of public banks are high (0.20>0.14). This is an indication that private banks attach more importance to the environmental issue, one of the sustainability areas. It can be said that the reason for this is that the environmental issue is more taken into consideration, and that private banks use this issue as a promotional tool in terms of their prestige. In addition, it is seen that the averages of the sustainability statements related to the product liability of private banks and the averages of the sustainability statements of the public banks about the product liability are high (0.64>0.42). This is an indication that private banks attach more importance to product responsibility, which is one of the areas of sustainability. It can be said that the reason for this is that the subject of product responsibility is related to customer satisfaction, and that private banks give priority to customer satisfaction in their services.

It has been concluded that the sustainability report statements about human resources and society do not differ according to whether the banks are public or private. This result is an indication that both public and private banks generally attach the same level of importance to the preparation of sustainability reporting.

Considering the size of the banks, it was concluded that the sustainability report statements about human resources, product responsibility and society differ according to the size of the banks. It has been concluded that environmental sustainability report statements do not differ according to the size of the banks. The asset sizes of banks can also be accepted as an indicator of institutionalism in terms of management. Therefore, this result is in line with the study by Kılıç et al. (2015) in which they found a positive relationship between the size of the board of directors of banks and their sustainability reporting.

In Table 30, there are panel data analysis results that we have done to find out the effect of the banks' sustainability report on environment, human resources, product responsibility and society dimensions on the banks' return on assets, return on equity and net interest margin.

As a result of the analyzes made, it is seen that the sustainability report disclosures have a significant effect only on the net interest margin. It is seen that the sustainability report disclosures do not have a significant effect on the return on assets and return on equity.

When the effect of the sustainability report disclosures on the net interest margin is analyzed in terms of dimensions, it is seen that the disclosures regarding the human resources dimensions have a negative effect on the net interest margin. When the state of banks being public or private is added to our model, it is seen that the human resources dimension still has a negative effect on the net interest margin, and the disclosures about the community dimensions have a positive effect on the net interest margin. When the size of the banks is added to our model, it is seen that the explanations about the human resources dimension have a negative effect on the net interest margin, and the explanations about the community dimensions also have a positive effect on the net interest margin.

When we examine the net interest margin in terms of the formula, it is seen that apart from the return on assets and return on equity capital, only the net profit from interest income is in the denominator, and items such as net fee and concession income, dividend income, other operating income and commercial profit or loss are not used. Therefore, assuming that interest income, which is one of the main operating incomes of banks, is related to more stakeholders than other items, it can be said that this net interest margin is more sensitive to sustainability explanations than return on assets and return on equity.

The study contributed to the literature due to the limited number of studies on analyzing the effect of sustainability reporting on the financial performance of banks in the field of banking. In future studies, the relationship between sustainability disclosures and financial performance can be re-evaluated by taking a longer-term sample.

AUTHORS' DECLARATION

This paper complies with Research and Publication Ethics, has no conflict of interest to declare, and has received no financial support.

AUTHORS' CONTRIBUTIONS

Conceptualization, writing-original draft – AA; methodology, data collection, formal analysis, editing – OD; Final Approval and Accountability – AA/OD

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Determinants of Clove Exports in Zanzibar: Implications for Policy

Zanzibar'da Karanfil İhracatının Belirleyicileri:Politika Önerileri

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ABSTRACT

Clove is one of the high value spices that have supported the economy of Zanzibar for many decades since the 18 th Century. However, clove production and exports have been declining significantly and consistently since the 1980s. The declining of the clove exports most likely jeopardizes the Zanzibar efforts to improving human development with positive changes in living standards. This paper analyses factors for the declining trend in clove exports using time series data that were collected between 1980 and 2020 and analysed using the vector error correction model, complemented with qualitative data collected from 39 key informants. The time series results show that clove production, producer price, world price, Gross Domestic Product (GDP), and Exchange Rate had positive and statistically significant impact on clove exports in a long-run at 1% level of significance; while Foreign Direct Investment, human population and Cross Capital Formation showed significant negative impact. Only inflation showed insignificant negative impact. Based on qualitative results, there were two major determinants: (i) factors that affected clove production, and (ii) low and fluctuation of the clove price. The time series results coincided with qualitative information. We conclude that some factors affected clove exports indirectly through clove production. Other factors affected exports through fluctuation of clove price. Therefore, we recommend an integrated policy approach that aims at improving clove production and price stabilization in order to rectify the decreasing trend in clove exports.

Anahtar Kelimeler:

Karanfil,

İhracat,

Vektör Hata Düzeltme Modeli,

Zanzibar

Jel Kodları:

C22, Q01, Q11

ÖZET

Karanfil, 18. Yüzyıldan bu yana onlarca yıldır Zanzibar ekonomisini destekleyen yüksek değerli baharatlardan biridir. Ancak, karanfil üretimi ve ihracatı 1980'lerden bu yana önemli ölçüde ve sürekli olarak azalmaktadır. Karanfil ihracatındaki düşüş, Zanzibar'ın yaşam standartlarında olumlu değişikliklerle insani gelişmeyi iyileştirme çabalarını tehlikeye atmaktadır. Bu çalışma, 1980 ve 2020 yılları arasında vektör hata düzeltme modeli kullanılarak analiz edilen zaman serisi verilerini kullanarak karanfil ihracatındaki düşüş eğiliminin faktörlerini analiz etmekte ve 39 önemli bilgi kaynağından toplanan nitel verilerle tamamlanmaktadır. Zaman serisi sonuçları, karanfil üretimi, üretici fiyatı, dünya fiyatı, Gayri Safi Yurtiçi Hasıla (GSYİH) ve Döviz Kurunun karanfil ihracatı üzerinde uzun vadede %1 önem düzeyinde pozitif ve istatistiksel olarak anlamlı bir etkiye sahip olduğunu göstermektedir. Doğrudan yabancı yatırım, insan nüfusu ve brut sermaye oluşumu ise önemli ölçüde olumsuz etki göstermiştir. Sadece enflasyon önemsiz negatif etki göstermiştir. Analiz sonuçlarına göre i) karanfil üretimini etkileyen faktörler ve (ii) karanfil fiyatının düşük ve dalgalanması iki ana belirleyicisidir. Buna karşın diğer faktörler, karanfil fiyatındaki dalgalanma yoluyla ihracatı etkilediği tespit edilmiştir. Bu nedenle, karanfil ihracatındaki düşüş eğilimini düzeltmek için karanfil üretimini iyileştirmeyi ve fiyat istikrarını hedefleyen bütünleşik bir politika yaklaşımını öneriyoruz.

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1. INTRODUCTION

This paper analyses the determinants of the declining trend in clove exports in Zanzibar. The clove is one of the most common spices on the Island of Zanzibar. It contributes to about 60 percent of the foreign exchange of Zanzibar (Hervé et al. 2014; Bakar 2015; URT 2016; Suda et al. 2020), suggesting that it has significant potential in driving economic growth and development on the Island. Studies like Juma (2010) demonstrate an association between Zanzibar's economy, livelihood, and performance of the clove industry. The same study shows that the economy of Zanzibar and the livelihood of the clove growers improve during periods of rising clove prices in the international markets and vice versa. For instance, the increase in clove prices in the international markets is accompanied by increased foreign exchange earnings, the share of agriculture in the gross domestic product (GDP), and employment in the clove industry. This translates into an improvement in economic growth and social welfare in Zanzibar.

The Island of Zanzibar comprises two sister islands of Unguja and Pemba. In the previous years, Zanzibar was considered a hub for international trade between USA, France, Britain, and India. The Island has fertile soil, arable land, and good climatic conditions for agricultural activities (Moh'd et al. 2017). With that, the economy of Zanzibar mainly depends on the agricultural sector, particularly on exports of cloves and seaweed. Cloves are an essential cash crop and have remained important since the colonial period. This crop is a principal source of revenue in Zanzibar. Nevertheless, the dependence of the economy on clove and seaweed exports implies that there are few commodities for export on the Island. In addition, the clove industry has been affected by recurring and common problems that decrease production and productivity, and some are concerned with the inefficiency of the clove marketing system. According to Hervé et al. (2014) and Moh'd et al. (2017), the problems encompass poor agricultural extension services, the decreasing farm size of cloves, inadequate use of clove processing firms, low producer prices, lack of funds, poverty, monopoly of the Zanzibar State Trading Corporation (ZSTC), increased clove production in other parts of the world, a limited market for Zanzibar clove products, and a lack of involvement of the private sector. Authors like Moh'd et al. (2017) categorize the problems into internal and external problems. While internal factors include price, production-related factors, inadequate funding, a lack of participation in the private sector and poverty, external problems are mainly concerned with the monopoly of the market.

The contribution of traditional agricultural crops to export earnings in the United Republic of Tanzania (URT), of which Zanzibar is a part, fell dramatically from 50 per cent in the 1990s to about 20 per cent in the 2000s (Akyoo and Lazaro 2007). Cloves are not an exception. For instance, between the 1960s and 1970s, the earnings from cloves were high, and therefore, the Island financed the Zanzibar Development Budget by over 80 per cent. However, currently, the clove industry in Zanzibar shows a significant and consistent decrease in production and world market price. For instance, the annual clove production in tonnes declined by 84.4 per cent in the period between the 1970s and 2000s. Similarly, export volumes fell by 60 per cent between 2003 and 2009 and by 89 per cent between 2003 and 2018. Although the world market demand for cloves increased, exports by volume fell from 90 per cent in the 1940s to about 6 per cent in the 2000s, 0.5 per cent in 2012, and 0.12 per cent in 2016 (Masoud 2017; REPOA 2018). This state of affairs has implications on the amount of cloves exported and export earnings, therefore affecting the economy and livelihood of clove growers.

This paper contributes to the international literature on the debate 'why clove exports are showing a decreasing trend in Zanzibar'. This is an area with inadequate information about Zanzibar. The results will help clove stakeholders, including policy makers, to improve the clove industry. Moreover, while considering quantitative analysis as a major empirical approach, the study contributes to innovation of complementing qualitative analysis with time series results. This helps to explain factors that cannot easily be quantified and entered in the regression model.

2. LITERATURE REVIEW

2.1. Theoretical Review

One of the frequently used theorectical arguments in development economics includes Ricardian hypothesis, which advocates the importance of technological change as the major source of comparative advantage, and Heckscher-Ohlin, which argues for the importance of relative factor endowments as a prime source of trade competitiveness. According to the Ricardian theory, the relative efficiency of producing goods and services determines the direction and magnitude of trade between two countries. In contrast, the Heckscher-Ohlin factor endowment theory predicts that countries with an abundance of one or more of the factors of production (land, labor, and capital) will specialize in commodities that require much of the abundant resources.

The increasing influence of policy on openness to the external world has led to numerous theoretical and empirical studies. Free trade is vindicated in different theories like the theory of absolute advantage (Smith 1776) and comparative advantage (Ricardo 1817). Others include neo-classical models like the Heckscher-Ohlin (Heckscher 1919; Bertil 1935) and New Trade Theory (Krugman 1979; Helpman and Krugman 1987). The free trade policies have been used to support policies of liberalization in developing countries (Sen 2010) as an alternative to the import-substitution policy after the 1970s. Export orientation has been credited for the remarkable economic transformation of many developing countries (Elbadawi 1998). According to Balassa (1990) and Edwards (1993), outward-oriented thinking is critical for economic transformation compared to inward-looking thinking. This implies the development of traditional agricultural exports and diversification into non-traditional exports, particularly in agrarian countries like those in sub-Saharan Africa including Tanzania.

According to Gbetnkom and Khan (2002), there are two schools of thought emanating from classical and modern theories of international trade that explain the determinants of agricultural export growth. First, agricultural exports are mainly determined by demand-side factors such as world market price and exchange rate. These are basically external factors to the exporting country. Thomas and Nash (1991) contend that developing countries' exports essentially comprise primary agricultural products. To that effect, export growth in developing countries depends on industrial growth in developed countries. This can also be interpreted as a low absorptive capacity of foreign markets in terms of accommodating imports from developing countries affects the growth of agricultural exports. The second school of thought focuses on supply-side factors, which are basically internal. According to this school of thought, the production of primary agricultural commodities determines exports, and increased production stimulates the growth of exports (David 2013). In this study, both classical and modern theories of international trade are used as the guiding theories. The premise that we put forward is that Zanzibar has favourable natural ecological and climatic conditions, and therefore, it should specialize in producing cloves for export. Moreover, the international trade of cloves attracts and fosters an environment for Zanzibar to continue producing and exporting cloves.

2.2. Empirical Literature

Export trade is one of the most important sources of foreign exchange in a country. Some scholars like Rivera-Batiz and Romer (1991) and Kingu (2014) succinctly support this premise. They argue that export trade stimulates economic growth and development through improvement of balance of payments deficit, enhancing diffusion of technologies, stimulating external demand for domestic products, increasing domestic production and efficient allocation of resources. Empirical literature confirms this premise in countries like Pakistan, Fiji, Vietnam, Tanzania, Turkey and Gabon (Suleiman et al., 2018). Others like Krugman and Venables (1995) contend that export trade tends to kill domestic infant industries particularly in developing countries where the industries cannot compete with those in developed countries. The current study considers export trade as a key for socio-economic development in the sense that the argument of the opponents of export trade can be addressed by an import-substitution strategy using foreign exchange earnings from exports (Rodrigues, 2010).

Studies on determinants of agricultural exports are not conclusive; the findings differ depending on the context. On one hand, Sharma (2001) and Babatunde (2009) determine factors for export performance and show that the exchange rate is a major factor affecting export performance in India and sub-Saharan Africa. In addition, Ahmed (2000) in Bangladesh, Bashir (2003) in Pakistan, and Santos-Paulino (2006) in the Dominican Republic show that export performance is determined by trade liberalization. On the other hand, using co-integration analysis, Menji (2010) shows that export performance in Ethiopia is determined by terms of trade, real effective exchange rate, and foreign direct investment (FDI). In addition, determinants of export in Africa include income per capita, the share of manufacturing in GDP, and FDI (Mold and Prizzon 2008). Other scholars like Kumar (1987) have reported GDP and level of production as determinants of export performance in India.

Gasheja et al. (2017) used the vector error correction (VEC) model to analyse the determinants of Rwanda exports. That study used data from 1976 to 2013. The factors that showed positive and significant impact on export growth rate were GDP, FDI, Industrial Value Added and Savings. Abdulai and Rieder (1995) and Abolagba et al. (2010) in Nigeria show, using ordinary least squares (OLS), that export of cocoa is determined by rainfall whereas the export of rubber is determined by domestic production, producer price, exchange rate, domestic consumption, and interest rate.

The Bank of Tanzania (2005) shows that determinants of agricultural exports include 'extension services, seasonal variation due to climatic changes, decreasing of clove farm size, underutilization of capacity of processing firms, and low farm gate price'. With regard to the importance of clove exports to Zanzibar's

economy, Kingu (2014) revealed that clove exports generate maximum earnings in the long run when the real exchange rate and world market price are taken into consideration.

Other studies have confirmed that differences in productivity and factor endowment explain a small part of trade performance variations over time and across countries (Bergstrand 1990; Bernstein and Weinstein 2002). Moreover, recent evidence suggests factor endowment has greater relative importance over productivity or technology in explaining international trade performance (Amoroso, Chiquiar, and Ramos-Francia 2011). The role of infrastructure in enhancing trade has also been widely discussed in policy circles and in the literature (Bougheas, Demetriades, and Mamuneas 1999; Francois and Manchin 2013; Bouët, Mishra, and Roy 2008; Moïsé et al. 2013). Empirical studies have generally confirmed positive and significant effects of infrastructure quality on trade values in exporting countries.

Both developed and developing countries provide financial and technical support to their agricultural producers for different reasons. Empirical studies assessing the link between domestic subsidies and trade have revealed mixed results depending on the type of commodity and support. Many have argued that the removal of European Union (EU) and U.S. agricultural subsidies could have a significant effect on the world prices of some commodities, such as cotton, tobacco, and soybeans (Bouët et al. 2005; Bureau, Jean, and Matthews 2006). However, the impact of domestic subsidies Global food, financial, and oil markets are increasingly interconnected (Tadasse et al. 2016). Shocks to any of these markets is likely to affect the nature and extent of agricultural trade. The 2007/2008 food price crisis, for example, caused many countries to impose export barriers and relax import restrictions on food products, which further aggravated the problem of price spikes and adversely affected agriculture lower than other cross-border measures (Hoekman, Ng, and Olarreaga 2004; Anderson and Martin 2005). Developing countries do also provide technical, financial, and institutional support to smallholder producers to boost productivity and improve market efficiency, thereby enhancing agricultural exports (Benin, Mogues, and Fan 2012).

A study by Staatz and Dembélé (2007) indicates that agriculture's capacity to contribute to growth and poverty alleviation in Africa has been greatly constrained in the past by underinvestment and miss-investment, in both physical and human capital, resulting in a huge cost to Africans in terms of foregone well-being. Helleiner's (2002) as cited in Bacchetta (2007) also found that FDI has not as yet made a particularly important contribution to African non-traditional export expansion. Oyejide (2007) investigated the critical of African investment codes which place heavy reliance on fiscal and other incentives which may be largely ineffective in attracting FDI and are at the same time quite costly in terms of lost revenue.

Degree of openness of the countries determines the export of primary commodities. Babatunde (2009) empirically investigates the effect of productive capacity (proxy by GDP of SSA countries) on its export by using both random and fixed effect regression of export supply model. The result reveals that GDP has highly significant positive impact on export volumes and export volumes appear to be lower when manufacturing share in GDP is higher. Traditionally, economists have argued that more open economies grow faster. This idea was largely based on the argument that openness improves resource allocation. According to Rodrik (1997) high levels of trade restrictions have been an important obstacle to exports, and their reduction can be expected to result in significantly.

Based on the foregoing theoretical and empirical literature, it is apparent that relevant factors that determine exports are many but differ by country and context. They include supply, demand, and institutional and climatic conditions. Importantly, while Zanzibar's economy substantially depends on clove exports, there is inadequate evidence on the factors that determine clove exports on the Island. In addition, most of the studies that have been done on exports have used OLS modelling, which is a weak estimation method; therefore, the results are not reliable. The reason is that most of the time series data trend over time, so regression between trended series using OLS techniques may produce erroneous but significant results with a high coefficient of determination (Granger and Newbold 1974). The cointegration methods employed by Menji (2010) have the ability to avoid this problem (Engle and Granger 1987). Cointegration methods offer a need for using the error correction model (ECM) for the same reason. Other studies that have used cointegration methods are Mustafa et al. (2016) and Soontaranurak and Dawson (2015).

3. METHODOLOGY

3.1. Data and Research Design

We used a trend analysis quantitative approach complemented by a qualitative approach in order to produce robust results for policy implications. The quantitative analysis utilises the vector error correction (VEC) model as specified in equation 1 to estimate clove export response from 1980 to 2020 in Zanzibar.

$$Zexp_t = a_0 + \sum_{k=1}^{k=n} a_k X_t^k + \varepsilon_t \quad (1)$$

Where: $Zexp_t$ is clove export from 1980 to 2020; X_t^k denotes a set of explanatory variables, both demand and supply-side; ε_t is an error term and a_k`s are model parameters.

The study used cointegration and VEC model to estimate the short-run and long-run effects of different determining factors on clove exports. The paper used demand- and supply-side factors to model clove exports. Using clove exports as our dependent variable, we used typical independent variables from international trade theories and empirical studies, particularly from Sharma (2001), Babatunde (2009), Bashir (2003), Abdulai and Rieder (1995), and Abolagba et al. (2010). The demand-side factors used include the world price of cloves, the producer price, and the real exchange rate. The supply-side factors used are clove production, FDI, GDP growth rate, population, inflation, climatic factors such as temperature and rainfall, and gross capital formation. Quantitative data were mainly secondary and were collected from different sources including the Office of the Chief Government Statistician of Zanzibar (OCGS), ZSTC, World Bank, United Nations–World Population Prospects, and World Development Indicators. A detailed description of the definition, units of measurement and data source for each variable used in the ECM model is shown in Appendix Table A1.

A qualitative approach was employed to collect information from key clove stakeholders in Mkoani, ChakeChake and Wete districts in Pemba; and Zanzibar North and Zanzibar West districts in Unguja. This was meant to complement the time series data in explaining the main factors for the decline of clove export. A total of 39 key clove stakeholders were selected using a snowballing sampling technique. This sampling technique enabled to capture of clove stakeholders with knowledge and experience in the clove industry. The stakeholders included 30 clove farmers, 20 from Pemba and 10 from Unguja; 2 officials from ZSTC; 3 officials from the Ministry of Agriculture, Natural Resource, Livestock and Fisheries; 3 officials from the Ministry of Trade and Industry; and 1 official from Zanzibar Investment Promotion Authority. Detailed information on the list of key informants is shown in Appendix A2.

3.2. Estimation of the Clove Export Response Model

The study employed Vector Error Correction Model (VECM) to estimate clove export function parameters. This is similar to many other researchers like Ahmed (2000), Bashir (2003), Penélope-López (2005) Agasha (2009), Allaro (2010) and Allaro (2012). This technique is superior to Ordinary Least Square (OLS) modelling because it establishes short-run and long-run relationships amongst variables. Granger (1986) cited in Gujarati (2004) asserts that testing for unit root and cointegration of the regression residual is an imperative condition since it is a pre-test to avoid the possibility of producing spurious regression output. In this study, these procedures were taken into consideration, by first conducting stationarity and cointegration tests.

Stationarity Test

The Dickey-Fuller (DF) test developed by Dickey and Fuller (1981) was employed for testing stationarity. The DF-test requires estimating the following equation using OLS:

$$\Delta y_t = \sigma + \beta_t + (\varphi - 1) y_{t-1} + \mu_t \quad (2)$$

Equation (2) indicates that the series y_t has both stochastic and deterministic trends and can be used as a DF-equation for testing the unit root null hypothesis such as:

Ho: (φ – 1) = 0 *(unit root or non-stationary)*

H1: (φ – 1) ≠ 0 *(no unit root or stationary)*

The test statistic used to test the unit root hypothesis is the *t*-statistic. If the calculated *t*-value (*t*-value of the coefficient φ – 1) is greater than the critical *t*-value, then y_t is non-stationary.

Cointegration Test

In this analysis, we tested for cointegration among the variables using the Johansen Method of Maximum Likelihood approach developed by Johansen (1988). The rationale here was to test for the presence of long-run and stable relationships among the time series data. Johansen's methodology takes its starting point in the vector autoregression (VAR) of order ***p*** given by:

$$y_t = \mu + A_1 y_{t-1} + \ldots\ldots + A_p y_{t-p} + \varepsilon_t \quad (3)$$

Where, y_t is an n×1 vector of variables that are integrated of order one, commonly denoted as I(1), and ε_t is an n×1 vector of innovations. This VAR can be re-written as:

$$\Delta y_t = \mu + \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \varepsilon_t \quad (4)$$

Where,

$$\Pi = \sum_{i=1}^{p} A_i - \mathrm{I}\,; \quad \text{and} \quad \Gamma_i = -\sum_{i=1}^{p} A_j \quad (5)$$

If the coefficient matrix ***Π*** has reduced rank r < n, then there exist n×1 matrices ***α*** and ***β*** each with rank r such that ***Π*= αβ'** and **β'y**, are stationary. r is the number of cointegrating relationships, the elements of **α** are known as the adjustment parameters in the VECM and each column of **β** is a cointegrating vector. It can be shown that for a given r, the maximum likelihood estimator of **β** defines the combination of y_{t-i} that yields the r largest canonical correlations of Δy_t, with y_{t-i} after correcting for lagged differences and deterministic variables when present. Johansen proposes two different likelihood ratio tests of the significance of these canonical correlations and thereby the reduced rank of the ***Π*** matrix: the trace test and maximum eigenvalue test are shown in equations (6) and (7) below;

$$J_{trace} = -T \sum_{i=r+1}^{n} \ln(1 - \lambda_i) \quad (6)$$

$$J_{max} = -T ln(1 - \lambda_{r+1}) \quad (7)$$

Here T is the sample size and λ_r is the ith largest canonical correlation. On one hand, the trace test tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of n cointegrating vectors. On the other hand, the maximum eigenvalue test tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of r+1 cointegrating vectors.

Error Correction Model Estimation

An Error Correction Model (ECM) is a time series model commonly used for data where the variables are likely to have a long-run stochastic relationship referred to as cointegration. According to Engle et al. (2011), ECMs are superior in estimating short-run and long-run effects of a time series to OLS modelling. The error term considers the reality that a deviation of the last period influences its long-run equilibrium. In simpler terms, an error correction involves de-trending or differencing the series in order to attain stationarity before estimating the relationship between the variables. In this paper, ECM is preferred because of its estimation strength to address the historical declining trend of clove production and exports in Zanzibar, and specifically, it helps to observe the long-run effects of the determining factors to clove exports.

The long-run clove exports supply function is specified as follows:

$$lnCE_t = \beta_0 + \beta_1 lnWP_t + \beta_2 lnCLP_t + \beta_3 lnPP_t + \beta_4 lnER_t + \beta_5 lnFDI_t + \beta_6 lnGDP_t + \beta_7 lnPOP_t + \beta_8 lnINF_t + \beta_9 lnGCF_t + \beta_{10} lnRF_t + \beta_{11} lnTP_t + u_t \quad (8)$$

Where CE is clove exports, WP is cloves world price, CLP is clove production, PP is producer price, ER is the exchange rate, FDI is Foreign direct investment, GDP is the Gross domestic product growth rate, POP is the population growth rate, GCF is gross capital formation, RF is rainfall, and TP is temperature. ***u*** is a random disturbance term with its normal classical properties, ***β*** is a vector of coefficients measuring long-run relationships, and **Ln** is a natural logarithm.

If these time series variables of lnCE, lnWP, lnCLP, lnPP, lnER, lnFDI, lnGDP, lnPOP, lnINF, lnGCF, lnRF, and lnTP are found to be unit roots, then the study required to take the first difference of the variables (as in equation (8) in order to obtain a stationary series:

$$\begin{aligned}\Delta lnCE_t = {} & \beta_0 + \beta_1 \Delta lnWP_t + \beta_2 \Delta lnCLP_t + \beta_3 \Delta lnPP_t + \beta_4 \Delta lnER_t + \beta_5 \Delta lnFDI_t \\ & + \beta_6 \Delta lnGDP_t \\ & + \beta_7 \Delta lnPOP_t + \beta_8 \Delta lnINF_t + \beta_9 \Delta lnGCF_t + \beta_{10} \Delta lnRF_t + \beta_{11} \Delta lnTP_t + u_t\end{aligned} \tag{9}$$

Equation (9) above does not have any inference to long-run aspects of decision making because the process of differencing equation (8) results in a loss of valuable long-run information in the data (Maddala, 1992 in Ahmed, 2000). In dealing with the loss of valuable information, the theory of cointegration came into place to mitigate the problem. The theory of cointegration addresses this issue by introducing an error, we specified the correction (EC) term in the model. We introduce an Error-correction term ($\boldsymbol{EC_t}$) lagged one period ($\boldsymbol{EC_{t-1}}$) so as to integrate short-run dynamics in the long-run clove export supply function. Thus a general Error Correction Model (ECM) in equation (10) is as follows:

$$\begin{aligned}\Delta lnCE_t = {} & \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta lnWP_{t-1} + \sum_{i=1}^{n} \beta_{2i} \Delta lnCLP_{t-1} + \sum_{i=1}^{n} \beta_{3i} \Delta lnPP_{t-1} \\ & + \sum_{i=1}^{n} \beta_{4i} \Delta lnER_{t-1} + \sum_{i=1}^{n} \beta_{5i} \Delta lnFDI_{t-1} + \sum_{i=1}^{n} \beta_{6i} \Delta lnGDP_{t-1} \\ & + \sum_{i=1}^{n} \beta_{7i} \Delta lnPOP_{t-1} + \sum_{i=1}^{n} \beta_{8i} \Delta lnINF_{t-1} + \sum_{i=1}^{n} \beta_{9i} \Delta lnGCF_{t-1} \\ & + \sum_{i=1}^{n} \beta_{10i} \Delta lnRF_{t-1} + \sum_{i=1}^{n} \beta_{11i} \Delta lnTP_{t-1} + \lambda_i EC_{t-1} + u_t\end{aligned} \tag{10}$$

Where, $\boldsymbol{EC_{t-1}}$ is the error-correction term which is the lagged value of the residuals obtained from the cointegrating regression of the dependent variable on the regressors; $\boldsymbol{\lambda_i}$ = the speed of adjustment parameter. It is expected to be negative; $\boldsymbol{\beta_i}$ = Coefficients measuring short-run relationship/effects among the variables; and $\boldsymbol{u}$ = Disturbance term.

3.3. Analysis of the key clove stakeholders' perceptions of clove export determinants

Qualitative results were used to explain trends in clove exports. The content analysis was used to analyse stakeholders' perceptions of the important factors that explain the trends in clove export in Zanzibar. The content analysis technique is a careful, detailed, systematic examination and interpretation of a particular body of material in an effort to identify patterns, themes, biases, and meanings (Berg 2009). This technique is useful in analysing the large amounts of verbal data collected through interviews with key informants in this paper.

4. RESULTS

4.1. Descriptive Statistics of Time Series Data

Before presenting the analysis of time series data, we present the properties of each variable by generating summary statistics to help observe how the variables behave. Descriptive statistics are based on the reforms made in the clove industry in Zanzibar. The first was from 1981 to 2010 during the implementation of the Clove Market Law, when ZSTC was the sole legal buyer and exporter of cloves on the Island (Table 1). Second, we present similar properties from 2011 to 2020 during the implementation of a 10-year (2011–21) clove development strategy, when a role to strengthen the clove industry was played by providing incentives to the farmers to encourage better management, supplying clove farmers with free clove seedlings and raising the clove price (Table 2).

Table 1. Implementation of the Clove Market Law (1981–2010)

Variable	Obs	Mean	Std. dev.	Min	Max
Export	30	4,411.192	3,384.201	12	12,000
Production	30	4,905.935	4,369.707	41	16,052
Producer price	30	810,007.7	1,131,71	13,43	3,374,39
World price	30	1,144,88	1,281,89	13,52	3,770,97
Gross domestic product (GDP)	30	4.346774	2.160189	0.5	8.17
Exchange rate (ER)	30	567.4248	483.3378	8.2	1,453.54
Foreign direct investiment (FDI)	30	1.956677	2.023286	0.0	5.77
Inflation	30	19.54265	11.42925	4.73	36.14
Population	30	4.604194	0.672794	3.15	5.49
Rainfall	30	996.5097	104.8457	792.04	1,198.55
Temperature	30	22.70333	0.2847059	22.15	23.23
Gross capital formation (GCF)	30	21.95787	5.035915	14.899	32.84936

Note: number of observations: 30.
Source: authors' own computation using data from WDI, OCGS, and WB

Table 2. Implementation of the 10-year (2011–20) Clove Development Strategy

Variable	Obs	Mean	Std. dev.	Min	Max
Export	10	2,932.21	1,768.57	860	7,077
Production	10	3,804.7	2,467.63	211	8,572
Producer price	10	12,800,00	4,218,48	1,433,28	15,900,00
World price	10	16,700,00	4,106,04	10,900,00	23,900,00
Gross domestic product (GDP)	10	5.85	1.90160	1.3	7.7
Exchange rate (ER)	10	1,963.5	328.822	1,557	2,298
Foreign direct investiment (FDI)	10	2.7564	1.49759	0.76	4.69
Inflation	10	6.27	3.50366	2.7	14.7
Population	10	4.441	0.19098	4.14	4.62
Rainfall	10	1,053.07	131.807	827.48	1,293.22
Temperature	10	22.773	0.396037	22.08	23.22
Gross capital formation (GCF)	10	28.099	2.466925	25.04924	33.24036

Note: number of observations: 10
Source: authors' own computation using data from WDI, OCGS, and WB

The findings in Tables 1 and 2 show that, on average, Zanzibar exported 4,411.192 tonnes of cloves during the implementation of the Clove Market Law in the period between 1981 and 2010, but it exported, on average, 2,932.21 tonnes of cloves during the implementation of the 10-year clove development strategy from 2011 to 2020. This shows a huge disparity in the number of clove exports between the two reform periods. Clearly, the Clove Market Law was characterized by higher exports, while exports declined during the 10-year clove development strategy. Similarly, clove production showed a decreasing trend while producer price showed an increasing trend during the implementation of the Clove Market Law and following the introduction of the 10-year clove development strategy. The clove prices show a significant improvement after the implementation of the 10-year clove development strategy, although part of the improved prices, both producer prices and world market prices, may capture inflation and exchange rates of the Tanzanian Shilling. The rest of the variables are not directly related to the two major clove reforms.

4.2 .Estimation of Clove Export Supply Response Model

Unit root test results

In order to carry out cointegration tests, the study tested the order of integration of the time series data. When the series was integrated in the same order, we proceeded with cointegration tests. The results in Table 3 show that the series was non-stationary at levels but became stationary at first differences. This is because, at levels, the Augmented Dickey and Fuller (ADF) statistic values are less than ADF critical table values, while in the first difference the ADF statistic values become greater than ADF critical table values. This shows that the series were integrated of the first order. Therefore, the unit root test results suggested that the existence of cointegration relationships between the series had to be tested (Table 4).

Table 3. ADF Unit Root Test Results

Variables	Level	First difference	Critical value (5%)
Export	-1.914	-5.145	-2.97
Production	-1.957	-5.607	-2.97
Producer price	1.943	-2.99	-2.97
World price	-1.376	-2.98	-2.97
Gross domestic product (GDP)	-2.554	-3.009	-2.97
Exchange rate (ER)	1.924	-2.99	-2.97
Foreign direct investiment (FDI)	-1.951	-3.62	-2.97
Inflation	-1.375	-2.987	-2.97
Population	-2.824	-3.019	-2.97
Rainfall	-2.579	-14.214	-2.97
Temperature	-1.421	-3.213	-2.97
Gross capital formation (GCF)	-1.344	-5.379	-2.97

Note: model with constant for variable series. Number of observations: 41
Source: authors' own computation using data from WDI, OCGS, and WB

Cointegration test results

We continued by testing if there was cointegration between the series—that is, testing if the variables had long-run and stable dynamics. We employed the Johansen Co-integration Test by performing cointegration tests with a constant with no trend. Table 4 shows the results from the Johansen likelihood ratio tests for cointegration. The two common likelihood ratio tests—the trace and maximum Eigen value (λ-max)—were used to determine the number of cointegrating relations in the time series. The hypothesis of no cointegration between the series was rejected at the five per cent level of significance based on both the trace and maximum Eigen statistics. The results indicate that there existed a long-run equilibrium relationship between the series.

Table 4. Johansen Cointegration Test

Hypothesis	Statistic		Critical values (5%)	
	Trace	Max	Trace	Max
r = 0	327.90	81.89	233.13	62.81
r = 1	246.01	76.55	192.89	57.12
r = 2	169.45	63.71	156	51.42
r = 3	105.74*	36.43*	124.24	45.28

Note: * denotes significance at the 5% significance level. The number of observations: 41.
Source: authors' own computation using data from WDI, OCGS, and WB.

Vector error correction model results

The results from the VEC model presented in Table 5 show that the R-squared was 0.8706, indicating that 87.1 per cent of the variations in clove exports were explained by the variables entered in the model. The F-statistic probability of 0.0408 implies that the model, as a whole, was statistically significant at the five per cent level of significance. The coefficient of the error correction term in the first cointegration equation measured the speed of adjustment. The -1.77 indicates that about 177 per cent departure from long-run equilibrium was corrected in each period. Put differently, the previous period's deviation from long-run equilibrium was corrected in the subsequent

period at an adjustment speed of 177 per cent. The p-value of 0.000 shows that the speed of adjustment was statistically significant at the 0.1 per cent level.

Table 5. Vector Error Correction Model Results

Model summary				
R-squared =0.8706	F-statistic =4.4832		Durbin-Watson =1.6738	
Adj.R-squared= 0.6764	Prob (F-statistic)=0.0408			
Short-run effects				
Variables	**Coefficient**	**Std. err.**	**t-statistic**	**Prob.**
D(EXPORT(-1)	0.1617	0.2890	0.56	0.576
D(PRODUCTION)	0.0956	0.2276	0.42	0.674
D(LOCAL_PRICE)	0.00008	0.0002	0.48	0.628
D(WORLD_PRICE)	0.00002	0.0001	0.18	0.86
D(GDP)	-172.50	317.722	-0.54	0.587
D(ER)	15.938	8.7735	1.82	0.069
D(FDI)	146.096	503.229	0.29	0.772
D(INFLATION)	-11.141	141.211	-0.08	0.937
D(POPULATION)	-178.584	1,456.95	-0.12	0.902
D(GCF)	18.1786	166.554	0.11	0.913
D(RAINFALL)	4.5178	4.5643	0.99	0.322
D(TEMPERATURE)	132.616	1,788.05	0.07	0.941
ECT(-1)	-1.7745	0.50917	-3.49	0.000
Long-run effects				
Variables	**Coefficient**	**Std. err.**	**t-statistic**	**Prob.**
EXPORT	1	.	.	.
PRODUCTION	1.317139	0.0534763	24.63	0.000
LOCAL_PRICE	0.0004496	0.0000895	5.02	0.000
WORLD_PRICE	0.0002902	0.0000545	5.32	0.000
GDP	188.5299	63.19344	2.98	0.003
ER	2.091077	0.5666581	3.69	0.000
FDI	-790.5653	113.7831	-6.95	0.000
INFLATION	-36.5714	25.63772	-1.43	0.154
POPULATION	-720.6474	174.8021	-4.12	0.000
GCF	-146.5855	25.857	-5.67	0.000
RAINFALL	-3.878556	1.272401	-3.05	0.002
TEMPERATURE	607.087	381.5521	1.59	0.112
_cons	2,372.64	.	.	.

Note: number of observations: 41.
Source: authors' own computation using data from WDI, OCGS, and WB.

The results for short-run and long-run impacts are shown in Table 5. The lagged value of clove exports is a proxy for the existing capacity of Zanzibar's clove exports. In the short run, all variables were not significant at any level of significance. In the long run, the quantity of clove production, clove local price, world price, GDP, and exchange rate showed a positive significant impact on clove exports at the one per cent level of significance. Furthermore, the results show that FDI, population growth rate, gross capital formation, and rainfall had significant negative long-run impacts on the level of clove exports in Zanzibar at the one per cent level of significance.

4.3. Qualitative Findings

This section presents the stakeholders' views of the factors determining the decreasing trend of clove exports in Zanzibar. The factors raised during the interviews are clove price fluctuation, extension services and farming practices, government policies, climate and disease factors, and urbanization.

Price fluctuation

Interviews showed that price fluctuation was one of the biggest challenges impacting clove production and exports in Zanzibar. The rise and fall of clove market prices in the international markets relate to increasingly strong competition from other clove-producing countries like Indonesia, Madagascar, and Comoros (Juma 2010). This is common in most developing countries that depend on raw agricultural commodities. Price fluctuation was a serious concern to the clove growers. It also appeared that price challenges led farmers to sell cloves through smuggling channels.

Extension services and farming practice

According to the interviews, extension services granted by the government were inadequate. In order to expand clove production in Zanzibar, extension service is one of the crucial factors that should be prioritized with the aim of enabling farmers to get basic farming skills. According to a study by Birkhaeuser et al. (1991), 'agricultural extension services are one of the most common forms of public-sector support of knowledge diffusion, and this can bridge the gap between discoveries in the laboratory and changes in individual farmers' fields'.

Interviews with clove stakeholders showed poor management of clove trees. This decreased clove production due to weed competition for nitrogen and other nutrients. Owners of clove trees had inherited them from their forefathers, and some did not have the passion to continue managing the trees despite their great impact on their income earnings. The government has started a programme for re-planting new clove trees, but some clove farmers are not interested in it, perhaps because of focusing on non-farm activities.

Government policies

Following the Zanzibar Revolution in 1964, the land was nationalized. According to Martin (1991), the larger Arab plantations were also nationalized, and the three-acre policy was established. By 1974, almost 22,262 tenants—residents and landless peasants—had received three-acre plots of land from the government; a considerable proportion of this would have been clove land. This caused land fragmentation of the large original clove plantations. In addition, the administrative structure of the clove market in Zanzibar shows that all powers and authority on cloves are under the government through ZSTC, something which deprives intervention of the private sector.

Climate and disease factors

Better clove production highly depends on favourable climatic conditions with moderate rainfall and temperature (Chami 2020). Interviews showed that the impact of climate change manifested through floods and drought, and increased surface temperatures have adverse consequences on clove production. Clove growers also observed increased temperature and unpredictability of rainfall since the 1990s, which led to clove trees dying and the remaining ones becoming less productive compared to the period before the 1990s.

In connection with climatic factors, interviews showed that disease outbreaks, particularly sudden-death diseases, caused clove tree mortality. The disease was increasing in both Unguja and Pemba and persisted for many years. The only premonitory symptom is slight chlorosis, followed by thinning of the foliage and a decline of the absorbing system. Death follows after a period that may vary from only a few days to many months. Death occurs from lack of water caused by disorganization of the absorbing roots, therefore reducing the tree population, followed by a decline in production. Therefore, the Government of Zanzibar established a Clove Rehabilitation Programme in 1975, which involved clove nurseries re-established between 1975 and 1985 (Revolutionary Government of Zanzibar 2003). This programme increased clove production.

Urbanization

Interviews showed that there was a process of urbanization caused by migrants from Tanzania Mainland and the rest of East Africa. Meanwhile, there has been the mobility of the population from the two islands of Zanzibar as well as rural-urban migration within Unguja Island. This has reduced the size of land for clove production since the 1960s due to the expansion of urban areas.

5. DISCUSSION

Based on the descriptive statistics presented in Tables 1 and 2, the two major reforms that took place in the clove industry in Zanzibar showed different trends in clove exports, the quantity of production, producers, and world market prices. Unlike during the implementation of the Clove Market Law which took 30 years from 1981 to 2010, the efforts of the Revolutionary Government of Zanzibar through ZSTC partly increased producer prices

during the implementation of the Clove Development Strategy in a 10-year period from 2011 to 2020. The world market price was also high during that particular reform. However, clove production and exports showed a decreasing trend when compared with the period during the implementation of the Clove Market Law. These findings imply that increasing clove exports is attributed to increased clove production in the sense that an increase in clove production increased clove exports and vice versa. Unlike expectations, an increase in price during the Clove Development Strategy (2011 to 2020) did not influence clove production, possibly because the period was too short.

A decrease in clove production during the Clove Development Strategy and failure to increase producer prices in the same period imply the failure of the Revolutionary Government of Zanzibar to improve the clove industry because the government controls the industry. In addition, there is almost no private sector investment and participation in the clove industry in Zanzibar (Moh'd et al. 2017). Therefore, the price of cloves is not left to the vagaries of the market forces.

Further analysis of the results using the VEC model showed that all independent variables had no significant impact on clove exports in the short run. In the long run, the number of cloves produced, producer price, world market price, GDP, and exchange rate showed positive and significant impacts on clove exports at a one per cent level of significance, while FDI, population growth rate, rainfall, and gross capital formation showed a negative significant impact. The variables had positive signs, implying that there was a direct positive relationship between each of them and the dependent variable—in this case, clove exports. This implies that when the variables increased, clove exports increased as well, and vice versa. For example, a unit increase in the number of cloves produced increased clove exports. The impact of clove production on the clove export supply function that was significant implies that a decision to export cloves into external markets was dependent on the producer country's capacity. Despite the government's efforts through the Clove Development Strategy to improve clove production, data on clove productivity are limited. Interventions like improving extension services to clove farmers are critical for improving productivity. The results of the impact of clove production on clove exports are in line with Jongwanich (2007) who argues that clove exports in nine countries in East and Southeast Asia are determined by factors including supply-side production capacity.

In addition, the time series results showed that improved producer and world market prices, in the long run, stimulated domestic production, which in turn influenced clove exports. This implies that producer and world market prices were together a key in enhancing exports. Importantly, this study has shown that producer and world market prices increased during the Clove Development Strategy (2011–2020) compared to the period during the Clove Market Law (1981–2010). This is a good indicator of improving the clove industry. The long-run findings about GDP imply that increased production created surplus output supplied to the international markets. In addition, exchange rate depreciation in the international market stimulated export. These results are in line with findings by Odunga (2020), Mwinuka (2010), Mwinuka and Felix (2015), Ndulu and Lipumba (1990) for Tanzania, and Fugazza (2004). Regarding the world price, the results are in line with findings by Edward and Golub (2002) who used South African data. Regarding the exchange rate, the results are in line with Sharma (2001).

The existence of a long-run negative impact of FDI and gross capital formation on clove exports implies low levels of investment in the clove industry. Despite the fact that FDI is considered potential for development through technology transfer and employment creation, the agricultural sector attracts low FDI inflows compared to the accommodation and food service sectors in Zanzibar. For instance, between 2016 and 2017, there was completely no FDI inflow into the agricultural sector, including the clove industry, whereas accommodation and food services attracted, on average, inflows of USD$74.9 million (Zanzibar Revolutionary Government 2017). This implies that there are neither foreign nor domestic companies involved in the clove industry in production and processing. Clove production is dominated by smallholder farmers, whereas the market is controlled by the Revolutionary Government of Zanzibar through ZSTC. Processing and value addition are hardly done, although the law gives a provision for them (International Trade Centre 2014). This is possible because of the low level of technology invested in the clove industry.

About the human population growth rate, its impact has an implication on population size and the declining size of land devoted to clove production as the population increases. The statistics on the changing size of arable land are limited. But this is categorically a typical case in Zanzibar, particularly in Unguja, where most of the clove farms have been turned into residences because of increasing population size and expansion of urban areas, as reported by ZSTC (2018). According to the URT, Zanzibar's population size increased from 640 in 1978 to 675 in 1988 to 1,303,569 in 2012, growing at a rate of 3.0 per cent per annum, but from 2012 it grew at a rate of 2.8 per cent per annum. The urban population grew at 4.4 per cent in 2012, higher than the growth rate of the rural

population, which was 1.7 per cent (URT 2014), resulting in increasing urbanization. In urban areas, 44 per cent are working in the service sector compared to 41 per cent working in the agriculture sector, including clove farming in rural areas. The rest are working in the manufacturing sector. This state of affairs associated with urbanization has decreased clove production and, by implication, exports.

Based on the long-term average rainfall, the negative coefficient implies that rainfall had a negative association with clove production. For instance, between 1981 and 2010, the long-term mean was 996.5 mm per annum with a standard deviation of plus or minus 104.8 mm. From 2011 to 2020, the long-term mean increased to 1,053.07 mm per annum with a standard deviation of plus or minus 131.8 mm. Although these statistics show an increasing long-term mean in a period of 40 years, rainfall was not adequate when compared with the moisture requirement for clove production. For instance, in the eight years between 2005 and 2012, the amount of rainfall was below the normal or below the long-term mean (Appendix Table A4). This was a period of drought, so clove production was negatively affected. Moreover, the standard deviation was high implying that there was high rainfall variability, which is most problematic in affecting clove production. The graph of rainfall anomaly against time shown in Appendix Table A4 also justifies the presence of rainfall variability in Zanzibar from 1980 to 2020. Interviews with clove stakeholders showed that irrigation was not practised in clove farming in Zanzibar. This implies that drought and rainfall variability most likely decreased clove production or made it more challenging. According to the Zanzibar Revolutionary Government (2003), cloves require heavy and reliable rainfall between 1,500 and 2,000 mm per annum. The temperature did not show an impact, possibly because it remained almost constant, at a long-term mean of 22.7^0C throughout the period under consideration.

Qualitative results complement the time series results in this study. Interviews with clove stakeholders show that clove exports were determined by a number of interwoven factors that collectively influenced clove exports indirectly through clove production. Some of these factors were also reported by the Bank of Tanzania (2005). The clove stakeholders argued that despite government control, the producer price of cloves was low and not stable and was controlled by the rise and fall of the world market price. Since the clove industry in Zanzibar is controlled by the government through ZSTC, Moh'd et al. (2017) are of the view that the ZSTC provides lower producer prices than the black market. Therefore, there has been an emergence of smuggling cloves into Kenya. These together frustrated stakeholders' efforts and therefore paralyzed clove production and exports as well. Some farmers sold cloves to middlemen in an effort to get better prices compared to the ones offered by ZSTC. However, the availability of middlemen was not predictable, possibly because of too much control of the state in the market system through ZSTC. These results imply that giving farmers a better and stable price could be an incentive for clove production that in turn increases clove exports. During the implementation of the Clove Development Strategy, the Government of Zanzibar, through ZSTC, improved producer prices of cloves from TZS3,500 to TZS14,000 per kg. It also pledged higher prices to farmers even if the world market price fluctuated downwards (ZSTC 2018). Nevertheless, the world price continued to dictate the producer price, implying that falls in the world price caused falls in the producer price. Moh'd et al. (2017) argue that price disparity is one of the factors for the decline in the clove industry in Zanzibar.

Clove tree diseases decreased the clove tree population. The main disease manifests through the yellowing and thinning of foliage, followed by the death of a clove tree. This was exacerbated by inadequate extension services offered by the government through ZSTC. Despite the clove rehabilitation programme of 1975, the problem persisted, causing a decrease in the clove tree population—low production that in turn decreased clove exports. This is also reported by Hilal (2013) and Bakar (2015). Martin (1991) shows that in a period of 50 years from the 1940s to the 1990s the clove tree population decreased by 20 per cent. The same author indicates that the problem is caused by clove tree diseases and the ageing of the trees. This implies that clove diseases and a decrease in the clove tree population have affected the industry for many decades. Other factors that had similar impacts include poor clove tree management and poor harvesting practices, suggesting poor extension services and therefore failure of the ZSTC. Disease control measures, including the use of pesticides, were hardly used because of poor knowledge among clove growers. The poor performance of the clove industry has definitely caused poor livelihoods among smallholder farmers. According to Chami (2020), some clove growers cut clove trees for firewood and charcoal to sell to earn a living. Although statistics are limited, the unimpressive performance of the clove industry suggests that the number of clove farmers has decreased.

Urbanization has increased since the 1960s. This is attributed to pulling factors, largely tourism and service industries, in Zanzibar which led to an increase of immigrants from Tanzania Mainland and other parts of East Africa. Increased urbanization coupled with poor land governance exacerbated the problem of unofficial settlements and improper land use apart from clove farming. Complex land tenure legislation has further aggravated the problem. For example, the key informants in Unguja asserted that '*we are the natives of Unguja;*

our experience is that there are many areas that were full of clove trees in the 1980s, and some were covered by natural forests, but now those areas have been changed for other uses due to urbanization, with huge construction of various infrastructures and human settlements'. Although infrastructure development is critical for development, it has decreased clove trees which in turn decreased clove production and exports. The Revolutionary Government of Zanzibar recognizes the importance of the clove industry to the people, and the economy and thus continues to support the industry at the level of laws, policies, and interventions. In addition, the government is promoting diversification into other crops like rice, cassava, banana, sweet potatoes, vegetables, selected tropical fruits, and other spices including pepper.

Other factors were the government policies, particularly the three-acre policy and the role of ZSTC. The revolution of Zanzibar in 1964 came with the nationalization of clove plantations from the Arabs. As such, indigenous farmers were given three acres to produce cloves. The government intended to restore the land to the natives and empower them economically. In addition, the three acres were restricted for agricultural use, and the government forbade the selling of the land. This caused problems in that the new owners of clove farms did not manage the farms well because of inadequate farming knowledge (ZSTC 2018). Indigenous farmers also ended up building houses or selling the land to immigrants for residential purposes, implying a weakness of the three-acre policy. This justifies the arguments put forth by Hikmany (2015) on the premise that the objectives of land acquisition contradict the constitution of Zanzibar of 1984. This also decreased land for clove production, which definitely reduced the clove tree population.

About government control of the cloves market through ZSTC, it is the sole and legal buyer and exporter of cloves in Zanzibar. Cloves are purchased from the farmers by ZSTC and then exported to the world market (Moh'd et al. 2017). This is a monopsony marketing system. Interviews with clove stakeholders indicated that the government controlled the price of cloves offered to the farmers, and the price was supposed to be constant even if the world market price fluctuated downward. Such government intervention sounds better in a situation of stabilized world market price. However, the situation was challenging when the world market fluctuated downward; it was difficult to compensate the farmers. Another option to deal with the price fluctuation is to process raw cloves into other products for export. Although information about processing cloves is limited, the processing is hardly done, and it is not well developed in Zanzibar. We urge the government to promote clove processing in addition to supporting production, ensuring good quality of cloves and marketing.

6. CONCLUSION AND POLICY RECOMMENDATIONS

6.1. Conclusion

Clove exports in Zanzibar are determined by a combination of factors. The major ones are clove production, producer price, world price, GDP, and exchange rate. Others are rainfall variability, FDI in the production and processing of cloves, increased human population, and gross capital formation. These factors determine clove exports directly or indirectly, and their impacts are considerably high. Other determinants are diseases, poor clove tree management, and poor harvesting practices, which collectively imply poor extension services. Others are urbanization, the three-acre policy, and the monopoly nature of the clove market system. These factors determine clove exports indirectly through clove production. Clove production and exports were so directly linked that an increase in production increased exports and vice versa. Therefore, the determinants of clove exports can be collapsed into production factors, those which influence clove production on the supply side, those related to market and price at the local and world market levels, the demand side, institutional factors including policies and laws, and climatic factors. The world market price controls the producer price such that a fall in the world market triggers falls in the producer price. There is also the government's institutional and policy failure to revitalize the clove industry.

6.2. Policy Recommendations

Based on the conclusions, we recommend the following policy interventions:

(i) We recommend an *integrated policy approach*, which considers together different factors that affect clove exports. The integrated policy can coordinate different goals to address factors affecting clove exports. Some of the interventions to consider in this policy include increasing, stabilizing, and sustaining producer prices. At the government level, the interventions should include creating an enabling environment for FDI inflows into the clove industry to improve clove production. It appears that a larger number of the clove tree population results in greater production; therefore, at the grassroots level, the government should implement a replanting programme to restore the population of clove trees. The replanting programme is not new; it was

implemented in the 1960s and showed a positive impact in terms of restoring the clove tree population and production. To deal with drought and rainfall variability, the government should consider introducing an irrigation farming system.

(ii) Because clove production and exports are directly linked, the *integrated policy approach* should aim to increase clove productivity. The intervention should include intensification of clove farming systems, introducing a high level of intercropping, new post-harvest techniques, clove farming methods, management of clove trees, control of diseases, and improvement of extension services to the clove farmers. Farmers should be trained to improve the farming skills and knowledge required for clove production and processing.

(iii) The government has been implementing the Clove Development Strategy, and its success has indicated positive results. This paper recommends that some of the issues to consider in the *integrated policy approach* are those implemented by ZSTC through the Clove Development Strategy. These include the establishment of modern clove-buying centres, provision of interest-free loans to the clove farmers, provision of free seedlings, provision of training to the farmers, and rehabilitation of road infrastructure in clove-producing areas. When these are implemented collectively and effectively, they can revamp clove production. Therefore, the key clove stakeholders like ZSTC; the Ministry of Agriculture, Natural Resources, Livestock, and Fisheries; and the Ministry of Trade, Industry, and Marketing should consider the factors raised in this study in order to improve clove production, which appears to be affected by a combination of different factors that in turn determine clove exports.

(iv) The existing clove marketing structure in Zanzibar is currently a monopsony controlled by the government through the ZSTC. In this system, the government is supposed to control producer prices, thereby protecting farmers from being affected by the downward price fluctuations. This is important because producer price is affected by the world market price such that a fall in the world market price causes a fall in the producer price. Therefore, this study recommends two policy issues. First, the government should compensate smallholder farmers when the world market price fluctuates downward. This will help stabilize producer prices and so not negatively affect their income and livelihood. Second, the government should consider promoting investments in processing cloves. This needs the adoption of technologies to produce products from cloves. This is critical for value addition and can enable the Revolutionary Government of Zanzibar to diversify export products instead of depending on exporting raw cloves, therefore increasing government revenue. Thus, given the increased competition of cloves in the world market that causes downward fluctuation of the producer price, the future sustainability of the clove industry in Zanzibar depends on the ability of the revolutionary government to offer good prices and protect smallholder farmers from being affected negatively by the falls of the world market price.

(v) The Revolutionary Government of Zanzibar should promote and implement new policies that aim at reducing farmers' income dependence on cloves. This should be done by promoting diversification of other crops including other spices with a competitive advantage. Since the livelihood of the majority depends directly or indirectly on the agricultural sector, diversifying income sources besides agriculture is inevitable for improving the livelihoods of the people and economy of Zanzibar.

(vi) In order to understand the dynamics of clove exports, researchers need to consider the vigorous analysis of time series data using a VEC model, complemented with qualitative information. A mixed-methods approach helps to get more useful insights in addition to a better explanation of the factors that determine clove exports.

AUTHORS' DECLARATION

This paper complies with Research and Publication Ethics, has no conflict of interest to declare, and has received no financial support.

AUTHORS' CONTRIBUTIONS

Conceptualization, writing-original draft, editing – SK and TJ, data collection, methodology, formal analysis – SK, Final Approval and Accountability – SK and TJ

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APPENDIXES

Appendix A. Definition, Level of Measurement, and Data Source of Variables Used in the ECM Model

Variable	Definition	Unit of measurement	Data Source
Export quantity of cloves	The quantity of cloves exported to the world market from Zanzibar	Tonnes	OCGS and ZSTC
World price of cloves	Price of cloves at the world market	TZS	OCGS and ZSTC
Exchange rate	Rate at which TZS is converted into USD	TZS	OCGS and ZSTC
Foreign direct investment	Foreign direct investment, net inflows (per cent of GDP)	Per cent	WDI
Clove production	Amount of cloves harvested	Tonnes	WDI
Producer price	Price of cloves paid to the producers	TZS	WDI
GDP growth rate	Annual growth rate of GDP per cent at prices of market based on constant local currency	Per cent	UN-WPP
Population	Population growth rate (annual per cent)	Per cent	WDI
Inflation	Inflation, consumer prices (annual per cent)	Per cent	OCGS and ZSTC
Gross capital formation	Gross capital formation (per cent of GDP)	Per cent	WDI
Rainfall	Long-term mean in millimetres per year	mm per year	https://climateknowledgeportal.worldbank.org/country/tanzania-united-republic
Temperature	Long-term mean	°C	https://climateknowledgeportal.worldbank.org/country/tanzania-united-republic

Note: OCGS=Office of the Chief Government Statistician of Zanzibar, ZSTC=Zanzibar State Trading Corporation, UNWPP=United Nations - World Population Prospects, and WDI=World Development Indicators.

Appendix B. Clove Stakeholders' Key Informants

Stakeholders	Stakeholder's role in clove industry	Number of interviewees	Designation of interviewees
Farmers	Farm preparation, clove planting, caring, harvesting, drying, cleaning, handling, and transporting to the selling point.	30	Small and medium farmers
Zanzibar State Trading Corporation	Providing input services, including implements, equipment, fertilizers and chemicals, post-harvest management, and handling materials. Promoting production, marketing, processing, storage, and trade of cloves and other agricultural products. Providing assistance in the formation and support of farmers and actors, farmers' group, and cooperative organizations.	2	Managing director Marketing officer
Ministry of Agriculture, Natural Resources, Livestock, and Fisheries	Extension services to clove growers and other clove stakeholders. Agricultural research on cloves.	3	Director of agriculture and extension services Extension officer Extension officer
Ministry of Trade, Industry, and Marketing	Ensure the State Corporation fulfills their tasks efficiently and effectively. Ensure farmers have better conditions and access to services such as extension, loans, subsidized inputs, and better prices. Responsibility for the growth of the clove industry and encouraging farmers to invest in this sector.	3	Director of trade and marketing External trade officer Marketing officer
Zanzibar Investment Promotion Authority	Improving productivity and aid trade diversification of exports that meet international standards. Attracting FDI in agriculture.	1	Director of investment facilitation and project development

Source: authors' own compilation and Chami (2022)

Appendix C. Rainfall variability in Zanzibar between 1980 and 2020