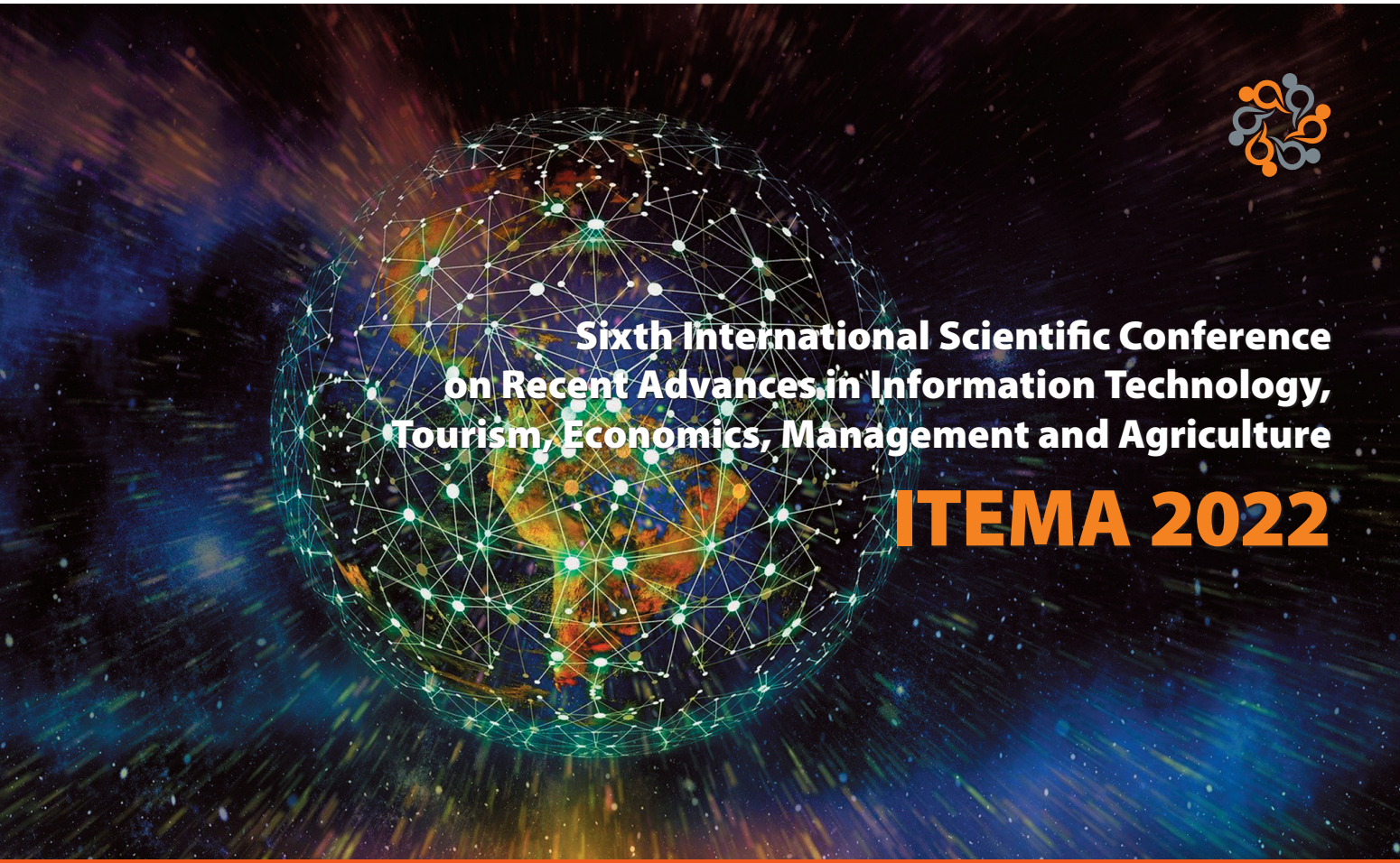


Sixth International Scientific Conference
on Recent Advances in Information Technology,
Tourism, Economics, Management and Agriculture

ITEMA 2022

www.itema-conference.com

SELECTED PAPERS

Organized by

Association of Economists and Managers of the Balkans
UdEkoM Balkan

Partner institutions

University of Maribor
Faculty of Economics and Business

foi
University of Zagreb
Faculty of Organization and Informatics
Varaždin

University of Belgrade
Faculty of Geography

19 26
Poznań University of Economics and Business

Facultatea de Agricultură
USAMVBT

SIXTH INTERNATIONAL SCIENTIFIC CONFERENCE
ITEMA 2022

Recent Advances in Information Technology, Tourism, Economics, Management and Agriculture

SELECTED PAPERS

Maribor, Slovenia
October 27, 2022

Sixth International Scientific Conference ITEMA
Recent Advances in Information Technology, Tourism, Economics, Management and Agriculture
ISSN 2683-5991
Selected Papers (part of ITEMA conference collection)

Editor:
Vuk Bevanda
PhD, Associate Professor, Faculty of Social Sciences, Belgrade, Serbia

Associate Editor:
Paulo Monteiro Alexandre
PhD, Associate Professor, Polytechnic Institute of Setúbal, School of Business Administration, Setúbal, Portugal

Organizational Committee:
Anton Vorina
PhD, Professor, School of Economics, Vocational College, Celje, Slovenia
Nikolina Vrcelj
PhD candidate, Udekom Balkan, Serbia
Nevena Bevanda
PhD student, Udekom Balkan, Serbia
Ivana Mirčević
BSc, Udekom Balkan, Serbia
Uroš Mirčević
Ing., Udekom Balkan, Serbia
Goran Stevanović
BSc, Udekom Balkan, Serbia

Published by:
Association of Economists and Managers of the Balkans – **UdEkoM Balkan**
Ustanicka 179/2 St. 11000 Belgrade, Serbia
office@udekom.org.rs
+381 62 8125 779

Conference partners:
Faculty of Economics and Business, University of Maribor, Slovenia
Faculty of Organization and Informatics, University of Zagreb, Croatia
Faculty of Geography, University of Belgrade, Serbia
Institute of Marketing, Poznan University of Economics and Business, Poznan, Poland
Faculty of Agriculture, Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania", Timisoara, Romania

Cover image by: Gerd Altmann from Pixabay
Printed by: SKRIPTA International, Belgrade
Print circulation: 100 copies
Belgrade, 2023
ISBN 978-86-80194-64-6
ISSN 2683-5991
DOI: https://doi.org/10.31410/ITEMA.S.P.2022

CIP - Katalogizacija u publikaciji
Narodna biblioteka Srbije, Beograd

330(082)
004(082)
005(082)
338.48(082)
631(082)
616.98:578.834]:33(082)

INTERNATIONAL Scientific Conference ITEMA 2022 Recent Advances in Information Technology, Tourism, Economics, Management and Agriculture (6 ; 2022)
Selected Papers / Sixth International Scientific Conference ITEMA 2022 Recent Advances in Information Technology, Tourism, Economics, Management and Agriculture, Maribor, Slovenia October 27, 2022 ; [editor Vuk Bevanda]. - Belgrade : Association of Economists and Managers of the Balkans / UdEkoM Balkan, 2023 (Belgrade : Skripta International). - XVI, 119 str. : ilustr. ; 29 cm. - (ITEMA Conference Collection, ISSN 2683-5991)

Tiraž 100. - Napomene i bibliografske reference uz tekst. - Bibliografija uz svaki rad. - Registri.

ISBN 978-86-80194-64-6

a) Informaciona tehnologija -- Zbornici b) Ekonomija -- Zbornici v) Menadžment -- Zbornici g) Turizam -- Zbornici d) Poljoprivreda -- Zbornici đ) Korona virus -- Ekonomski aspekt -- Zbornici

COBISS.SR-ID 120761609

Editorial Committee of the ITEMA Conference

Contents

Index of Authors

Index

Preface

The purpose of the annual ITEMA conference is to support the power of scientific research and dissemination of the research results with the objective to enhance society by advancing knowledge; policy-making change, lives, and ultimately, the world. Our objective is to continue to be the foremost annual conference on cutting-edge theory and practice of information technology, tourism, economics, management, and agriculture, encouraging advancement via excellence, and interaction.

ITEMA conference aims to bring together the international academic community (experts, scientists, engineers, researchers, students, and others) and enable interactive discussions and other forms of interpersonal exchange of experiences and popularization of science and personal and collective affirmation.

The annual ITEMA conference is committed to the highest standards of publishing integrity and academic honesty as ensuring ethics in all its publications. Conformance to standards of ethical behavior is therefore expected of all parties involved: authors, editors, reviewers, and the publisher. The conference organizer follows the Committee on Publication Ethics (COPE) guidelines on how to deal with potential acts of misconduct.

All received full papers prior peer review process are subject to plagiarism check with iThenticate by Turnitin software. Any identified plagiarism automatically disqualifies a paper. Afterward, all full papers are double-blind peer-reviewed by the reviewers drawn from the editorial committee or external reviewers depending on the topic, title, and the subject matter of the paper. Peer reviewers provide a critical assessment of the paper and may recommend improvements. Although the author may choose not to take this advice, we highly recommend that the author address any issues, explaining why their research process or conclusions are correct.

The conference program of the 6th International Scientific Conference on Recent Advances in Information Technology, Tourism, Economics, Management, and Agriculture - ITEMA 2022 held on October 27, 2022, combined presentations of the latest scientific developments in the field of knowledge management with blockchain, data-driven vehicle lifecycle management, AI-based website content generation, comparative analysis of protocol attributes, cryptocurrency evidence, electronic invoicing, genetic algorithms for job shop problems, risk management with automation, social networks in healthcare, e-platform usage in education, augmented reality learning, information security and cybersecurity, payment security in online commerce, tourism, COVID-19's economic impact, digitalization, strategic alliances, capital markets, healthcare financing, FINTECH, sustainability reporting, human resources, education strategies, agricultural analysis, and others. The selection of papers for presentation on the conference day was based on quality, originality, and relevance.

ITEMA 2022 keynote speaker was full-time professor Kornelije Rabuzin representing the Faculty of Organization and Informatics, University of Zagreb, Varaždin, Croatia with the topic *Using Business Intelligence*.

Within publications from the ITEMA 2022 conference:

- 12 double peer-reviewed papers have been published in the **ITEMA 2022 Selected Papers**,
- 48 double peer-reviewed papers have been published in the **ITEMA 2022 Conference Proceedings,**
- 106 abstracts have been published in the **ITEMA 2022 Book of Abstracts**.

Altogether ITEMA 2022 publications have more than 700 pages. All full papers have DOI numbers and ORCID iD integration.

Participation in the conference took **193 researchers** representing **20 different countries** from different universities, eminent faculties, scientific institutes, colleges, various ministries, local governments, public and private enterprises, multinational companies, associations, etc.

ITEMA 2022 Participants' Affiliation

Albania
- Agricultural University of Tirana, Faculty of Economy and Agribusiness
- European University of Tirana, Tirana
- Tirana University, Faculty of Natural Sciences, Department of Chemistry
- University "Aleksandër Moisiu", Durres
- University "Luarasi", Faculty of Law, Department of the Public Law, Tirana
- University of Elbasan, Faculty of Economy, Department of Marketing
- University of Tirana, Faculty of Economics, Str. Arben Broci, Tirana
- University of Tirana, Sheshi Nënë Tereza 4, 1010 Tirana

Austria
- Central European Uniiversity, Quellenstrasse 51, 1100 Vienna
- University of Applied Sciences Kufstein, Andreas Hofer-Str. 7, Kufstein
- University of Klagenfurt, Universitätsstrasse 65-67

Bosnia and Herzegovina
- BIT Center Tuzla
- Fam3 doo Tuzla
- University in Sarajevo, Faculty of Education, 71000 Sarajevo
- University in Tuzla, Faculty of Economics
- University of Sarajevo, Faculty of Science, Zmaja od Bosne 35, 71000 Sarajevo
- University of Travnik, Faculty of Management and Business Economics, 71250 Kiseljak

Bulgaria
- Medical University Plovdiv, Department of Health Management and Health Economics, 15A, Blvd. Vasil Aprilov, 4000 Plovdiv
- New Bulgarian University, 21 Montevideo Str., Sofia
- Sofia University "St. Kliment Ohridski", 15 Tzar Osvoboditel Blvd., Sofia
- Sofia University "St. Kliment Ohridski", Faculty of Geology and Geography, "Socio-Economic Geography" Department, Tzar Osvoboditel 15, Sofia
- University of Plovdiv "Paisii Hilendarski", 24 Tsar Asen Str., Plovdiv

Croatia
- College of Applied Sciences "Lavoslav Ružička" in Vukovar, Županijska 50, Vukovar
- Croatian Health Insurance Fund, Kapucinska 33, Osijek
- Institute of Economics, Trg J. F. Kennedyja 7, 10000 Zagreb
- PIK Vrbovec plus d.o.o., Gospodarska zona 20, Antunovac
- Regional Wholesales Market Osijek d.d., Jablanova bb, Osijek
- University North, Trg dr. Žarka Dolinara 1, 48000 Koprivnica
- University of Rijeka, Faculty of Economics and Business, Ivana Filipovića 4, 51000 Rijeka
- University of Split, Faculty of Economics, Business and Tourism, Cvite Fiskovića 5, 21000 Split
- University of Zagreb, Faculty of Organization and Informatics, Pavlinska 2, Varaždin
- Zagreb School of Business, Ulica grada Vukovara 68, 10000 Zagreb

China
- Hong Kong Baptist University, Department of Finance and Decision Sciences
- Hong Kong Polytechnic University, School of Professional Education and Executive Development

Czech Republic
- Comenius University in Bratislava, Faculty of Management, Odbojárov 10, 820 05 Bratislava 25
- Mendel University in Brno, Faculty of Business and Economics, Department of Marketing and Trade, Zemědělská 1665/1, 613 00 Brno-sever
- Prague University of Economics and Business, W. Churchill Sq. 1938/4, 130 67 Prague 3 – Žižkov

France
- UCA - Skema Business School

Greece
- University of the Aegean, 41 Kountouriotou Str., 82100 Chios
- University of the Aegean, School of Engineering, Department of Financial and Management Engineering, Kountouriotou 42, 82100 Chios

Hungary
- Centre for Economic and Regional Studies, Institute for Regional Studies West-Hungarian Research Department; Liszt Ferenc u. 10, 9022 Győr
- Eötvös Loránd University, Faculty of Economics, Egyetem tér 1-3.,1053 Budapest
- Magyar Agrár - és Élettudományi Egyetem (MATE), Páter Károly u. 1, 2100 Gödöllő
- University of Debrecen, Faculty of Economics and Business, Institute of Accounting and Finance, Böszörményi út 138, 4032 Debrecen

Italy
- Polytechnic University of the Marches, Department of Management, Piazzale Martelli 8, 60121 Ancona
- Univeristy of Brescia, Department of Law, via San Faustino No. 41, Brescia
- University of Pisa, Department of Economics and Management, via Ridolfi 10, 56124 Pisa
- University of Bologna, Department of Statistical Sciences "Paolo Fortunati", Via delle Belle Arti 41, 40126 Bologna

Kuwait
- American College of the Middle East
- American University of the Middle East

Montenegro
- Port of Bar, Obala 13. jula 2, 85 000 Bar

North Macedonia
- Ss Cyril and Methodius University in Skopje, Faculty of Economics – Skopje, bul. Goce Delcev 9v, Skopje
- Pro Local – Fostering Development CSO, Bitola, Pelagonia

Poland
- Poznan University of Economics and Business, Al. Niepodległości 10

Portugal
- Cybersafe Lda, Alfragide
- Research Unit on Governance, Competitiveness and Public Policies (GOVCOPP), ESTGA – UA, 3810-193 Aveiro, FEUC – UC
- School of Business and Administration, Polytechnic Institute of Setúbal
- University of Coimbra, Faculty of Economics, Av. Dias da Silva, № 165, 3004-512 Coimbra
- University of Évora, Center for Studies and Advanced Training in Management and Economics (CEFAGE)

Romania
- Babeș-Bolyai University, Cluj-Napoca
- Babeș-Bolyai University, Faculty of Economics and Business Administration, Teodor Mihali Street No. 58-60
- Partium Christian University, Faculty of Economics and Social Science, Department of Economics, str. Primăriei, nr. 36, 410209 Oradea
- University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Mărăști Blvd, Bucharest
- University of Oradea, Faculty of Civil Engineering, Cadastre and Architecture, 4 B. St. Delavrancea, 410058, Bihor
- West University of Timisoara, Faculty of Economics and Business Administration

Serbia
- Academy of Applied Technical and Preschool Studies, Department Vranje, Filipa Filipovica 20, 17500 Vranje
- Academy of Applied Technical Studies Belgrade, Department of Computer-Mechanical Engineering, Blv. Zorana Djindjića 152 a, 11070 Belgrade
- Academy of Technical and Art Applied Studies Belgrade, Department School of Information and Communication Studies, Zdravka Čelara 16, Belgrade
- Association of Economists and Managers of the Balkans, Belgrade
- ATSSB, Department of Belgrade Polytechnic, Katarine Ambrozić 3, Belgrade
- Belgrade Business and Arts Academy of Applied Studies, Kraljice Marije 73, Belgrade
- Chamber of Commerce and Industry of Serbia, Kneza Miloša 12, Belgrade
- Faculty of Security Studies, Gospodara Vucica 50, Belgrade
- Faculty of Social Sciences, Belgrade
- Quadro Consulting, 6 Vladimira Popovića St., Belgrade
- Singidunum University – Belgrade
- University in Novi Sad, Faculty of Economics in Subotica
- University of Belgrade, Faculty of Economics and Business, Kamenička 6, 11000 Belgrade
- University of Belgrade, Faculty of Agriculture, Nemanjina 6, 11081 Belgrade
- University of Belgrade, Faculty of Mining and Geology, Djusina 7, Belgrade
- University of Belgrade, Faculty of Organisational Sciences, Jove Ilića 154, Belgrade
- University of Defence, Military Academy, Belgrade
- University of Niš, Faculty of Economics, Trg kralja Aleksandra Ujedinitelja 11
- University of Niš, Innovation Centre at University of Niš, Univerzitetski trg 2
- Videobolt, Bulevar Mihaila Pupina 10a, Belgrade

Slovakia
- Academy of the Police Force in Bratislava, Sklabinská 1, 835 17 Bratislava
- Alexander Dubček University in Trenčín, Faculty of Social and Economic Relations, Študentská 3, 91150 Trenčín
- Comenius University in Bratislava, Faculty of Law, Šafárikovo námestie 6, 810 00 Bratislava
- Comenius University in Bratislava, Faculty of Medicine, Špitálska 24, 813 72 Bratislava
- Comenius University, Faculty of Management, Odbojarov 10, Bratislava
- Slovak University of Agriculture in Nitra, Tr. A. Hlinku 2, 94976 Nitra
- University of Economics in Bratislava, Faculty of Commerce, Department of Tourism, Dolnozemská cesta 1, 852 35 Bratislava

Slovenia
- Celje School of Economics, Higher Vocational College
- Faculty of Economics and Business
- University of Maribor, Faculty of Economics and Business, Razlagova 14, 2000 Maribor

DOI: https://doi.org/10.31410/ITEMA.S.P.2022.1

Capital Structure and Profitability: Panel Data Evidence from the European Tourism Industry

Rezart Demiraj[1]
Suzan Dsouza[2]
Enida Demiraj[3]

Received: Novembar 24, 2022
Accepted: January 24, 2023
Published: June 12, 2023

Keywords:
Capital structure;
Profitability;
Tourism industry;
Europe

Abstract: *Finding the optimal debt-equity mix, where shareholders' welfare and firm value are maximized is the goal of every business organization. The literature review revealed a broad spectrum of mixed and contradictory empirical findings on this topic, suggesting that the debate is far from over. This paper aims to assess the impact of capital structure on the profitability of the tourism industry in the European continent. This study is motivated by the importance that the tourism industry has for the economic development of European countries. The sample includes all European-listed firms in the tourism industry. Data is extracted from the Thomson Reuters (Refinitiv) database for a period of 10 years, i.e., 2010-2019. Panel data regression is used to determine the impact of the debt-to-assets ratio on the return on assets. The results reveal that the debt ratio has a significant negative impact on ROA, but not on ROE.*

1. INTRODUCTION

Europe is one of the most attractive touristic destinations worldwide. As a significant contributor to GDP, tourism represents a major economic activity that promotes economic growth and employment. Despite the unprecedented negative impact of the Covid-19 crisis, in 2021, the tourism industry contributed 1450.1 billion dollars to the GDP and 34.65 million jobs in Europe (Statista Research Department, 2022a, 2022b). In addition to being an important economic driver through income generation and employment, tourism is also essential to social and cultural development. Therefore, the performance and prosperity of firms in the tourism industry are of particular interest to the European region. Literature has identified capital structure as an important determinant of profitability and firm value, hence this study aims to investigate the impact of capital structure on the profitability of tourism firms in Europe and offer pertinent recommendations.

Capital Structure represents the composition of a firm's financial resources in terms of borrowed and own capital. Profitability refers to the ability of firms to generate enough revenues that compensate for all their expenses and contribute to the increase of shareholders' wealth. Firms have long been searching for an optimal capital structure that maximizes profits while limiting risk exposure. As a result, many studies have focused on the relationship between capital structure and firm value, with many theories being developed over the years. However, the results have been contradictory when it comes to proving those theories empirically. To date, no magical formula for capital structure has been found.

The remainder of the study is organized as follows. Section 2 contains a review of important literature on capital structure and profitability. The research methodology is described in section 3. Section 4 presents the results, followed by their discussion. Finally, section 5 offers conclusions and implications of the study.

[1] American University of the Middle East, Kuwait
[2] American University of the Middle East, Kuwait
[3] American College of the Middle East, Kuwait

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

The quest for an optimal capital structure is not new. Probably the most prominent authors that dedicated a lot of effort to this topic are Franco Modigliani and Merton Miller. In 1958 they came up with the so-called capital irrelevance theory. Under specific conditions, such as lack of bankruptcy risk and absence of taxes, they theorized that the value of a firm is not related to its capital structure. In other words, a firm's value would be no different whether a firm was financed entirely from debt or stock (Modigliani & Miller, 1958). However, if the tax-saving effect of debt is considered, they concluded that more debt leads to higher firm value, provided that there is no risk of bankruptcy (Modigliani & Miller, 1963).

Of course, even this modified theory is based on a somewhat unrealistic assumption. Firms in the real world are not immune to bankruptcy. Moreover, there is a direct relationship between debt and bankruptcy. Due to this relationship, firms must carefully balance the costs and benefits of debt. This concept is formalized in the so-called trade-off theory, in which firms maximize their values by increasing the debt portion of their capital structure to the point where the marginal benefits of debt (i.e., tax savings) equal its marginal costs (i.e., bankruptcy costs) (Myers & Majluf, 1984).

Another theory related to the capital structure is the pecking order theory. According to this theory, firms generally prefer internal funds over external financing, and among external financing options, debt is preferable to stock (Myers, 2001; Stiglitz, 1973).

Finally, a fourth relevant theory is the agency cost theory. This theory posits that the conflicting interests of managers and shareholders reflect in their preferences for financing options. For example, managers who are interested in preserving their power within the organization and securing their jobs and compensation tend to avoid borrowing. On the contrary, shareholders prefer borrowing because they see it as a means of exerting stricter control over managers, which may push them to higher levels of efficiency (Jensen & Meckling, 1976).

Table 1. Summary of literature review

	Capital Structure (Leverage) relationship with	
Works	**ROA**	**ROE**
Yoon and Jang (2005)		+
Margaritis and Psillaki (2007)	+	
Pouraghajan et al. (2012)	–	–
Salim and Yadav (2012)	–	–
Winantea (2013)		+
Seetanah et al. (2014)	–	–
Shamaileh and Khanfar (2014)	–	
Nasimi (2016)	–	+
Alarussi and Alhaderi (2018)		–
Nguyen et al. (2019)	–	+
Samo and Murad (2019)	0*	–
Zaitoun and Alqudah (2020)	–	
Ayaz et al. (2021)	U	U
Habibniya et al. (2022)	–	0

Note: * Not significant

Source: Authors

Over the years, many empirical studies have been conducted in an attempt to test these theories. The literature review focuses on those studies that have explored the relationship of capital structure with financial performance represented by either ROA, ROE, or both. Some studies have found a positive relationship between higher debt levels and firm profitability. Others have shown that an aggressive capital structure (higher debt levels) is associated with lower financial performance. And some have even come up with mixed results, i.e., different effects on ROA and ROE, respectively. Table 1 presents a summary of some works relevant to this study.

In an attempt to weigh the debate on the relationship between capital structure and profitability, this study examines the impact of the debt ratio (D/A) on the two traditional profitability ratios, ROA and ROE. To this purpose, the following hypotheses are formulated:

Hypothesis one: Debt ratio (DA) negatively impacts firms' return on assets (ROA) in the European tourism industry.

Hypothesis two: Debt ratio (DA) negatively impacts firms' return on equity (ROE) in the European tourism industry.

3. METHODOLOGY

Sample. The sample includes all the listed companies in the European tourism industry for which information is available in the Thomson Reuters (Refinitiv) database. After cleaning the data from firms with incomplete or missing information, the sample comprised a total of 238 firms from 36 countries of the European continent. Financial information for the remaining firms in the sample was extracted for a period of 10 years, from 2010 to 2019, obtaining an unbalanced panel of 2033 firm-year observations. The years before 2010 and after 2019 were excluded from the sample to avoid the effect of the two global crises, i.e., the global financial crisis and the Covid-19 pandemic.

Variables. The variables used in the study are categorized as dependent, independent, and control variables. The dependent variable is profitability which has many indicators. However, following many prior studies (see Table 1), ROA and ROE are used as measures of firm profitability. The independent variable is the capital structure which also may be measured by various financial ratios. However, the most meaningful and commonly used in literature are debt-to-assets and equity-to-assets ratios. Since these two ratios are perfectly inversely correlated, only the debt-to-assets ratio is used. As for control variables, factors that are discussed in the literature and are thought to explain, at least in part, the variation in firm profitability, are selected; asset tangibility (TAN), firm size (S), and liquidity (LQ) are used at a firm level, whereas, at a macroeconomic level, the inflation rate (INF) is used. Table 2 presents the variables' explanation and measurement.

Research Model. The study hypotheses were tested employing panel data regression. Panel data regression is used in many studies in the field and is known to have advantages over other types of regression. Before proceeding with the regression models, as explained above, the data was cleaned from firms with missing or incomplete information. Next, descriptive statistics were obtained, such as mean values, standard deviation, minimum and maximum values, skewness, and kurtosis. Then the pairwise correlation coefficients were acquired to analyze the correlation among the variables and determine how to best use them in the regression models. Finally, the dataset was winsorized at 2% to reduce the effect of the outliers, and the Housman test was run to decide whether to use the fixed effects or the random effects model.

Table 2. Variables description and measurement

Category	Abbr.	Variables Description and Measurement
Dependent variables	ROA	Return on Assets = Net Income / Total Assets
	ROE	Return on Equity= Net Income / Total Equity
Independent variable	D/A	Debt Ratio = Total Debt / Total Assets
Control variables	TAN	Asset Tangibility = Non-current Assets / Total Assets
	S	Size = Ln of Total Assets
	LQ	Liquidity = Current Assets / Current Liabilities
	INF	Inflation Rate = CPI

Source: Authors

The regression model used in this study is the following:

$$Profitability = f\,(Capital\ Structure,\ Control\ Variables)$$

$$PROFITABILITY = \alpha_{it} + \beta_1 CAPITAL\ STRUCTURE + \beta_2\ CONTROL\ VARIABLES + Fixed\ Effects + \mathcal{E}_{it}$$

Where:
Profitability refers to the ROA and ROE of firm *i* in year *t*
Capital structure refers to the Debt-to-Assets ratio of firm *i* in year *t*
Control variables refer to tangibility, size, liquidity, and inflation rate of firm *i* in year *t*.
Fixed effects refer to country and year
$\mathcal{E}_{it}$ is the error term

Based on the above model, the following regression equations were formulated:

$$ROA_{it} = \beta_0 + \beta_1 D/A_{it} + \beta_2 TAN_{it} + \beta_3 S_{it} + \beta_4 LQ_{it} + \beta_5 INF_{it} + \varepsilon_{it} \quad (1)$$

$$ROE_{it} = \beta_0 + \beta_1 D/E_{it} + \beta_2 TAN_{it} + \beta_3 S_{it} + \beta_4 LQ_{it} + \beta_5 INF_{it} + \varepsilon_{it} \quad (2)$$

The data were processed using the Stata statistical package, and all tables, except for Table 1, are generated by Stata.

4. RESULTS AND DISCUSSION

4.1. Descriptive statistics and variables correlation

Table 3 presents the number of observations, mean values, standard deviation, and min/max values, in addition to the skewness and kurtosis for each variable. Standard deviation, skewness, and kurtosis values reveal that there are not too many outliers in the sample, and the probability distribution is reasonably symmetrical.

Table 4 presents the correlation among the variables. The relatively high correlation between ROA and ROE was expected but is not concerning since they will be used in separate regression models, being the dependent variables in the study. As for the other variables, the correlation matrix reveals a very weak correlation among them, with few cases of mild correlation. The variable correlation matrix is analyzed to identify any collinearity in the variables pool. However, conclusions on the impact of the D/A on ROA and ROE are drawn based on the regression results.

Table 3. Descriptive statistics of the variables (2010-2019)

Variables	Obs.	Mean	Std. Dev.	Min	Max	Pr(Skewness)	Pr(Kurtosis)
ROA	2033	0.037	0.103	-0.329	0.324	0.00	0.00
ROE	2033	0.037	0.348	-1.469	1.007	0.00	0.00
D/A	2033	0.497	0.273	0.028	1.173	0.00	0.00
TAN	2033	0.732	0.239	0.044	0.989	0.00	0.00
S	2033	18.871	2.098	14.437	23.286	0.55	0.00
LQ	2033	2.036	3.515	0.097	19.676	0.00	0.00
INF	2033	1.414	1.345	-1.429	4.625	0.01	0.19

Source: Authors

Table 4. Variables pairwise correlation matrix (2010-2019)

Variables	ROA	ROE	D/A	TAN	S	LQ	INF
ROA	1						
ROE	0.4561*	1					
D/A	-0.0196	0.0297	1				
TAN	-0.0847*	-0.0549*	0.0064	1			
S	0.2093*	0.131*	0.237*	0.32*	1		
LQ	-0.0469*	-0.0113	-0.3979*	-0.3851*	-0.2138*	1	
INF	-0.0003	-0.0061	-0.015	0.0334	0.0002	0.0301	1

Note: * Statistically significant at 5 percent level.

Source: Authors

4.2. Regression results

Based on the Housman test values, it was decided to run the random effects regression model on both D/A-ROA and D/A-ROE relationships. Only the most significant and strongest results are analyzed among the No dummy, Year dummy, Country dummy, and Year & Country dummy for both models.

Table 5. Random effects regression results of D/A with ROA (2010 – 2019)

Variables	No dummy	Year dummy	Country dummy	Year and country dummy
	ROA	**ROA**	**ROA**	**ROA**
D/A	-.055***	-.054***	**-.059*****	-.058***
	(-0.011)	(-0.011)	(-0.011)	(-0.011)
TAN	-.096***	-.097***	-.097***	-.097***
	(-0.015)	(-0.015)	(-0.015)	(-0.015)
S	.017***	.017***	.018***	.017***
	(-0.002)	(-0.002)	(-0.002)	(-0.002)
LQ	-.002**	-.002**	-.002**	-.002**
	(-0.001)	(-0.001)	(-0.001)	(-0.001)
INF	-0.001	-0.002	-0.002	-0.002
	(-0.001)	(-0.002)	(-0.001)	(-0.002)
_cons	-.183***	-.176***	-0.094	-0.086
	(-0.04)	(-0.042)	(-0.093)	(-0.093)
Observations	2033	2033	2033	2033
Pseudo R^2	.z	.z	.z	.z
Adj R^2	.z	.z	.z	.z
Hausman test (Prob > chi2)	0.2237	0.2237	0.2237	0.2237

Note: Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1

Source: Authors

Table 5 shows the regression results for the impact of capital structure (D/A) on profitability as measured by the return on assets (ROA). The results point to a negative impact of the debt ratio over the return on assets. For every increase by one unit in the debt-to-assets ratio, a decrease of ROA by -.059 points is expected (country dummy model). The results are significant at 1%. These findings support the first hypothesis of the study, where a negative impact of capital structure on ROA was predicted.

Table 6. Random effects regression results of D/A with ROE (2010 – 2019)

Variables	No dummy	Year dummy	Country dummy	Year and country dummy
	ROE	ROE	ROE	ROE
D/A	-0.055	-0.05	-0.062	-0.056
	(-0.041)	(-0.041)	(-0.045)	(-0.045)
TAN	-.226***	-.227***	-.273***	-.274***
	(-0.052)	(-0.052)	(-0.056)	(-0.055)
S	.029***	.029***	.036***	.035***
	(-0.006)	(-0.006)	(-0.007)	(-0.007)
LQ	-0.004	-0.004	-0.004	-0.005
	(-0.003)	(-0.003)	(-0.003)	(-0.003)
INF	-0.004	-0.002	-0.006	-0.008
	(-0.006)	(-0.009)	(-0.006)	(-0.009)
_cons	-.308***	-.351***	-0.148	-0.184
	(-0.117)	(-0.119)	(-0.237)	(-0.231)
Observations	2033	2033	2033	2033
Pseudo R^2	.z	.z	.z	.z
Adj R^2	.z	.z	.z	.z
Hausman test (Prob > chi2)	0.1175	0.1175	0.1175	0.1175

Note: Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1

Source: Authors

Table 6 shows the regression results for the impact of capital structure (D/A) on profitability as measured by the return on equity (ROE). The derived results show a negative coefficient on the relationship between the debt ratio and return on equity. However, the results are statistically not significant for either of the No dummy, Year dummy, Country dummy and Year & Country dummy models. Hence, these findings do not allow us to conclude that capital structure has a negative impact on ROA as predicted and the second hypothesis of the study is rejected.

The findings of this study are consistent with Habibniya et al. (2022). The results presented above are further analyzed concerning the four capital structure theories presented in the Literature Review section.

The negative impact of capital structure on ROA in this study does not support the *capital structure irrelevance theory* of Modigliani and Miller, nor their modified theory. The way firms finance their investment projects matters, and firms with greater portions of debt in their capital structure do not perform better. The most sensible explanation for this conclusion is the existence of bankruptcy costs in the real world, which Modigliani and Miller ignored. The results are in line with the *trade-off theory*. There are advantages and disadvantages to borrowing capital, that must be taken into account and balanced carefully by managers to maximize profits and firm value. As for *the pecking order theory*, it is supported by these findings in that, more profitable firms tend to rely less on borrowed capital, pointing to a preference for cash generated by their operations instead.

Finally, according to the *agency cost theory* firms with higher debt ratios would be expected to fare better, since managers would be less relaxed and more under pressure to perform well, and vice-versa. However, this theory does not find support in the study results.

5. FUTURE RESEARCH DIRECTIONS

Future research may be conducted on the capital structure and its role in dealing with financial distress during periods of crises (e.g. global financial crisis and the Covid-19 crisis). For example, it would be interesting to see how firm value was affected during the Covid-19 crisis and what was the role of capital structure in it.

6. CONCLUSION

This study explores the impact of capital structure on the financial performance of European firms in the tourism industry. Despite the sheer amount of studies on this topic over the years, both conceptual and empirical, the debate is not settled yet. Furthermore, each industry has its characteristics, and every contribution is welcomed. The focus is on the European tourism industry due to its significance and weight in the total economic output of the continent. Fixed effects panel regression is used to determine the impact of the capital structure represented by debt-to-assets (D/A) ratio on the firm financial performance represented by ROA and ROE. The results reveal a significant negative relationship between D/A and ROA but not significant between D/A and ROE. By focusing on a single industry and by taking a sizeable sample, this study contributes to the ongoing debate on this important relationship and can be used by firms to attain an equilibrium between the two main financing sources, borrowings and own capital.

References

Alarussi, A. S., & Alhaderi, S. M. (2018). Factors affecting profitability in Malaysia. *Journal of Economic Studies, 45(3)*, 442–458. https://doi.org/10.1108/jes-05-2017-0124

Ayaz, M., Mohamed Zabri, S., & Ahmad, K. (2021). An empirical investigation on the impact of capital structure on firm performance: evidence from Malaysia. Managerial Finance, 47(8), 1107-1127. https://doi.org/10.1108/mf-11-2019-0586

Habibniya, H., Dsouza, S., Rabbani, M. R., Nawaz, N., & Demiraj, R. (2022). Impact of Capital Structure on Profitability: Panel Data Evidence of the Telecom Industry in the United States. *Risks, 10(8)*, 157. https://doi.org/10.3390/risks10080157

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics, 3(4)*, 305-360. https://doi.org/10.1016/0304-405x(76)90026-x

Margaritis, D., & Psillaki, M. (2007). Capital Structure and Firm Efficiency. Journal of *Business Finance & Accounting, 34(9–10)*, 1447–1469. https://doi.org/10.1111/j.1468-5957.2007.02056.x

Modigliani, F., & Miller, M. H. (1958). The Cost of Capital, Corporation Finance and the Theory of Investment. *The American Economic Review, 48(3)*, 261–297. Retrieved from http://www.jstor.org/stable/1809766

Modigliani, F., & Miller, M. H. (1963). Corporate Income Taxes and the Cost of Capital: A Correction. *The American Economic Review*, *53(3)*, 433–443. Retrieved from http://www.jstor.org./stable/1809167

Myers, S. C. (2001). Capital Structure. *Journal of Economic Perspectives*, 15(2), 81–102. https://doi.org/10.1257/jep.15.2.81

Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, 13(2), 187–221. https://doi.org/10.1016/0304-405X(84)90023-0

Nasimi, A. N. (2016). Effect of capital structure on firm profitability (an empirical evidence from London, UK). *Global Journal of Management and Business Research*, *16(4)*. Retrieved from https://journalofbusiness.org/index.php/GJMBR/article/view/2026/2-Effect-of-Capital-Structure_JATS_NLM_xml

Nguyen, V. C., Nguyen, T. N. L., Tran, T. T. P., & Nghiem, T. T. (2019). The impact of financial leverage on the profitability of real estate companies: A study from Vietnam stock exchange. *Management Science Letters, 9(13)*, 2315-2326. https://doi.org/10.5267/j.msl.2019.7.023

Pouraghajan, A., Malekian, E., Emamgholipour, M., Lotfollahpour, V., & Bagheri, M. M. (2012). The relationship between capital structure and firm performance evaluation measures: Evidence from the Tehran Stock Exchange. *International Journal of Business and Commerce*, *1(9)*, 166-181. Retrieved from https://ijbcnet.com/1-9/IJBC-12-1915.pdf

Salim, M., & Yadav, R. (2012). Capital Structure and Firm Performance: Evidence from Malaysian Listed Companies. *Procedia - Social and Behavioral Sciences, 65*, 156-166. https://doi.org/10.1016/j.sbspro.2012.11.105

Samo, A. H., & Murad, H. (2019). Impact of liquidity and financial leverage on firm's profitability - an empirical analysis of the textile industry of Pakistan. *Research Journal of Textile and Apparel, 23(4)*, 291-305. https://doi.org/10.1108/rjta-09-2018-0055

Seetanah,B.,Seetah,K.,Appadu,K.,&Padachi,K.(2014).Capitalstructureandfirmperformance:evidence from an emerging economy. *The Business & Management Review*. Retrieved from https://www.proquest.com/conference-papers-proceedings/capital-structure-firm-performance-evidence/docview/1518260972/se-2

Shamaileh, M. O., & Khanfar, S. M. (2014). The Effect of the Financial Leverage on the Profitability in the Tourism Companies (Analytical Study- Tourism Sector- Jordan). *Business and Economic Research, 4(2)*, 251-264. https://doi.org/10.5296/ber.v4i2.5546

Statista Research Department. (2022a, June 14). Total contribution of travel and tourism to employment in Europe from 2019 to 2021. Statista. https://www.statista.com/statistics/617528/travel-tourism-total-gdp-contribution-europe/

Statista Research Department. (2022b, June 22). Total contribution of travel and tourism to GDP in Europe from 2019 to 2021. Statista. https://www.statista.com/statistics/617528/travel-tourism-total-gdp-contribution-europe/

Stiglitz, J. E. (1973). Taxation, corporate financial policy, and the cost of capital. *Journal of Public Economics, 2(1)*, 1-34. https://doi.org/10.1016/0047-2727(73)90008-x

Winantea, Y. (2013). The Influence of Capital Structure Towards Profitability (Study on Hotel and Tourism Companies that listed in Indonesia Stock Exchange). *Journal Ilmiah Mahasiswa FEB*, *1(2)*. Retrieved from https://jimfeb.ub.ac.id/index.php/jimfeb/article/view/684

Yoon, E., & Jang, S. (2005). The Effect of Financial Leverage on Profitability and Risk of Restaurant Firms. T*he Journal of Hospitality Financial Management, 13(1)*, 35-47. https://doi.org/10.1080/10913211.2005.10653798

Zaitoun, M., & Alqudah, H. (2020). The Impact of Liquidity and Financial Leverage on Profitability: The Case of Listed Jordanian Industrial Firms. *International Journal of Business and Digital Economy*, *1(4)*, 29–35. Retrieved from https://www.ijbde.com/archive/volume-1-issue-4

6th International Scientific Conference ITEMA 2022 – Selected Papers
DOI: https://doi.org/10.31410/ITEMA.S.P.2022.9

Potential and Need of Tourism Cluster Organizations in Slovakia

Jozef Gáll[1]

Received: December 3, 2022
Accepted: January 19, 2023
Published: June 12, 2023

Keywords:
Tourism;
Tourism cluster organizations;
Destination management;
Tourist regions of Slovakia

Abstract: *One of the important issues in the context of tourism cluster organizations is their role as a tool and potential for the development of the region's economy and as a source of its advantages, but also some potentially negative effects. The main aim of this article is to evaluate the potential of existing clusters and cluster organizations and to identify the real nature, direction, and impact of the cluster organization in tourist regions and its real impact on member companies (institutions). To achieve it, we will use primary sources of information, which represent the results of surveys carried out in the environment of companies and institutions associated with selected cluster organizations, by asking cluster policy implementers and information obtained from cluster organization coordinators. Qualitative methods such as the method of sociological inquiry in the form of a questionnaire and an individual in-depth interview will be used to obtain a reliable picture. A detailed analysis, which examined the cooperation between companies, research and development institutions, and local governments, allowed us to identify the activities of the cluster organization, its technological level, innovations in the cluster organization and competitive position, as well as development perspectives. The research carried out between coordinators and member companies (institutions) pointed out the key problems of cluster activities and cooperation. Part of it is a processed issue of cluster support in regions and current activities on the part of local (regional) authorities.*

1. INTRODUCTION

Theories and concepts of industrial clusters have generally been applied to manufacturing sectors and their applicability to the service sector (especially tourism) has been minimal. In recent years, however, this issue has experienced exponential growth. Jackson and Murphy (2002) even argue that the application of the concept of industrial clusters in the tourism industry is extremely appropriate given that the tourism product cooperates with local bases, supports joint actions of interconnected businesses and institutions, and leads to the formation of agglomerations. Although Porter (1998) carried out studies mainly in the context of traditional industries, this author mentions the importance of elements belonging to tourism, stating that tourist satisfaction does not only depend on the attractiveness of the primary offer of a tourism destination but also the quality and efficiency of related business entities, such for example, hotels, restaurants, shopping centers and transport infrastructure.

An important issue in the context of tourism clusters is their role as a tool and potential for the development of the region's economy and as a source of its advantages, but also of some potentially negative effects. Pichierri (2002) states that benefits (of various scales) resulting from joint activities among members of a cluster organization are often mentioned in the literature. Thanks to these activities, the organizations that make up the membership base of the cluster,

[1] University of Economics in Bratislava, Faculty of Commerce, Department of Tourism, Dolnozemská cesta 1, 852 35 Bratislava, Slovak Republic

but also entire regions, can gradually develop, which means that we can consider this development as synergistic. A synergistic effect can be achieved not only in high-tech industries but also in more traditional industries, such as tourism (Wierżyński, 2011).

The cooperation of members of a tourism cluster organization using the support of educational and research facilities can be a source of many advantages. The author Kaźmierski (2009) divided these benefits into two groups, labeling them as hard and soft benefits (Table 1).

Table 1. Advantages of tourism cluster organizations for their members

Hard benefits	
Source	**Advantages**
local supply chains	effectiveness of supply chain management
specialized workforce	higher productivity
specialized services/products	faster and easier access
wide range of partners/collaborators	lower cost, higher quality
concentration of enterprises/institutions	creating links and working relationships
Soft benefits	
Source	**Advantages**
a culture of cooperation	joint vision, planning, implementation
trust	favorable cooperation between organizations
learning (I.)	transfer of innovation and technology
learning (II.)	knowledge and know-how
informal labor markets	efficiency, greater career opportunities

Source: Own processing (Kaźmierski, 2009)

The effects of the functioning of cluster structures are primarily related to resources, affect the change in their quality, increase their attractiveness and determine their specificity. The hard benefits result from the investments of the members of the cluster organization, the execution of more efficient business transactions and the reduction of expenses associated with production and employment. Soft benefits result from the possibility of learning and knowledge transfer, which leads to innovation, advancement and improvement of member organizations (Kaźmierski, 2009).

Wierżyński (2011) states that the functioning of tourism clusters can also be associated with potential negative effects on the region, such as:

- the danger that clusters can, under certain conditions, turn into a cartel that causes consumers to increase prices;
- the danger of the emergence of an economic monoculture in the region related to the excessive concentration of a given sector of the economy, which may contribute to structural problems in the region (including difficulties in reducing the high level of structural unemployment);
- perception of the given region only through one sector, which may discourage other potential investors from other sectors of the economy.

In the Slovak Republic, in the last two decades, the number of cluster organizations in the regions has increased significantly, although their actual performance is limited. The first cluster organizations began to be created in 2008, initiated by a political document – National Strategic Reference Framework of the Slovak Republic 2007 – 2013 (MVaRR SR, 2006). Over the following years, there have been many impulses from private and public sector entities to establish tourism cluster organizations. In the final stage, most of the entities did not fulfill their plans or ended the organization's activities after some time. The second case is represented by

cluster organizations that currently carry out their activities and participate in the intensive development of tourism in the region. There are currently 13 cluster organizations in the tourism industry operating on the territory of the Slovak Republic.

2. RESEARCH DESIGN

The main goal of the presented article is to evaluate the potential of existing clusters and cluster organizations and to identify the real nature, direction and impact of the cluster organization in tourism regions and its real impact on member companies (institutions).

In a direct link to the main goal set out above, the following key research questions have been formulated (RQ):

RQ1: *As an important tool for the effective development of the region, what impact do cluster tourism organizations have on increasing the level of competitiveness of member companies (institutions)?*

RQ2: *What are the advantages and disadvantages of cluster structures for the tourism region and the companies (institutions) located in it?*

RQ3: *What is the current role of local (regional) authorities in the partnership with the tourism cluster in the region?*

The method of sociological questioning in the form of a questionnaire and an individual in-depth interview was carried out with managers of successful cluster organizations who agreed to cooperate and participate in the research, representatives of their membership base, and implementers of cluster policy. This part of the research will touch on all the problems of the cluster organization. It examines cooperation between member companies, research and development institutions, and local government. It will make it possible to identify the activities of the cluster organization, its technological level, innovations in the cluster organization and competitive position as well as its development perspectives. An individual in-depth interview will also focus on the organizational structure of the cluster organization and management and financing methods. Part of the interview will be to obtain information diagnosing the problems of the cluster organization.

The questionnaire contained 21 questions, which have the character of closed, open, and scaled questions, and we can divide them thematically into three areas. The first area of the question concerns the specification of the profile of companies (institutions) that operate in both cluster companies. The second area examines the level of cooperation between member organizations, the activities of cluster members and their position on the issues of advantages and disadvantages arising from their membership in a tourism cluster organization. The third area concerns the regional aspect of cluster activity; including the issue of priorities and expected forms of cluster support by local (regional) authorities, as well as an evaluation of their activities carried out so far.

3. FINDINGS

The questionnaire was addressed to a total of 208 organizations forming the membership base of tourism cluster organizations in Slovakia for the period June – November 2022, when the questionnaire research was carried out. In total, representatives of 192 organizations filled out the questionnaire, which represents 92.30 % of the entire examined sample. Table 2 presents the profile of the respondents who took part in the questionnaire research.

Table 2. Profile of the respondents of the surveyed cluster organizations

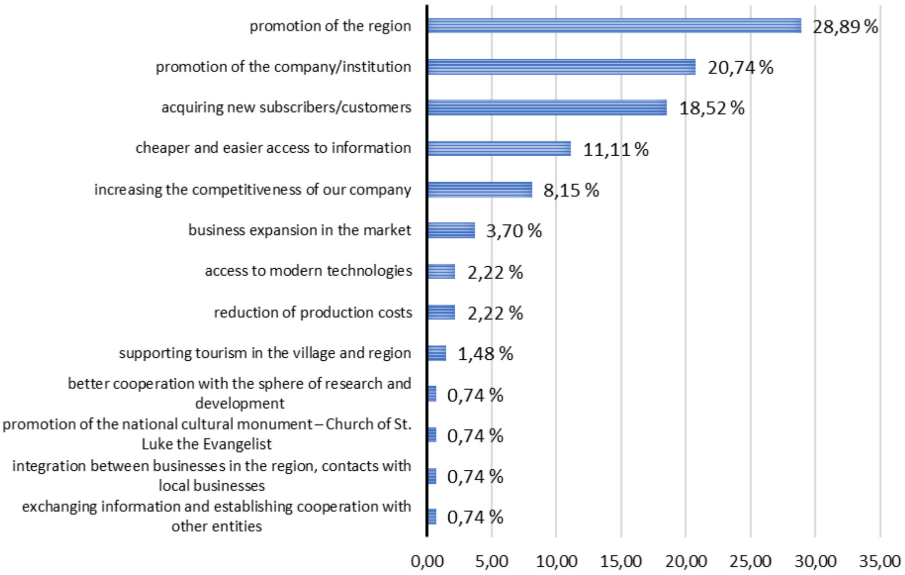
		Number (n = 192)	% of number
tourism facility / other entity	accommodation facility	56	29,17 %
	catering facility	8	4,17 %
	travel agency, tourist information center	4	2,08 %
	cultural and educational facility	4	2,08 %
	sports and recreation facility	12	6,25 %
	city	60	31,25 %
	civil association	12	6,25 %
	tourist resort	12	6,25 %
	PR agency	4	2,08 %
	non-profit organization	4	2,08 %
	publishing house	4	2,08 %
	organization for development	4	2,08 %
	Ltd. company – production and sales	8	4,17 %
company size (institution)	1 – 9 persons	100	52,08 %
	10 – 30 persons	56	29,17 %
	31 – 49 persons	16	8,33 %
	more than 50 persons	20	10,42 %

Source: Own processing, 2022

Studying Table 2, we can observe that almost one-third (31.25 %) of the membership is made up of the public sector. And only subsequently, tourism clusters are represented by accommodation facilities (29.17 %). The analysis of the size of companies (institutions) that are members of cluster organizations shows a relatively high share of micro-enterprises and small enterprises (89.58 % in total) concerning medium-sized enterprises (more than 50 persons). Such a situation may result from the fact that mainly more vulnerable tourism facilities and other entities that have a position and importance in the region and the field of tourism are invited to the clusters. This indicates the fact that tourism clusters in the regions are mainly a support tool for small and medium-sized enterprises at the expense of large enterprises, which ultimately stems from the concept of the cluster itself. The second factor affecting this fact may be a small number or complete absence of large tourism businesses in the region.

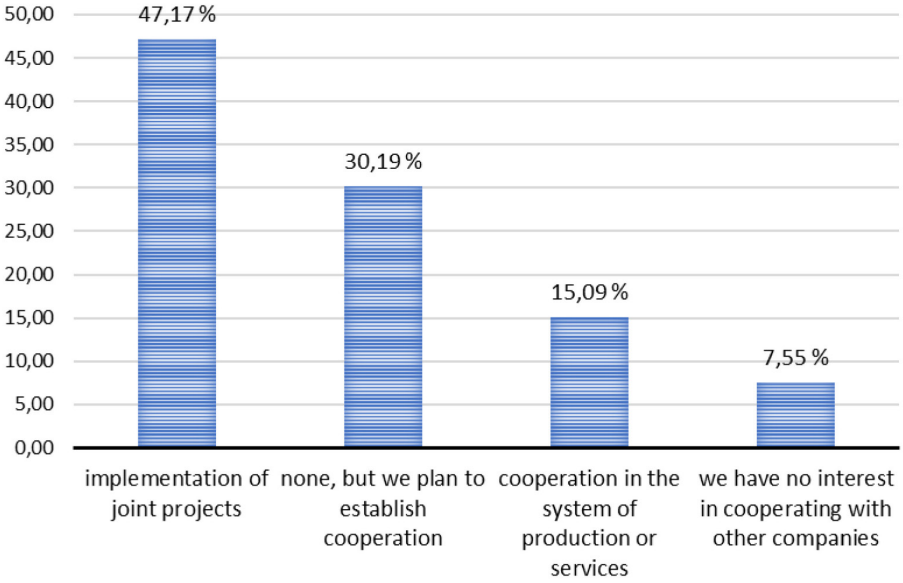
In the subsection Introduction, we presented various benefits resulting from participation in activities in a tourism cluster organization. For that reason, we asked a question to find out the motives of the requested companies (institutions) entering the tourism cluster. In Graph 1, we can see that the most frequent reason – the advantage that respondents indicated was the promotion of the region (28.89 %), promotion of the company/institution (20.74 %) and acquisition of new customers/customers (18.52 %). Surprisingly, companies do not consider access to modern technologies (2.22 %) or cooperation with the R&D sphere (0.74 %) as key advantages of clusters, on which cluster organizations initiate their concept.

The starting point of the idea of creating tourism clusters is a cooperation between member companies. We, therefore, asked the respondents in the question whether their company (institution) established cooperation with other member companies of cluster organizations, while we also asked them to specify the form of this cooperation (Graph 2).



Graph 1. What was the reason for joining the cluster of which you are a member?

Source: Own processing, 2022



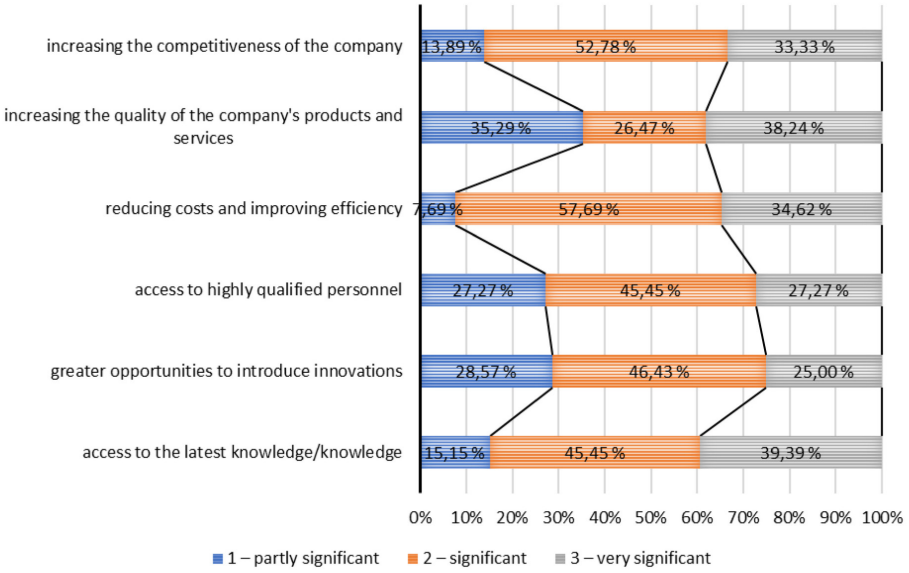
Graph 2. How did your company (institution) cooperate with other member companies of cluster organizations?

Source: Own processing, 2022

More than one-third of all companies (37.74 %) did not cooperate and do not cooperate with other companies (institutions). Of these, 30.19 % of the approached companies plan to establish cooperation with other members of cluster organizations in the future. The most popular form of cooperation is the implementation of joint projects (47.17 %). The remaining 15.09 % is represented by cooperation between companies in the production or service system. These results indicate the necessity of educational activities on the part of coordinators of cluster organizations, which will not only point out the advantages of developing various forms of cooperation but also popularize the idea of clustering.

In the question, we asked the respondents about the advantages of cooperation with other companies (institutions) of cluster organizations. This question is very important from the point of

view of the goals of our research. The distribution of answers to this question is presented in Graph 3, while the respondents could rate each of the listed advantages according to their appropriate importance on a scale from 1 – partly significant to 3 – very significant advantage. The majority of organizations see the advantages of cooperation with other enterprises, as evidenced by their current and potential interest in establishing cooperation, which results from the analysis of the previous question. From the results shown in Graph 3, it can be seen that the surveyed members of the tourism cluster organizations assigned category 2 – significant to the advantages for several options.



Graph 3. What, in your opinion, are the biggest advantages of cooperation with other companies and what importance do you attribute to them?

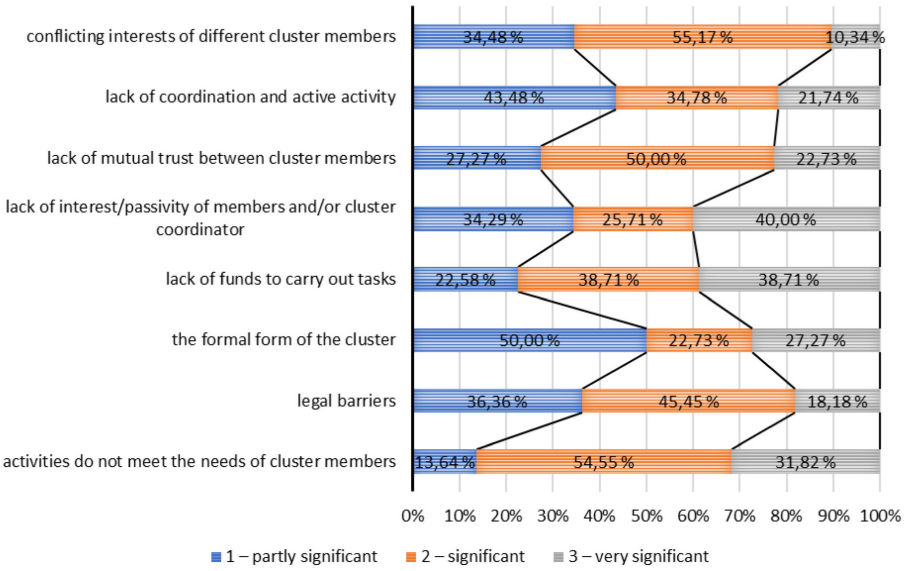
Source: Own processing, 2022

Cluster tourism organizations do not only include establishments with a direct link to the field of tourism. Their activities should also involve other entities operating in the region, such as universities, educational and research establishments, or consultative institutions. Cooperation with them, in the opinion of the respondents to the question, does not take place to a large extent. As many as 68 % of companies did not cooperate with research centers, universities, and research and development institutions. The most frequently declared form of cooperation was lectured by company employees at the university or an invitation to a lecture/workshop by a representative of the university in the company (16 %). Organizations cooperate much less often to improve production technologies or service quality (2 %).

The results of the questionnaire research show a relatively strong assessment of the real influence of the participants of cluster organizations on their activities. The requested members also positively evaluate the previous participation in the cluster, which brought them tangible financial-economic and non-economic results. When evaluating the relations between individual member organizations, the respondents were quite critical; while more than half of the respondents do not agree with the statement about the existence of economic connections in cluster organizations. What is very important, more than half of the respondents declare that their membership in the tourism cluster made it possible to establish beneficial contacts. The positive results of tangible impacts are also reflected in another statement that when joining the cluster, companies (institutions) expected better results.

The most frequent activity within cluster organizations are working meetings of cluster members (30.08 %). From in-depth interviews with the coordinators of the cluster organizations, it follows that these are planned meetings (mainly annual and year-end meetings) that take place at regular intervals – at least twice a year. Other activities with the highest share are joint product/region promotion (25.56 %) and joint business events and fairs (13.53 %). Despite the lower shares in options such as training for cluster members (8.27 %) or a joint investment program (4.51 %), we can claim that the tourism clusters in demand are not only at the stage of organization but are mature structures that significantly influence the support and development of tourism in the territorial area of operation.

Another question was aimed at identifying the main disadvantages of cooperation with other companies (institutions) of cluster organizations. These opinions of members of cluster organizations are equally important. Due to the correct interpretation and evaluation of the research problem, the respondents were again offered the opportunity to evaluate individual disadvantages on a scale from 1 – partly significant to 3 – a very significant disadvantage. The opinions of the questioned members on this issue are shown in Graph 4. In the final result, category 2 – a significant disadvantage, received the most answers and thus the largest share, in the case of several disadvantages.



Graph 4. What, in your opinion, are the most important obstacles and problems of cluster activity that you have encountered and what importance do you attach to them?

Source: Own processing, 2022

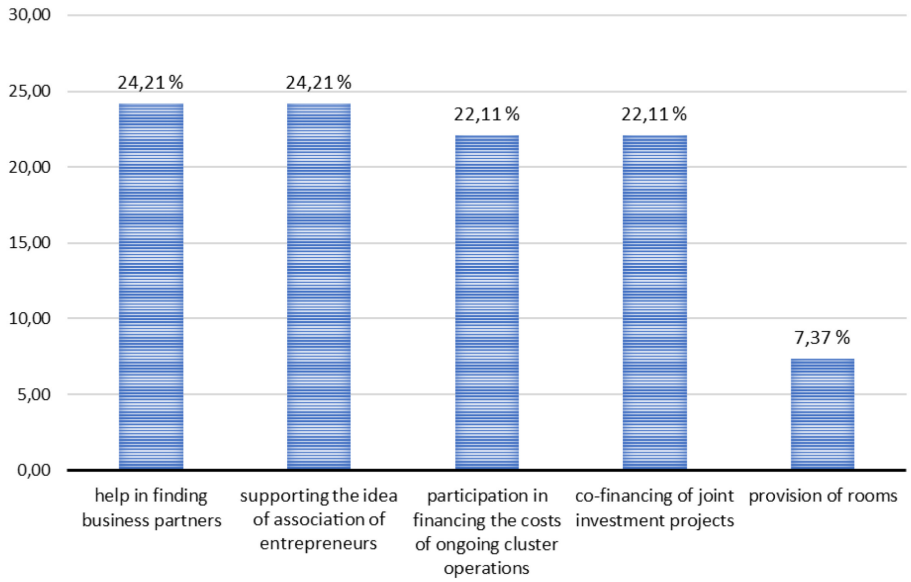
One of the advantages of the activities of cluster organizations is their access to financial resources from European structural and investment funds. For this reason, in our questionnaire research, a question regarding financial aspects in the context of subsidies from the European Union could not be missing. Less than half of the respondents (43.75 %) answered positively to the question of whether the participants of the cluster organizations have used funds from the European Union so far, which appears to be a low percentage considering the wide range of opportunities to obtain funds.

Considering the above-mentioned fact, it is interesting to analyze the distribution of answers to the question that referred to the selection of the most frequent reasons for the unused opportunity

to obtain and draw subsidies from European Union funds. Most respondents said that they did not apply for a subsidy because the procedure for obtaining subsidies from funds is too complicated (35.85 %). The second most frequent answer (18.87 %) is the opinion of members of cluster organizations that they have no chance of obtaining financial resources. The same proportion of respondents (13.21 %) do not have sufficient information about the possibilities of obtaining funds from this source or operating in a sector in which no activity subsidies were/are not provided.

As part of the questionnaire research, we were interested in the opinion of participants of cluster organizations on relations with local (regional) authorities and their ties to cluster activities. Most respondents (41.67 %) evaluate cooperation with local (regional) authorities positively. Based on the results, we can conclude that there is coordination between local (regional) authorities and cluster organizations, although not very intensive – due to the high proportion of neutral responses from the respondents – neither positively nor negatively (31.25 %).

As a logical follow-up to the previous question, we asked the inquiring participants of cluster organizations a question regarding the expected forms of support for tourism clusters from local (regional) authorities. As we can see in Graph 5, all the forms of support we offer are the dominant expectations of the requested member companies (institutions) of cluster organizations. Respondents had the option (in addition to our predefined options) to indicate other forms of support from local (regional) authorities. Within this answer, they mentioned the following forms of support – better and clear establishment of common goals in the field of tourism development in the region and coordination and control of correct procedures for achieving these goals; involvement of active citizens in the presentation of tourism in the region.



Graph 5. What should be the forms of support for groups of local (regional) authorities?
Source: Own processing, 2022

The question, which ends not only the analysis of problems in local (regional) aspects but also our questionnaire survey, concerned the evaluation of current activities in the area of tourism cluster support. The distribution of answers indicates that almost one-half of the respondents (41.67 %) consider the actions of local (regional) authorities to be insufficient. While one-third of them (33.33 %) evaluate the support as sufficient.

4. FUTURE RESEARCH DIRECTIONS

Our detailed analysis of the collected information from the questionnaire survey allowed us to formulate summary conclusions regarding the true nature, direction, and impact of cluster organizations in tourism regions.

Part of the evaluation of the empirical research presented in the article are individual in-depth interviews with the coordinators of the addressed cluster organizations. We can summarize the shortcomings of cluster organizations in the following points:

- Reluctance (inability) to cooperate is undoubtedly an important factor that currently hinders the process of developing the structures of cluster organizations. From the interviews with the coordinators, it appears that there is mutual respect and esteem among the members of the cluster organizations. They can communicate with each other, be helpful to each other and participate together in projects initiated by the tourism cluster. All this forms an ideal basis for good cooperation between the members themselves. In this case, the first step towards creating a partnership between the members of the cluster organizations is important, while this impulse should be directed by the tourism cluster coordinators.
  The survey also shows that in both regions the idea of cooperation between research centers, universities, research and development institutions and members of cluster organizations has not yet developed. The effects of this cooperation can be different - depending on the expectations of both parties involved. However, it is necessary to keep in mind that the sphere of research and development is a potentially strong and desirable partner in cluster organizations. It is a very positive fact that the clusters as a whole are aware of the importance of this cooperation and have developed sufficient cooperation with universities operating in their vicinity during their operation.
- Research shows that participants in cluster organizations lack knowledge about the possibilities of obtaining subsidies from European Union funds for the implementation of activities.
- The results indicated insufficient coordination and cooperation of local (regional) authorities with member companies (institutions), which represents a significant obstacle in the activity and development of tourism cluster organizations. The reason is the low interest of the local self-government bodies towards the members, the lack of initiatives on their part, or their lengthy solution or the fact that tourism is not a priority in their strategic documents. The coordinators' opinions in this area are unequivocal. Local (regional) authorities should be helpful in effectively solving various problems and be actively involved in the activities of cluster organizations. The coordinators evaluated the level of cooperation between the clusters and the local government, in contrast to their members, positively.

In addition to the summary conclusions formulated above, the necessity of carrying out information and promotional activities by tourism clusters is important. The survey indicated that not all member companies (institutions) have information about the activities of the cluster in the region - while in-depth interviews show that there are a large number of activities initiated by clusters in both regions. This ignorance of members casts a bad light on the tourism cluster and makes members uneasy about the idea of staying in this organization. The research results also confirm the very important idea that tourism clusters are a factor in increasing the competitiveness of this area concerning other regions of the country.

The key direction of research for the coming years in the issue of tourism clusters is to popularize this concept and devote to the reliable mapping of clusters in regions (those existing ones

that continue to require constant attention, as well as potential tourism clusters that may be created in the coming years).

It is equally necessary to focus on the application of the cluster policy. This complex step requires the development of a detailed study that takes into account the level of cluster development, the prospects for the development of the industries and regions in which the clusters operate, and the strategic goals and efficiency of the clusters. A properly laid foundation of the cluster policy model represents their effective management in the regions and brings the benefits associated with them.

5. CONCLUSION

The main goal of the presented article was to evaluate the potential of existing clusters and cluster organizations and to identify the real nature, direction and impact of the cluster organization in tourism regions and its real impact on member companies (institutions).

As a basis for achieving the set goal of the presented article, we have set research questions (RQ) that are the subject of verification of the results of the research we have conducted.

RQ1: *As an important tool for the effective development of the region, what impact do cluster tourism organizations have on increasing the level of competitiveness of member companies (institutions)?*

The answer to this question is based on theoretical evidence and empirical evidence presented in the subsection Findings.

Within the framework of literary research, the important role of clusters (as a tool for effective development of the region) is described in their works by authors dealing with cluster issues, such as Porter (2008), Nordin (2003), or Pichierri (2002). Their opinions prove that the presence of the cluster in the region has positive effects, both for the entire region and for individual member companies (institutions). According to Porter (2008), the existence and development of clusters is considered an important tool for increasing the competitiveness not only of member companies (institutions) but also of the regions in which they operate. Authors Nauwelaers et al. (1995) claim that the tourism cluster contributes to the growth of the innovativeness of enterprises and facilitates the development and marketing of new products and services, thereby strengthening the attractiveness of the entire region. The analysis of the opinions presented shows that tourism clusters also have a positive effect on the local (regional) economy, job creation and have an impact on the local community. This research question was also verified from an empirical point of view, through a survey among representatives of successful tourism cluster organizations. The results of the research show that members of cluster organizations not only know the benefits resulting from their membership but also benefit from them.

RQ2: *What are the advantages and disadvantages of cluster structures for the tourism region and the companies (institutions) located in it?*

The activity of tourism cluster organizations brings its advantages and disadvantages for all its participants. Our survey identified the most common advantages and disadvantages of clustering companies and evaluated their degree of significance for individual members of the cluster

organizations addressed. The results show that member companies and institutions attach equal importance to the advantages, but also to the disadvantages arising from membership in the tourism cluster. Graph 3 and Graph 4 show us the results where category 2 – significant advantage/disadvantage – received the most answers and thus the largest share, in the case of several advantages and disadvantages.

The most significant benefits resulting from participation in the cluster are access to the latest knowledge/knowledge, an increase in the quality of the company's products and services, a reduction in costs and an improvement in efficiency, and an increase in the company's competitiveness. The conducted research also pointed out the key disadvantages of cluster activities. Among the most significant is the lack of interest/passivity of the members and/or the cluster coordinator, lack of funds to carry out the tasks, activities not meeting the needs of the cluster members and lack of mutual trust between the cluster members. Part of this research question is also the issue of financing cluster activities from EU subsidies, which we addressed separately in the survey. In this case, the following paradox occurs - Based on the answers, we know that the members are aware of the advantage of being able to draw funds from the EU. In fact, it is one of the most common reasons why members joined a cluster organization. On the other hand, research shows that the participants of cluster organizations lack knowledge about the possibilities of obtaining subsidies from EU funds for the implementation of their activities.

RQ3: *What is the current role of local (regional) authorities in the partnership with the tourism cluster in the region?*

The important role of public administration at the local (regional) level was confirmed by extensive reflections on the issue of cluster policy in practice. By studying the evidence, we found that there is no coordinated policy in the area of clusters (in the conditions of Slovakia). The answer to the stated research question is based on empirical research carried out with participants of cluster organizations, part of which is also represented by representatives of local governments (31.25 % of the surveyed respondents), as well as direct interviews with cluster coordinators. The results show that the assessment of cooperation between tourism clusters and local (regional) authorities is positive (41.67 %). However, due to the high value of the neutral answer – neither positive nor negative (31.25 %), we can assume that there is no very intensive cooperation. This assumption is also supported by the distribution of respondents' answers, where up to 41.67 % of respondents consider the activities of local (regional) authorities in the area of cluster support to be insufficient.

According to the coordinators of the cluster organizations, the mentioned results stem primarily from discrepancies between the expectations of the participants of the cluster organizations and their lack of knowledge about the possibilities of local (regional) authorities. Negative reasons given by members of cluster organizations are, for example, the low interest of local self-government bodies towards members, lack of initiatives on their part, or their lengthy solution or the fact that tourism is not a priority in their strategic documents. The tourism cluster coordinators, who are satisfied with the cooperation of local (regional) authorities so far, have the opposite opinion.

ACKNOWLEDGMENT

This research was supported by the University of Economics in Bratislava [KEGA no. 034EU-4/2020 entitled "Content and technical innovation approaches to teaching regional tourism"].

References

Jackson, J., & Murphy, P. (2002). Tourism Destinations as Clusters: Analytical Experiences from the New World. *Tourism and Hospitality Research, 4(1)*, 36-52. https://doi.org/10.1177/146735840200400104

Kaźmierski, J. (2009). *Logistyka a rozwój regionu*. Łódź: Wydawnictwo Uniwersytetu Łódzkiego.

MVaRR SR. (2006). Národný strategický referenčný rámec Slovenskej republiky 2007 – 2013 [online]. Retrieved from http://rraz.sk/files/files/Narodny_strategicky_referencny_ramec.pdf

Nauwelaers, C., Reid, A., Muller, E., Gundrum, U., & Koschatzky, K. (1995). *Innovative Regions? A Comparative Review of Methods of Evaluating Regional Innovation Potential.* Brussels: European Commission.

Nordin, S. (2003). Tourism Clustering & Innovation - Paths to Economic Growth & Development. Östersund: Mid-Sweden University. Retrieved from https://rmportal.net/library/content/nric/2507.pdf/at_download/file

Pichierri, A. (2002). Concertation and local development. *International Journal of Urban and Regional Research, 26(4)*, 689-706. https://doi.org/10.1111/1468-2427.00411

Porter, M. E. (1998). Clusters and the new economics of competition. *Harvard Business Review, 76*(6), 77-90.
Retrieved from https://hbr.org/1998/11/clusters-and-the-new-economics-of-competition

Porter, M. E. (2008). *On Competition: Updated and Expanded Edition.* Boston: Harvard Business Review Press.

Wierżyński, W. (2011). Klastering w branży turystycznej. Retrieved from www.pi.gov.pl

DOI: https://doi.org/10.31410/ITEMA.S.P.2022.21

Digitalization as an Emergent Process: Evidence from Italian Museums

Enrico Cori[1]
Costina Andreea Calota[2]

Received: Novembar 20, 2022
Accepted: January 19, 2023
Published: June 12, 2023

Keywords:
Digital skills;
Work organization;
Non-technical employees;
Employee-driven innovation

Abstract: *This paper aims to deepen some characteristics of the digitalization process in Italian museums. In particular, it aims at investigating the role of non-technical employees in such a process. Our research is qualitative and explorative. Three Italian museums, selected through convenient sampling, have been investigated through a longitudinal approach. The study points out the relevance of participatory, emergent, and mainly informal processes aimed at developing the museum's digital skills. The findings shed new light on the role of non-technical employees in fostering digitalization, thanks to autonomously developed learning processes. These are combined with the willingness to enhance employees' skills and ideas by museum managers. This approach can be viewed as an alternative or supplement to the development of digital skills through the inclusion of specialized roles (e.g.: digital manager). Some significant theoretical and managerial implications are highlighted, as well as some future lines of research.*

1. INTRODUCTION

For some years now, Italian museums have been facing the challenge of digitalization. The limitations and constraints imposed by the COVID-19 pandemic have offered interesting ideas for starting or redirecting the choices of adoption and use of digital technologies and tools. In particular, the solutions tested during the lockdown periods have contributed to the debate on the drivers of digitalization and the most effective ways to align market strategies, technologies in use, and digital skills.

Literature traditionally emphasizes a centralized way to develop digitalization paths and digital skills within museums, as well as the introduction of dedicated roles or units that are in charge of developing and enhancing the process of digitalization. Alternatively, the literature focuses on the role of the audience as a relevant organizational actor in the development of the technological paths of museums. The role played by employees has remained relegated to the margins and only in recent years it begins to be considered seriously.

We aim at shedding light on the role of non-technical employees in the digitalization processes of museums. We are also interested in understanding to what extent employee-driven digital innovation can shift the configuration of the drivers of digitalization in museums. So far, institutional pressures have emerged as the main driver.

The paper is structured as follows: in the next section, the theoretical background is presented; in the third section, we outline the research methodology and sampling criteria; in the fourth section, we illustrate and analyze evidence collected through the interviews and the documental analysis; in the fifth paragraph, we underline the limits of the research and propose some possible research development; finally in the sixth section, we draw some conclusions, and highlight theoretical and practical implications of this study.

[1] Università Politecnica delle Marche, Department of Management, piazzale Martelli 8, 60121 Ancona, Italy
[2] Università di Pisa, Department of Economics and Management, via Ridolfi 10, 56124 Pisa, Italy

2. THEORETICAL BACKGROUND

The theoretical foundations of our research lay in the following streams of literature: a) processes of *digitalization* and b) employee-driven *innovation*. Both these streams have been largely developed especially in the last decade, but studies in the context of museums and cultural heritage organizations are still quite scarce.

As regards processes of digitalization, past research points out an almost complete lack of debate about what drives museums to adopt digital technologies. In the few contributions that dwell on this issue, the significant role of institutional pressures and the resulting processes of mimetic and/or normative isomorphism emerges (Cori & Fraticelli, 2021; Rasmussen, 2019), especially in terms of the choice to introduce particular devices to support onsite and online fruition.

In the last two years, the challenges that museums, as well as other places of culture, have been called upon to face during the COVID-19 pandemic, have determined a greater interest in the study of digitalization processes. Most of these studies have focused on the actions taken by museums' managers to ensure the possibility of "visiting" collections even during periods of forced closure. Overall, however, the issues concerning the drivers of digitalization, as well as the search for alignment between audience strategies, technological choices, and digital skills, remain largely unexplored.

As regards the second stream of literature, the issue of employee-driven innovation processes (Aasen et al., 2012; Høyrup, 2010; Kesting & Ulhøi, 2010) is showing a renewed interest in the processes of digital transformation involving non-specialist roles (Cetindamar et al., 2022; Krejci et al., 2022; Mueller & Renken, 2017; Neyer et al., 2009; Osmundsen et al., 2018). Opland et al. (2022), in particular, coined the concept of "employee-driven digital innovation" and propose a conceptual model that incorporates three variables capable of explaining digital innovation behavior by employees: internal organizational environment, external competitive environment, and digital tools for supporting the innovation process. They also argue that "more knowledge is still needed about those organizational elements that can foster employee-led digital innovation and those that can hinder it" (2022, p. 264). Yet, research on employee-driven digital innovation in the field of cultural institutions seems to still be in an embryonic state, except for a few studies. The latter stress the role of non-technical employees in the digitalization processes (Cori & Fraticelli, 2021), as well as the relevance of digital literacy among museum practitioners (Huang et al., 2022).

In light of the gaps we identified in the literature, this study aims at enriching the current knowledge on the "employee-driven" approaches to digital innovation. It also aims to get more knowledge on the organizational conditions that stimulate the contribution of non-technical employees to digital innovation.

3. METHOD AND SAMPLE

We addressed the complexity of the phenomena under investigation through qualitative and explorative research. This is characterized by a longitudinal approach, "in which phenomena are observed for a certain period and data are recorded at successive points" (Corbetta, 2003, p. 31). Successive interviews are carried out in which the questionnaire is modified each time, thus allowing permanent monitoring of phenomena that are investigated (Corbetta, 2003, p. 148).

Considering the goals that are set through this study, we believed the multi-case study is the most suitable method; indeed, through a multi-case approach, it is possible to compare different situations to provide representations of reality and the dynamics at work, and then compare them with the literature of reference (Eisenhardt, 1989; Eisenhardt & Graebner, 2007; Yin, 2009).

The following museums have been selected through a "convenient sampling" (Mayan, 2016, p, 62), based on the availability to be interviewed: Balì Museum (Colli al Metauro, Pesaro and Urbino), Museums at Castello Sforzesco (Milan), and Museum at La Venaria Reale (Turin). The main features of the sample are summarized in Table 1. The sample has been built according to the following criteria: (a) a combination of historical and artistic importance of the site and relevance of the collections housed in it and (b) variety of the sample, according to the logic of the multi-case method.

The choice to select a sample consisting of art collections hosted in sites, whose historical and artistic value is notable, is linked to the belief that this combination extolls the opportunities inherent in the digital technologies for on-site fruition. As regards the variety of the sample, this was obtained by considering the following characteristics: ownership, year of foundation, the annual number of visitors, and characteristics of the collections hosted.

Selected museums have been investigated through semi-structured interviews and document analysis. Semi-structured telephone interviews were conducted with directors and curators of these museums between September 2018 and October 2022[3]. A total of three interviews for each museum were conducted: before the pandemic, as the selected museums have already started the digitalization process; following the definitive reopening of places of culture; finally, the third interview was administered about a year after the limitations regarding the access of audience were overcome. Each telephone interview, lasting between 30 and 45 minutes, has been recorded and faithfully transcribed; then, the text of the interview has been submitted to the respondents for a check.

Document analysis was performed on the museum's website and was aimed at deepening our knowledge about the main features of the museum offer, the types of services offered, and the methods of communication and interaction with the relevant public.

During the first interview three main questions had been posed, concerning: type of market strategy pursued by the museum; type of digital technologies/devices in use and reasons that have pushed museums to their adoption; range of digital skills held by managers or employees in the museum, or externally accessible.

The second interview was focused on the one side on the main solutions and tools/channels used by the museums during the period of closure to the public; on the other side, on the digitalization strategy undertaken by the museums, the roles involved, the skills required, as well as any inter-organizational relationship activated to access knowledge and skills needed to support the digitalization processes.

Lastly, the third interview was aimed at knowing if digital solutions proposed by non-technical employees during the periods of forced closure of museums have been "institutionalized" after the reopening; whether the significance of employee-driven innovations has led the museum

[3] Specifically, the following roles were interviewed: Francesca Cavallotti (Scientific Director of Balì Museum, Colli al Metauro), Fiorella Mattio (Curator of Museums at Castello Sforzesco, Milan) and Matteo Fagiano (Social Media Manager of Museum at La Venaria Reale, Turin).

management to change the digital skills development strategy and to encourage emerging digitalization processes through the enhancement of skills and ideas of non-technical employees.

Table 1. Main features of the sample

Museum	*Place*	*Year of foundation*	*Ownership*	*Visitors (2019)*	*Type of heritage*
Balì Museum	Colli al Metauro (PU)	2004	Private	50.000	Science museum
Museums at Castello Sforzesco	Milano	Late 1800s	Public (municipality)	587.000	Archaeological finds, wooden sculptures, ancient art, decoarts, musical instruments. Renaissance sculptures and paintings
La Venaria Reale	Torino	2008	Public-private network	837.000	Paintings and sculptures (15th to 17th century). Thematic exhibitions

Source: Our elaboration

4. FINDINGS

In this section, we summarize the main findings that emerged in the first steps of the research. We then focus on the content of the last two interviews, conducted in the post-pandemic period.

Before the onset of the pandemic, the three museums under investigation had already started a digitalization path, whose main driver seemed to be institutional pressures, as suggested by ongoing processes of mimetic and normative isomorphism (Cori & Fraticelli, 2021).

At the same time, however, the respective digitalization processes showed a certain degree of variety, which can be interpreted as the result on the one hand of different awareness on the part of directors and curators, and, on the other hand, of the extent to which museums can internally develop, acquire, or externally access digital skills.

How museums have faced periods of forced closure leads us to believe that, to date, the role of institutional pressures as drivers of digitalization processes is weaker than in the past, to the advantage of internal drives, which in turn seem linked to organizational choices.

Overall, the three museums faced the health emergency by providing innovative solutions, to make it possible the fruition of art collections by people forced to stay at home.

During the closing period, the museums under study significantly increased their presence on social networks, offering various content such as videos, interviews, tutorials and workshops, as well as solutions for younger people such as quizzes, interactive games, and challenges with prizes. In addition, Virtual Tours or interactive guided tours were provided using the digital content already available, to anticipate the visit on-site during the period when it was not possible while still maintaining its educational role. In addition, all museums interviewed turned their attention to educational services, through the organization of distance learning events, or by setting up a sort of "online campus" for children. In general, these solutions have made it possible not only to replace the visit inside the museum but also to reach different targets, to entertain users in a period of difficulty and crisis, to show art-works not exposed to the public, to involve staff that during the ordinary activity does not come into contact with visitors.

Museums allowed or strengthened the online use of their collection also with the contribution of non-technical employees, that leveraged autonomously developed skills and their creativity. The availability of non-technical employees and the willingness on the part of management to value their contribution have sometimes produced original solutions that were particularly appreciated by the audience.

The following example bears witness to the creative effort made by the employees normally in contact with the public:

"The custodians (...) put their personal skills to good use, providing us with some very funny videos in which each of them told what his favorite work was. (...) They even invented an 8-episode format called "Sforzesco pazzesco" with videos shot and edited by them" (Fiorella Mattio, Curator at Museums at Castello Sforzesco).

The following excerpt, while not making explicit reference to any specific solution, underlines the relevance of a participatory approach, where decisions relating to the introduction of digital technologies involve many organizational levels.

"Overall, the employees have gained the necessary skills not only to make the best use of the resources currently in use but also to suggest some possible development hypotheses to be presented to those who will then make the decisions. (...) Proposals (for the introduction of new technologies) mature at various levels internally, by those directly involved in the process of providing the services; everyone can have a proposal linked to digital innovation; (...) in a widespread way it is possible to identify elements of innovation" (interview to Matteo Fagiano, Social Media Manager at La Venaria Reale)

Finally, the last two excerpts underline the importance attributed to internal digital skills development paths; this is a choice that can be regarded as preparatory to an "employee-driven innovation" approach.

The objective is to develop resources internally (digital skills); it is preferable to involve employees in a training course rather than relying on an external consultant, because the resources thus developed remain available to the museum" (interview to Francesca Cavallotti, Scientific Director at Balì Museum)

A continuous learning process can be observed, carried out in self-study mode (...) but in some way connected to the digitalization path of the museum (Francesca Cavallotti, Scientific Director at Balì Museum)

In all three cases examined the management's care towards a participatory and widespread approach to digital transformation represents a constant throughout the observation period, albeit with different nuances. The outcomes of this process are observable above all in correspondence with the forced closures of museums due to the pandemic and have not always been "institutionalized" after the reopening. However, the involvement of employees is not occasional but finds an antecedent in the choices relating to the development of digital skills and, more generally, in the organizational logic that governs the process of digitalization.

The situations observed lead us to believe that the effectiveness of digitalization processes can be fostered by the joint and integrated use of a centralized and formalized approach on the one side, and an emergent, participatory and informal approach on the other side. In the first case, digital skills are mainly held by technical/specialist roles, and the digitalization process is formalized in guidelines, according to a top-down method. On the contrary, in the second case, the digitalization

process makes use of skills that are widespread in the organization and is supported by employee-driven innovation, which often is incremental.

In this perspective, digitalization tends to become a widespread process that, while being guided by managerial roles, bases its ability to achieve the desired results on the quality of the interactions between non-technical employees, IT professionals, and managers. Equally important in this approach are the interactions between front-line employees and visitors, as they allow the museum to pursue a better alignment with the audience's needs and expectations (Schwob et al., 2022).

5. LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

In addition to the limitations generally associated with multi-case studies, primarily related to the non-generalizability of the results, our research suffers from some specific limitations.

The first limitation concerns the sample size. Limitations related to the time of the researchers and the availability of the key informants suggested studying only three different museums. However, we are aware that a saturation situation has not yet been reached, in which it is difficult to think that new, significant evidence can emerge (Mayan, 2016; Morse, 2000). For this reason, a line of research development can certainly be identified in the expansion of the sample.

The temporal extension of the study represents in our view a third limitation. The decision to move towards a longitudinal survey has allowed us to collect richer and more significant insights. However, the slow pace of digitalization processes within museums, despite the acceleration experienced in correspondence with the pandemic, would require an even longer observation period. A future line of research can therefore be identified in the provision of further moments of observation, with the aim of including the next steps of the digitalization process.

The fact that the field analysis was carried out through repeated interviews with a single key informant represents a further limitation of the present study. Although our choice was aimed at identifying the manager who has maintained an overall vision of the digitalization process over the years, we believe that richer insights can only be obtained by involving the employees themselves. A further line of development of the research can therefore be seen in the integration of the data collected so far with interviews with those employees who have contributed more than others in terms of ideas and proposed solutions.

Finally, a fourth limitation of the research concerns the difficulty to assess the results of employee-driven digital innovation. We believe that such limitation could only partially be overcome by extending the observation time horizon. However, this issue is currently regarded as one of the main research gaps in the literature about employee-driven innovation (Opland et al., 2022).

Beyond the research developments suggested by the current limitations, a natural line of development can be identified in the analysis of which organizational elements can foster employee-driven digital innovation and which other can impede it, that is in the ways in which organizations facilitate innovative practices among the so-called "ordinary employees". A more in-depth study of the organizational characteristics supporting widespread processes of digital innovation is also hoped for by scholars who first addressed this issue (Ciriello et al., 2017; Høyrup, 2010; Krejci et al., 2022; Opland et al., 2022; Voxted, 2018).

6. CONCLUSION

This study aimed at investigating the role of non-technical employees in the digitalization processes through a longitudinal analysis conducted on three Italian museums. The results confirm that non-technical employees play a significant role in the development of digital solutions, thanks to skills often developed on personal initiative and innovative ideas that are recognized and valued by managers.

Furthermore, the analysis provides some initial evidence relating to the existence of organizational conditions to support widespread digital innovation processes and the "employee-driven" approach. Among these: the awareness that innovation is a widespread phenomenon and not circumscribed to particular structures and roles; the emphasis on knowledge management/knowledge sharing; finally, values-oriented personnel selection criteria (e.g.: the museum's employees share with customers their passion for art).

It can also be assumed that non-technical employees contribute to making digitalization processes more effective thanks to their ability to tune in with the users and perceive their needs and expectations.

With regard to the drivers of the digitalization process, our research offers support to the idea they are multiple and different: on the one hand, institutional pressures, so far considered prevalent; on the other, internal drives, which seem to be strengthened by the contribution of non-technical employees and by the integration of this contribution with that of IT specialists.

We believe that our research can contribute to a clear acknowledgment of issues concerning the digitalization process by managers of Italian museums.

The results of the study have some significant theoretical and managerial implications. On the theoretical level, the study enriches the current knowledge regarding the drivers of digitalization processes in museums, in particular by emphasizing the role of organizational choices in determining their intensity and direction. It also contributes to extending research on employee-driven innovation, insofar scarcely investigated in the context of cultural heritage. Finally, it proposes a match between the literature on employee-driven innovation with that on digital skills and digital literacy.

On the managerial level, the study can make museums' managers and curators aware of what facilitates an effective alignment between the needs of the audience and the adoption of digital technologies. In particular, managers can consider more carefully the use of widespread digital skills, compared to those held by particular roles or accessible externally. They can also recognize the value of innovative skills and ideas from non-IT employees and the opportunity to integrate them with the skills held by specialist roles.

References

Aasen, T. M., Amundsen, O., Gressgård, L. J., & Hansen, K. (2012). In Search of Best Practices for Employee-Driven Innovation: Experiences from Norwegian Work Life. *Employee-Driven Innovation*, 57-74. https://doi.org/10.1057/9781137014764_3

Cetindamar, D., Abedin, B., & Shirahada, K. (2022). The Role of Employees in Digital Transformation: A Preliminary Study on How Employees' Digital Literacy Impacts Use of Digital Technologies. *IEEE Transactions on Engineering Management*, 1-12. https://doi.org/10.1109/tem.2021.3087724

Ciriello, R., Richter, A., & Schwabe, G. (2017). From process to practice: towards a practice-based model of digital innovation. *38th International Conference on Information Systems*, South Korea.

Corbetta, P. (2003). Social Research: Theory, Methods and Techniques. https://doi.org/10.4135/9781849209922

Cori, E., & Fraticelli, F. (2021). Aligning Market Strategies, Digital Technologies, and Skills: Evidence from Italian Museums. In: Demartini, P., Marchegiani, L., Marchiori, M., Schiuma, G. (Eds.) *Cultural Initiatives for Sustainable Development. Contributions to Management Science*. Springer, Cham., 23-44. https://doi.org/10.1007/978-3-030-65687-4_2

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *Academy of Management Review, 14(4)*, 532-550. https://doi.org/10.5465/amr.1989.4308385

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory Building From Cases: Opportunities And Challenges. *Academy of Management Journal*, 50(1), 25-32. https://doi.org/10.5465/amj.2007.24160888

Høyrup, S. (2010). Employee-driven innovation and workplace learning: Basic concepts, approaches and themes. *Transfer*, 16(2), 143–154. https://doi.org/10.1177/1024258910364102

Huang, P. C., Chen, L. Y., Li, I. C., & Shih, C. H. (2022). The Impact Of Museum Practitioners' information Literacy on the Effectiveness of Exhibition Digitization in the Post-Pandemic Era. *International Journal of Organizational Innovation*, *14*(4), 130-149.

Kesting, P., & Ulhøi, J. P. (2010). Employee-driven innovation: Extending the license to foster innovation. *Management Decision*, 48(1), 65–84. https://doi.org/10.1108/00251741011014463

Krejci, D., Küng, L., & Missonier, S. (2022). A Case Study of Enterprise-wide Digital Innovation: Involving Non-IT Employees. *30th European Conference on Information Systems (ECIS 2022)*, Timisoara, Romania.

Mayan, M. J. (2016). *Essentials of qualitative inquiry*, London: Routledge. https://doi.org/10.4324/9781315429250

Morse, J. M. (2000). Determining sample size. *Qualitative health research*, 10(1), 3-5. https://doi.org/10.1177/104973200129118183

Mueller, B., & Renken, U. (2017). Helping employees to be digital transformers–the Olympus Connect case. *ICIS 2017 Proceedings*, 1–19.

Neyer, A. K., Bullinger, A. C., & Moeslein, K. M. (2009). Integrating inside and outside innovators: a sociotechnical systems perspective. *R&D Management*, *39(4)*, 410-419. https://doi.org/10.1111/j.1467-9310.2009.00566.x

Opland, L. E., Pappas, I. O., Engesmo, J., & Jaccheri, L. (2022). Employee-driven digital innovation: A systematic review and a research agenda. *Journal of Business Research*, *143*, 255-271. https://doi.org/10.1016/j.jbusres.2022.01.038

Osmundsen, K., Iden, J., & Bygstad, B. (2018). Digital Transformation: Drivers, Success Factors, and Implications. *Mediterranean Conference on Information Systems (MCIS 2018) Proceedings*, 37.

Rasmussen, C. H. (2019). Is digitalization the only driver of convergence? Theorizing relations between libraries, archives, and museums. *Journal of Documentation*, *75*(6), 1258-1273. https://doi.org/10.1108/JD-02-2019-0025

Schwob, A., de Kervenoael, R., Kirova, V., & Sim, Y. S. (2022). Understanding and harnessing the potential of front-line employees' self-governance in technologised museums and theme parks: insights from a qualitative study. Museum Management and Curatorship, 1-24. https://doi.org/10.1080/09647775.2022.2111334

Voxted, S. (2018). Conditions of implementation of employee-driven innovation. *International Journal of Entrepreneurship and Innovation Management*, *22(4)*, 471–488. https://doi.org/10.1504/IJEIM.2018.092974

Yin, R. K. (2009). *Case Study Research. Design and Methods*, 2nd Edition, Thousand Oaks, CA: Sage Publications. https://doi.org/10.33524/cjar.v14i1.73

6th International Scientific Conference ITEMA 2022 – Selected Papers
DOI: https://doi.org/10.31410/ITEMA.S.P.2022.31

Testing the Causal Relationship between Central and Eastern European Capital Markets: Evidence in Periods of Uncertainty in the Global Economy

Paulo Alexandre[1]
Rui Dias[2]
Nicole Horta[3]
Paula Heliodoro[4]
Mariana Chambino[5]

Received: October 11, 2022
Accepted: January 15, 2023
Published: June 12, 2023

Keywords:
2020 and 2022 Events;
Capital markets movements;
Portfolio diversification

Abstract: *The purpose of this study is to examine the movements of capital markets in Austria (ATX), Serbia (BELEX 15), Hungary (BUX), Croatia (CROBEX), Russia (IMOEX), the Czech Republic (PRAGUE PX), Slovenia (SBI TOP), and Poland (WIG) from September 18th, 2017 to September 15th, 2022. To obtain more robust results, we divide the sample into two sub-periods: the Quiet period, from September 18th, 2017, to December 31st, 2019; and the Stress Period, from January 1st, 2020, to September 15th, 2022, marked by the global pandemic (COVID-19), the oil price war in 2020, and the Russian invasion in 2022. The time series exhibit non-normal distributions due to the presence of fat tails, a characteristic that is common in periods of extreme volatility. The results of the VAR Granger Causality/Block Exogeneity Wald Tests model verified the existence of 16 pairs of markets showing co-movements between them during the quiet subperiod. The market that causes more co-movements is the Austrian stock market (ATX), while the Russian stock index (IMOEX) does not cause shocks in the markets under analysis. In the Stress subperiod, we verify the presence of 42 pairs of markets causing (each other in the Grangerian sense. The stock indexes ATX, BUX, CROBEX, and PRAGUE PX show 6 causal relations in 7 possible, while the capital markets of Russia (IMOEX) and Poland are the ones that cause less (4 in 7 possible). In conclusion, we verify that the events that occurred in 2020 and 2022 have significantly increased the movements in these regional markets. Such findings could put into question the implementation of efficient portfolio diversification strategies and eventually some gains above the market average due to arbitrage levels. The authors consider this evidence to be relevant for supervisors, regulators, and investors operating in these regional markets.*

1. INTRODUCTION

The economic literature related to capital markets has paid much attention to identifying the mechanisms through which an exogenous shock propagates between two capital markets. Thus, many studies focus on detecting the interactions between international financial markets, while identifying determinants of contagion and the phenomenon of co-movement between capital markets (Dias, da Silva, et al., 2019; Dias, Heliodoro, et al., 2019).

Several studies have examined the effect of exogenous shocks on a financial market to understand the synchronizations between markets, as well as the diversification of portfolios in

[1] School of Business and Administration, Polytechnic Institute of Setúbal, Portugal
[2] School of Business and Administration, Polytechnic Institute of Setúbal, Portugal; Center for Studies and Advanced Training in Management and Economics (CEFAGE), University of Évora, Portugal
[3] School of Business and Administration, Polytechnic Institute of Setúbal, Portugal
[4] School of Business and Administration, Polytechnic Institute of Setúbal, Portugal
[5] School of Business and Administration, Polytechnic Institute of Setúbal, Portugal

international markets. In general, investors, risk managers, national regulators, and international financial institutions have shown interest in understanding how the phenomenon of contagion and interdependence develops due to the adverse implications of exogenous shocks on national financial markets (Dias et al., 2020; Dias et al., 2021; Pardal et al., 2020; Silva et al., 2020).

This study aims to investigate the shocks and causal relationships between the capital markets of Austria (ATX), Serbia (BELEX 15), Hungary (BUX), Croatia (CROBEX), Russia (IMOEX), Czech Republic (PRAGUE PX), Slovenia (SBI TOP) and Poland (WIG) over the period from September 18th, 2017 to September 15th, 2022. There is considerable literature on financial market interconnectedness, notably by writers Jawadi et al. (2019), Dias et al. (2020), and Dias and Carvalho (2021a), however many of these studies have mainly examined Western European markets. The choice of these emerging economies is motivated by the fact that their financial markets are entirely congruent with the major global financial markets, with substantial possibilities of interdependence.

In conducting this study, we are interested in answering the following research question: (1) Did the global economic instability caused by the events of 2020 and 2022 increase the com-movements between Western European and Eastern European capital markets? During the Quiet subperiod, the results indicate the existence of 16 of 56 possible causal relationships, whereas the number of causal relationships between pairs of markets under analysis increased significantly during the Stress subperiod, which included the events of 2020 and 2022, inferring 42 of 56 possible causal relationships. These findings may call into question portfolio diversification in these regional markets.

This research paper is divided into 5 sections. In addition to the current introduction, section 2 presents a Literature Review regarding articles on the movements and causal links between international capital markets, section 3 describes the methodology and data, section 4 contains the results. Section 5 presents the general discussions of the paper.

2. LITERATURE REVIEW

From the investor's point of view, knowledge of the form and intensity of interdependence between different financial markets is vital for efficient hedging decisions, to minimize the adverse effect of uncertainty on the expected return on investments. In the same way, understanding the interdependence relations between international stock markets facilitates the identification of diversification opportunities (Guedes et al., 2022; Teixeira et al., 2022; Zebende et al., 2022).

The authors Horvath and Petrovski (2012) examined the movements of Western European capital markets relative to Central Europe (Czech Republic, Hungary and Poland) and Southeast Europe (Croatia, Macedonia and Serbia) in the period 2006-2011.

The authors show that the co-movements in Central Europe are more significant when compared to the capital markets of Western Europe and Southeast Europe. Moreover, the results show that the correlation of Southeast European equity markets with developed markets is essentially zero, opening doors for investors operating in these markets to diversify their portfolios efficiently.

The authors Koseoglu and Cevik (2013) investigated the causality relationships between stock markets and foreign exchange markets in the Czech Republic, Hungary, Poland and Turkey.

Moreover, they show that stock markets cause in a Grangerian sense the exchange markets in all countries, both in mean and variance, suggesting that the stock market plays an important role in the price discovery process for the exchange market of the countries analyzed.

Özer et al. (2016) analyzed the co-movement between the markets of Germany, Austria, Czech Republic, Croatia, Lithuania and Greece, the authors show mixed results by failing to highlight co-movement. These findings have relevant implications for international investors, portfolio managers and policymakers.

In a complementary manner, the authors Cevik et al. (2017) analyzed the presence of a causal link between the financial markets of Central and Eastern European (CEE) countries adopting an asymmetric causality test. The authors evidence of a causal relationship running from the Czech Republic to Poland; moreover, Poland's stock market causes Turkey's stock market. Complementarily the results of the asymmetric causality test indicate only one causal link running from the Czech Republic to Hungary and Poland.

While the authors Jawadi et al. (2019) studied the movements between the US market and the G-6, BRIC and MENA markets. The authors show that the MENA and BRIC markets are segmented with the US market, while the G-6 markets show integration with the US.

In more recent studies, the author Shi (2022) investigated the co-movements between China's stock market and 12 capital markets in the Asia-Pacific region after the global financial crisis. The author uses weekly conditional correlations to detect contagion and explores the transmission mechanisms by regressing monthly economic and financial variables. The empirical results show that events (specifically, the Shanghai stock market crash, the US-China tariff war, and the COVID-19 pandemic) significantly increased the co-movements between China and Asia-Pacific markets.

While the authors Karamti and Belhassine (2022) analyzed the connection between the COVID-19 outbreak and major financial markets within a time and frequency framework. Wavelet coherence analysis reveals perceptive differences between short-term and long-term market reactions. In the short term, the authors evidence strong co-movement during the first and second wave of the 2020 pandemic. Furthermore, the authors explain that the panic caused by the pandemic spread in the United States contaminates international markets, and they suggest that the gold market and cryptocurrencies are safer investments.

In summary, this paper aims to contribute to providing information to investors and regulators in Central and Eastern European capital markets, where individual and institutional investors seek diversification benefits. Therefore, this paper aims to examine the synchronizations between European capital markets and to understand whether the hypothesis of portfolio diversification is challenged due to uncertainty in the global economy.

3. METHODOLOGY AND DATA

3.1. DATA

Price index data for the capital markets of Austria (ATX), Serbia (BELEX 15), Hungary (BUX), Croatia (CROBEX), Russia (IMOEX), Czech Republic (PRAGUE PX), Slovenia (SBI TOP) and Poland (WIG), were sourced from the *Thomson Reuters Eikon* platform. The quotes are daily and

cover the period from September 18th, 2017, to September 15th, 2022, which is a period marked by the global pandemic of 2020 and the Russian invasion of Ukraine in 2022; to keep the time series as reliable as possible we have kept the prices in local currency to mitigate exchange rate distortions.

Table 1. The name of countries and their indexes under analysis in this paper

Country name	Index
Austria	ATX
Serbia	BELEX 15
Hungary	BUX
Croatia	CROBEX
Russia	IMOEX
Czech Republic	PRAGUE PX
Slovenia	SBI TOP
Poland	WIG

Source: Own elaboration

3.2. METHODOLOGY

To answer the research question, we will start by characterizing the sample through statistical measures, such as mean, standard deviation, skewness and kurtosis. To validate the result regarding the time series distribution we will estimate Jarque and Bera (1980). To check white noise we will estimate the unit root tests of Breitung (2000) and Hadri (2000).

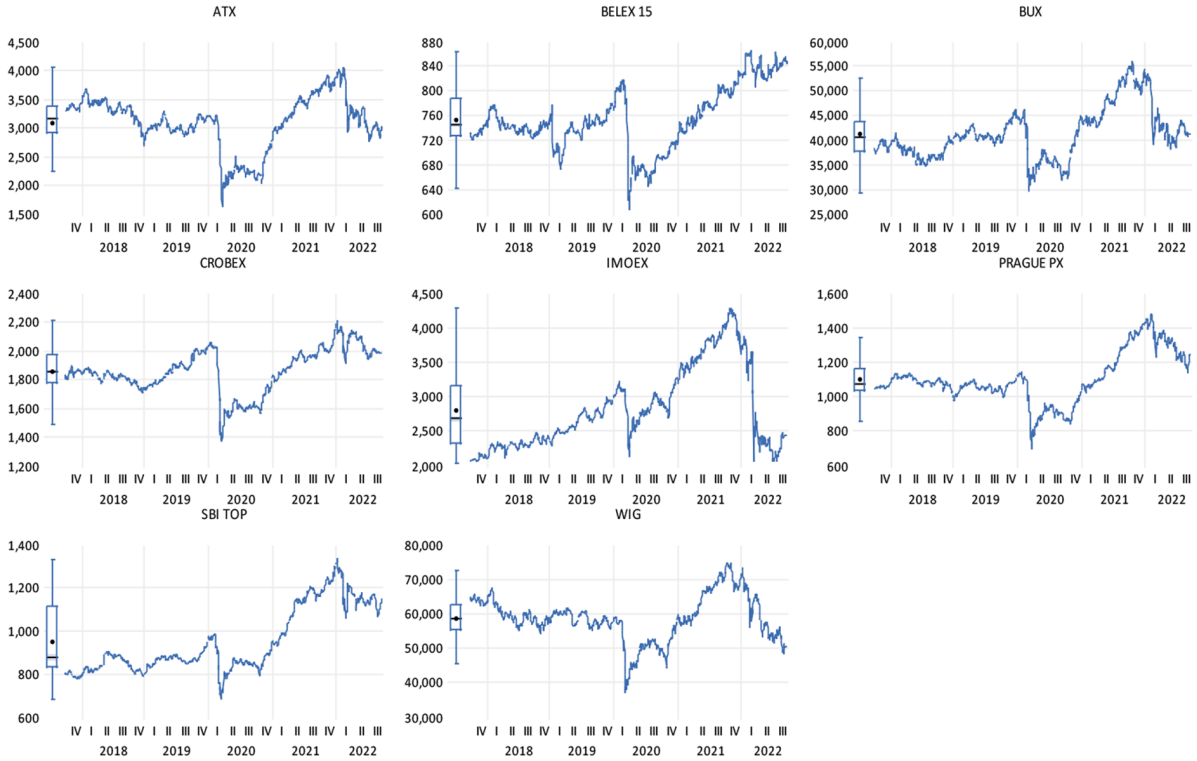
The VAR Granger Causality/Block Exogeneity Wald Tests methodology will be used to answer the research question. It employs the Wald statistic, which validates whether the coefficients of the endogenous variables lagged from the "cause" variable are null or does not "cause" the dependent variable in the Grangerian sense. It should, however, be noted that the result of this test is highly sensitive to the number of lags considered in the model, so the first concern is to properly estimate this value, to obtain robust evidence (Gujarati, 2004).

As a complement, and to determine the optimal number of lags, we used the LR criteria: sequential modified. LR test statistic (each test at 5% level). FPE: Final prediction error. AIC: Akaike information criterion. SC: Schwarz information criterion. HQ: Hannan-Quinn information criterion.

4. RESULTS

Figure 1 illustrates the evolution, in levels, of the price indexes of the European capital markets, namely Austria (ATX), Serbia (BELEX 15), Hungary (BUX), Croatia (CROBEX), Russia (IMOEX), Czech Republic (PRAGUE PX), Slovenia (SBI TOP) and Poland (WIG), over the period from September 18th, 2017 to September 15th, 2022, to analyze the reaction of financial markets to events such as the COVID-19 crisis in 2020 and Russia's invasion of Ukraine in 2022. The price indexes under study reveal the instability experienced in these markets, especially with the outbreak of the pandemic crisis.

With a subsequent upward trend in 2021, the markets again registered significant drops in 2022, especially in the Russian market due to its political decision to operate militarily in Ukraine. These findings are validated by the authors Bagão et al. (2020), Dias and Santos (2020), Dias and Carvalho (2021a), Teixeira et al. (2022), which show that the global pandemic of 2020 (Covid-19) caused very sharp turbulence in international financial markets.

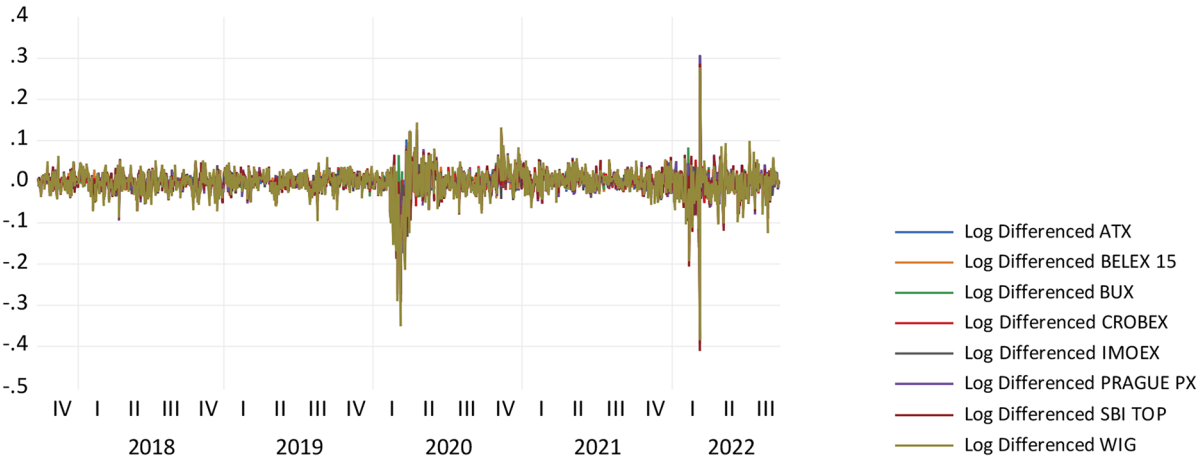


Note: Data processed by the authors (software: Eviews12)

Figure 1. Evolution, in levels, of the financial market under analysis, for the period from September 18th, 2017, to September 15th, 2022

Source: Own elaboration

Figure 2 shows the evolution of the price indexes in the first annual differences of the capital markets under analysis. In all the series, there is a relatively high dispersion around the average, as well as a relatively synchronized behavior between the time series. Through graphical analysis, we observe the existence of high volatility during the first and second quarters of 2020 and 2022, periods of high complexity marked by the COVID-19 pandemic and the Russian political decision to operate militarily in Ukrainian territory.



Note: Data processed by the authors (software: Eviews12)

Figure 2. Evolution of the returns, of the financial market under analysis, in the period from September 18th, 2017, to September 15th, 2022

Source: Own elaboration

Table 2a presents the values of the descriptive statistics of the price indexes of four stock markets, namely Austria (ATX), Serbia (BELEX 15), Hungary (BUX) and Croatia (CROBEX) and Table 2b presents the values of the descriptive statistics of the price indexes of Russia (IMOEX), Czech Republic (PRAGUE PX), Slovenia (SBI TOP) and Poland (WIG).

Regarding returns, according to classical financial theory, these would be close to zero, since it postulates that the longer the time interval of the time series, its return will tend towards zero. As can be seen, all indexes show returns close to zero and positive, except for the ATX, CROBEX and WIG price indexes, which showed negative returns for the period under study.

The results obtained show that the time series suggest departures from the normality hypothesis. This result emerges from the Jarque and Bera (1980) test, which allowed rejecting the null hypothesis of normality (H_0) in favor of the alternative ((H_1) - non-normality), for a significance level of 1%. Additionally, the skewness and kurtosis coefficients are statistically different from those of a normal distribution. These results are confirmed by the authors Guedes et al. (2022), Teixeira et al. (2022), Dias et al. (2022), Zebende et al. (2022) which show that the price series of capital markets present distributions that depart from normality.

Table 2a. Descriptive statistics, in returns, of the financial markets under analysis for the period from September 18th, 2017, to September 15th, 2022

	ATX	BELEX_15	BUX	CROBEX
Mean	-8.49E-05	0.000117	5.49E-05	7.80E-05
Std. Dev.	0.014819	0.006947	0.014134	0.008240
Skewness	-1.231871	-1.068310	-1.477502	-3.907048
Kurtosis	18.69780	15.33660	15.46578	53.60873
Jarque-Bera	13224.21	8210.143	8596.194	137343.2
Probability	0.000000	0.000000	0.000000	0.000000
Observations	1257	1257	1257	1257

Note: Data processed by the authors (software: Eviews12)

Source: Own elaboration

Table 2b. Descriptive statistics, in returns, of the financial markets under analysis for the period from September 18th, 2017, to September 15th, 2022

	IMOEX	PRAGUE PX	SBI TOP	WIG
Mean	0.000137	0.000137	0.000291	-0.000195
Std. Dev.	0.018450	0.010112	0.009027	0.013147
Skewness	-8.081235	-1.194789	-1.980833	-1.403024
Kurtosis	196.4023	15.81751	23.65061	18.53894
Jarque-Bera	1972739.	8903.676	23157.21	13058.80
Probability	0.000000	0.000000	0.000000	0.000000
Observations	1257	1257	1257	1257

Note: Data processed by the authors (software: Eviews12)

Source: Own elaboration

As we are estimating price indexes instead of returns, we should analyze the (non-) stationary nature of the time series of the capital markets under study. For identifying the presence of unit roots in the time series, there are individual or panel tests. However, in the present study, we will opt for the use of panel unit root tests because they have higher statistical power and allow obtaining more robust results, as they can increase considerably the sample size of the tests by considering not only the information of the time series dimension but also the cross-section dimension (Hadri, 2000; Maddala & Wu, 1999).

Specifically, the panel unit root tests postulated by Breitung (2000) and Hadri (2000). The Breitung test is considered a derived and improved test of the unit root test developed by Dickey and Fuller (1981) and has as a null hypothesis that all panels contain a unit root (or unstable variance). In turn, the test of Hadri (2000) will be used to validate the presence or absence of unit roots in panel data and to corroborate the results obtained from the previous test since its null hypothesis is contrary to the Breitung test.

According to the results obtained in Table 3 and 4, both tests suggest stationarity in first differences, that is, the data series are integrated of the first order, and these results allow us to assess that the time series present the necessary characteristics to show robust results.

Table 3. Breitung stationarity test (2000), applied to the financial markets under analysis, in the period from September 18th, 2017, to September 15th, 2022

Method			**Statistic**	**Prob.****
Breitung t-stat			-67.8685	0.0000
** Probabilities are computed assuming asymptotic normality				
Intermediate regression results on D(UNTITLED)				
Series	**S.E. of Regression**	**Lag**	**Max Lag**	**Obs**
D(ATX)	56.5883	0	22	1255
D(BELEX 15)	6.09273	1	22	1254
D(BUX)	640.726	2	22	1253
D(CROBEX)	15.3580	2	22	1253
D(IMOEX)	73.2703	0	22	1255
D(PRAGUE PX)	14.7590	0	22	1255
D(SBI TOP)	10.1143	1	22	1254
D(WIG)	1009.51	0	22	1255
	Coefficient	t-Stat	SE Reg	Obs
Pooled	-0.81482	-67.868	0.012	10026

Note: Data processed by the authors (software: Eviews12)

Source: Own elaboration

Table 4. Hadri Stationarity test (2002), applied to the financial markets under analysis, in the period from September 18th, 2017, to September 15th, 2022

Method			**Statistic**	**Prob.****
Hadri Z-stat			0.56682	0.2854
Heteroscedastic Consistent Z-stat			-0.43374	0.6678
* Note: High autocorrelation leads to severe size distortion in Hadri test, leading to over-rejection of the null.				
** Probabilities are computed assuming asymptotic normality				
Intermediate results on D(UNTITLED)				
		Variance		
Series	**LM**	**HAC**	**Bandwidth**	**Obs**
D(ATX)	0.0691	2476.260	13.0	1256
D(BELEX 15)	0.0292	34.98975	14.0	1256
D(BUX)	0.0566	345744.5	5.0	1256
D(CROBEX)	0.0408	350.3203	17.0	1256
D(IMOEX)	0.0822	2303.098	7.0	1256
D(PRAGUE_PX)	0.0699	155.0696	14.0	1256
D(SBI TOP)	0.0483	119.1608	14.0	1256
D(WIG)	0.0858	591143.9	9.0	1256

Note: Data processed by the authors (software: Eviews12)

Source: Own elaboration

In this paper, to analyze the structures of causal relations of time series, namely from Austria (ATX), Serbia (BELEX 15), Budapest (BUX), Croatia (CROBEX), Russia (IMOEX), Czech Republic (PRAGUE PX), Slovenia (SBI TOP) and Warsaw (WIG) during two periods, the Granger Causality approach was used. This approach, through the estimation of an Autoregressive Vector (VAR), allows us to identify the direction of causality, that is, using the F-statistic test it allows us to calculate for which values a given time series provides statistically significant information (predictive ability) on the evolution of the future values of another time series. For example, if one considers two stationary time series (X and Y; H0: If Y did not cause X, then we would be facing a unidirectional causal relationship). Nevertheless, if time series both cause and are caused by their pair, this leads us to conclude that we are facing a bidirectional causal relationship.

Note that to estimate the autoregressive vector, the first step is to estimate the optimal number of lags (observable values of the lagged time series) in the VAR model.

To determine the optimal number of lags for the estimation of the VAR model for the quiet period, the criteria presented in Table 5 was used. Based on the LR criterion, the results point to a model with 4 lags. In Table 6 we can observe the results of the test, which for the number of lags equal to 4; it leads us not to reject the null hypothesis, which postulates the non-existence of autocorrelation of residuals. Thus, rejecting the hypothesis of autocorrelation of serial residuals, it is determined that the model estimated considering a lag equal to 4 days is robust.

Table 5. Information Criteria to determining the optimal number of lags in VAR model for the Tranquil Period

Lag	LogL	LR	FPE	AIC	SC	HQ
0	15749.15	NA	4.80e-35	-56.31895	-56.25704*	-56.29477*
1	15837.40	173.6700	4.40e-35	-56.40573	-55.84852	-56.18814
2	15912.06	144.7786	4.24e-35*	-56.44387*	-55.39136	-56.03286
3	15972.28	115.0513	4.30e-35	-56.43035	-54.88253	-55.82591
4	16018.37	**86.72698***	4.58e-35	-56.36625	-54.32313	-55.56840
5	16057.41	72.35749	5.02e-35	-56.27695	-53.73853	-55.28568
6	16090.43	60.25008	5.61e-35	-56.16611	-53.13239	-54.98142
7	16135.20	80.41410	6.02e-35	-56.09732	-52.56829	-54.71921
8	16164.28	51.39540	6.85e-35	-55.97237	-51.94805	-54.40085
9	16205.56	71.78266	7.45e-35	-55.89109	-51.37147	-54.12616
10	16248.84	74.01328	8.06e-35	-55.81695	-50.80203	-53.85860

Note: Data processed by the authors (software: Eviews 12). * Indicates lag order selected by the criterion. LR: sequential modified. LR test statistic (each test at 5% level). FPE: Final prediction error. AIC: Akaike information criterion. SC: Schwarz information criterion. HQ: Hannan-Quinn information criterion.

Source: Own elaboration

Table 6. VAR Residual Serial Correlation LM Tests

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	66.94431	64	0.3763	1.046828	(64, 2988.5)	0.3764
2	61.12963	64	0.5786	0.954978	(64, 2988.5)	0.5787
3	81.13419	64	0.0728	1.271716	(64, 2988.5)	0.0729
4	71.20053	64	0.2506	1.114171	(64, 2988.5)	0.2507
5	65.86011	64	0.4123	1.029688	(64, 2988.5)	0.4124

Note: Data processed by the authors (software: Eviews 12)

Source: Own elaboration

Table 7 shows the shocks in the capital markets of Austria (ATX), Serbia (BELEX 15), Hungary (BUX), Croatia (CROBEX), Russia (IMOEX), Czech Republic (PRAGUE PX), Slovenia (SBI TOP) and Poland (WIG), for the Quiet subperiod. When we apply 4 lags to the Granger Causality Tests model, we find 16 pairs of markets showing comovement between them, as follows: The Austrian stock market (ATX) causes shocks on BUX, CROBEX, IMOEX, PRAGUE PX and WIG, ATX is the market that causes the most (5 out of 7 possible); The Czech Republic stock index (PRAGUE PX) causes shocks in Serbia (BELEX 15), Hungary (BUX), Russia (IMOEX) (3 out of 7 possible); Hungary (BUX) market shocks Austria (ATX) and Poland (WIG) (2 out of 7 possible); Slovenia (SBI TOP) causes in a Grangerian sense the stock indexes in Hungary (BUX), Poland (WIG) (2 out of 7 possible); Stock market index Poland (WIG) causes stock market shocks in Russia (IMOEX), Czech Republic (PRAGUE PX) (2 out of 7 possible); The stock market Czech Republic (PRAGUE PX) causes movements on the stock market in Slovenia (SBI TOP), while the stock market Russia (IMOEX) does not cause shocks on the markets in the analysis.

Table 7. Granger Causality Tests applied to the financial markets under analysis, in the period from September 18th, 2017, to December 30th, 2022 (Tranquil Period)

	F-Statistic	**Prob.**
BELEX 15 does not Granger Cause ATX	1.05078	0,3803
ATX does not Granger Cause BELEX 15	0.67370	0,6104
BUX does not Granger Cause ATX	**4.56488*****	0,0012
ATX does not Granger Cause BUX	**2.54162****	0,0389
CROBEX does not Granger Cause ATX	0.36066	0,8366
ATX does not Granger Cause CROBEX	**3.64626*****	0,0061
IMOEX does not Granger Cause ATX	1.24910	0,289
ATX does not Granger Cause IMOEX	**3.76539*****	0,0049
PRAGUE PX does not Granger Cause ATX	1.61824	0,1682
ATX does not Granger Cause PRAGUE PX	**42.4698*****	4,00E-31
SBI TOP does not Granger Cause ATX	1.45053	0,216
ATX does not Granger Cause SBI TOP	1.16741	0,3242
WIG does not Granger Cause ATX	0.90762	0,4591
ATX does not Granger Cause WIG	**13.1769*****	3,00E-10
BUX does not Granger Cause BELEX 15	0.66281	0,618
BELEX_15 does not Granger Cause BUX	0.27883	0,8917
CROBEX does not Granger Cause BELEX 15	0.66464	0,6168
BELEX 15 does not Granger Cause CROBEX	0.70160	0,5911
IMOEX does not Granger Cause BELEX 15	0.49629	0,7385
BELEX 15 does not Granger Cause IMOEX	0.68176	0,6048
PRAGUE PX does not Granger Cause BELEX 15	**2.67354****	0,0313
BELEX 15 does not Granger Cause PRAGUEPX	1.23831	0,2935
SBI TOP does not Granger Cause BELEX_15	1.01169	0,4007
BELEX 15 does not Granger Cause SBI TOP	0.78973	0,5321
WIG does not Granger Cause BELEX 15	1.44270	0,2185
BELEX 15 does not Granger Cause WIG	0.11123	0,9786
CROBEX does not Granger Cause BUX	1.28111	0,2762
BUX does not Granger Cause CROBEX	1.09616	0,3576
IMOEX does not Granger Cause BUX	1.62878	0,1655
BUX does not Granger Cause IMOEX	1.55066	0,1861
PRAGUE PX does not Granger Cause BUX	**3.84096*****	0,0043

BUX does not Granger Cause PRAGUE PX	1.58294	0,1773
SBI TOP does not Granger Cause BUX	**3.49666*** **	0,0078
BUX does not Granger Cause SBI TOP	1.92676	0,1045
WIG does not Granger Cause BUX	0.72687	0,5738
BUX does not Granger Cause WIG	**4.43825*** **	0,0015
IMOEX does not Granger Cause CROBEX	0.44291	0,7776
CROBEX does not Granger Cause IMOEX	0.97459	0,4209
PRAGUE PX does not Granger Cause CROBEX	0.54811	0,7005
CROBEX does not Granger Cause PRAGUE PX	**2.23718***	0,0638
SBI TOP does not Granger Cause CROBEX	0.99070	0,412
CROBEX does not Granger Cause SBI TOP	1.12725	0,3427
WIG does not Granger Cause CROBEX	1.29738	0,2698
CROBEX does not Granger Cause WIG	0.54908	0,6998
PRAGUE_PX does not Granger Cause IMOEX	**2.28470***	0,0591
IMOEX does not Granger Cause PRAGUE PX	0.59557	0,666
SBI TOP does not Granger Cause IMOEX	0.81857	0,5136
IMOEX does not Granger Cause SBI TOP	0.68341	0,6037
WIG does not Granger Cause IMOEX	**4.07004*** **	0,0029
IMOEX does not Granger Cause WIG	1.48464	0,2054
SBI TOP does not Granger Cause PRAGUE PX	0.83193	0,5052
PRAGUE PX does not Granger Cause SBI TOP	**2.30572***	0,0571
WIG does not Granger Cause PRAGUE PX	**6.51376*** **	4,00E-05
PRAGUE PX does not Granger Cause WIG	1.44431	0,218
WIG does not Granger Cause SBI TOP	0.56089	0,6911
SBI TOP does not Granger Cause WIG	**3.91589***	0,0038

Note: Data processed by the authors (software: Eviews 12).
The asterisks ***, **, * indicate statistical significance at 1%, 5% and 10%, respectively

Source: Own elaboration

For the Stress subperiod and to estimate the VAR model for this time lag, it was also necessary to determine the ideal number of lag days to include. For that purpose, the criteria presented in Table 8 were used. Based on the FPE and AIC criteria, the results point to a model that considers 9 days of lag.

Table 8. Information Criteria to determining the optimal number of lags in VAR model for the Stress Period

Lag	LogL	LR	FPE	AIC	SC	HQ
0	15617.80	NA	1.39e-30	-46.04660	-45.99328	-46.02596
1	15918.13	592.6910	6.91e-31	-46.74375	-46.26384*	-46.55796
2	16042.77	243.0275	5.78e-31	-46.92262	-46.01613	-46.57169
3	16179.01	262.4397	4.67e-31	-47.13573	-45.80265	-46.61966
4	16394.81	410.5795	2.99e-31	-47.58350	-45.82383	-46.90228*
5	16490.95	180.6579	2.72e-31	-47.67831	-45.49206	-46.83195
6	16614.54	229.3243	2.28e-31	-47.85411	-45.24127	-46.84261
7	16706.47	168.4017	2.10e-31	-47.93650	-44.89707	-46.75985
8	16804.47	177.2003	1.91e-31	-48.03678	-44.57076	-46.69499
9	16876.23	128.0781	**1.87e-31***	-48.05969*	-44.16709	-46.55275
10	16936.21	105.6297*	1.89e-31	-48.04783	-43.72864	-46.37575

Note: Data processed by the authors (software: Eviews 12).
* Indicates lag order selected by the criterion. LR: sequential modified. LR test statistic (each test at 5% level). FPE: Final prediction error. AIC: Akaike information criterion. SC: Schwarz information criterion. HQ: Hannan-Quinn information criterion.

Source: Own elaboration.

Table 9. VAR Residual Serial Correlation LM Tests

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	98.45723	64	0.0037	1.546542	(64, 3415.3)	0.0037
2	94.81279	64	0.0074	1.488506	(64, 3415.3)	0.0074
3	110.9086	64	0.0003	1.745291	(64, 3415.3)	0.0003
4	106.7975	64	0.0006	1.679590	(64, 3415.3)	0.0006
5	124.8360	64	0.0000	1.968454	(64, 3415.3)	0.0000
6	129.9772	64	0.0000	2.051061	(64, 3415.3)	0.0000
7	121.9031	64	0.0000	1.921384	(64, 3415.3)	0.0000
8	70.11506	64	0.2800	1.096813	(64, 3415.3)	0.2801
9	97.53325	64	0.0044	1.531823	(64, 3415.3)	0.0044
10	73.24462	64	0.2007	1.146291	(64, 3415.3)	0.2008

Note: Data processed by the authors (software: Eviews 12)

Source: Own elaboration

Table 9 presents the results of the test, which allows rejecting H_0 for the number of lags equal to 9, which postulates the non-existence of autocorrelation of serial residuals, a crucial requirement for the estimation of a robust model.

Table 10 shows the shocks between the stock indexes of Austria (ATX), Serbia (BELEX 15), Hungary (BUX), Croatia (CROBEX), Russia (IMOEX), Czech Republic (PRAGUE PX), Slovenia (SBI TOP) and Poland (WIG), for the Stress subperiod. When we apply 9 lags to the Granger Causality Tests, we find that 42 (out of 56 possible) pairs of markets show co-movements between each other.

In this subperiod of uncertainty in the global economy, the markets that had more influence on the remaining markets were the markets represented by the ATX, BUX, CROBEX and PRAGUE PX indexes, which showed 6 causal relations in 7 possible ones. The ATX index during this period showed predictive capacity over the behavior of indexes such as the BELEX 15, the CROBEX, the IMOEX, the PRAGUE PX, the SBI-TOP and the WIG. The BUX index influenced the ATX, the BELEX 15, the CROBEX, the PRAGUE PX, the SBI-TOP and the WIG stock markets. The Croatian stock index influenced the ATX, BELEX 15, BUX, PRAGUE PX, SBI-TOP and WIG indexes. PRAGUE PX is also considered, for the sample period under study, as a market with a strong influence on the remaining markets, specifically on ATX, BELEX 15, CROBEX, IMOEX, SBI-TOP and WIG.

Still with a relative influence, the indexes BELEX 15 and SBI-TOP present 5 causal relations out of 7 possible ones. In the case of BELEX 15, it caused the indexes ATX, IMOEX, PRAGUE PX, SBI TOP and WIG. The SBI-TOP caused the ATX, the BUX, the CROBEX, the PRAGUE PX and the WIG.

Finally, with 4 causal relations out of 7 possible ones, the IMOEX index appeared, which showed influence on ATX, BELEX 15, BUX and SBI-TOP. Also, the WIG showed 4 out of 7 causal relations, namely with the ATX, the BELEX 15, the IMOEX and the PRAGUE PXn general, during the quiet period, 16 causal relations were found in 56 possible ones. During the Stress period, on the other hand, there was a very significant increase in the number of causal relations between pairs of markets under analysis, inferring 42 causal relations out of a possible 56. These findings are in line with the results evidenced by the authors Pardal et al. (2021), Dias and Carvalho (2021b) which show that financial markets in periods of stress tend to increase their comovement among themselves.

Table 10. Granger Causality Tests applied to the financial markets under analysis, in the period from 1st January 2020 to September 15th, 2022 (Stress Period)

Null Hypothesis	F-Statistic	Prob.
BELEX 15 does not Granger Cause ATX	**2.41026****	0,0108
ATX does not Granger Cause BELEX 15	**10.2502*****	7,00E-15
BUX does not Granger Cause ATX	**14.4464*****	2,00E-21
ATX does not Granger Cause BUX	1.41261	0,1786
CROBEX does not Granger Cause ATX	**17.2922*****	8,00E-26
ATX does not Granger Cause CROBEX	**2.05753****	0,0312
IMOEX does not Granger Cause ATX	**2.42010****	0,0104
ATX does not Granger Cause IMOEX	**11.5216*****	7,00E-17
PRAGUE PX does not Granger Cause ATX	**4.99444*****	2,00E-06
ATX does not Granger Cause PRAGUE PX	**15.8923*****	1,00E-23
SBI TOP does not Granger Cause ATX	**15.1678*****	1,00E-22
ATX does not Granger Cause SBI TOP	**2.94479*****	0,002
WIG does not Granger Cause ATX	**23.9718*****	1,00E-35
ATX does not Granger Cause WIG	**1.87121***	0,0533
BUX does not Granger Cause BELEX 15	**2.91111*****	0,0022
BELEX 15 does not Granger Cause BUX	0.88284	0,5402
CROBEX does not Granger Cause BELEX 15	**6.90212*****	2,00E-09
BELEX 15 does not Granger Cause CROBEX	1.58932	0,1145
IMOEX does not Granger Cause BELEX 15	**1.85790***	0,0554
BELEX 15 does not Granger Cause IMOEX	**2.64553*****	0,0051
PRAGUE PX does not Granger Cause BELEX 15	**9.89020*****	3,00E-14
BELEX 15 does not Granger Cause PRAGUEPX	**2.54922*****	0,007
SBI TOP does not Granger Cause BELEX_15	0.91580	0,5107
BELEX 15 does not Granger Cause SBI TOP	**2.17349****	0,0222
WIG does not Granger Cause BELEX 15	**2.56960*****	0,0065
BELEX 15 does not Granger Cause WIG	**1.90468****	0,0485
CROBEX does not Granger Cause BUX	**2.05818****	0,0312
BUX does not Granger Cause CROBEX	**21.4591*****	5,00E-32
IMOEX does not Granger Cause BUX	**2.82029*****	0,0029
BUX does not Granger Cause IMOEX	0.74824	0,6646
PRAGUE_PX does not Granger Cause BUX	1.56872	0,1208
BUX does not Granger Cause PRAGUE PX	**17.1802*****	1,00E-25
SBI TOP does not Granger Cause BUX	**4.63684*****	6,00E-06
BUX does not Granger Cause SBI TOP	**6.51677*****	6,00E-09
WIG does not Granger Cause BUX	0.75113	0,6619
BUX does not Granger Cause WIG	**24.4322*****	3,00E-36
IMOEX does not Granger Cause CROBEX	1.20222	0,2905
CROBEX does not Granger Cause IMOEX	1.60669	0,1094
PRAGUE PX does not Granger Cause CROBEX	**2.46770*****	0,009
CROBEX does not Granger Cause PRAGUE PX	**19.6664*****	2,00E-29
SBI TOP does not Granger Cause CROBEX	**20.2739*****	3,00E-30
CROBEX does not Granger Cause SBI TOP	**2.22192****	0,0192
WIG does not Granger Cause CROBEX	1.11535	0,3493
CROBEX does not Granger Cause WIG	**29.2575*****	6,00E-43
PRAGUE PX does not Granger Cause IMOEX	**10.1195*****	1,00E-14
IMOEX does not Granger Cause PRAGUE PX	0.96218	0,4703

SBI TOP does not Granger Cause IMOEX	1.53859	0,1305
IMOEX does not Granger Cause SBI TOP	**1.97262****	0,04
WIG does not Granger Cause IMOEX	**4.29346*****	2,00E-05
IMOEX does not Granger Cause WIG	0.49442	0,8787
SBI TOP does not Granger Cause PRAGUE PX	**12.3335*****	4,00E-18
PRAGUE PX does not Granger Cause SBI TOP	**1.90168****	0,0489
WIG does not Granger Cause PRAGUE PX	**19.4386*****	5,00E-29
PRAGUE PX does not Granger Cause WIG	**2.94111*****	0,002
WIG does not Granger Cause SBI TOP	1.07866	0,3763
SBI TOP does not Granger Cause WIG	**20.0243*****	7,00E-30

Note: Data processed by the authors (software: Eviews 12).
The asterisks ***, **, * indicate statistical significance at 1%, 5% and 10%, respectively

Source: Own elaboration

Overall, during the Tranquil period, ATX was the market that most influenced the behavior of the other capital markets under analysis, showing 5 causal relations out of 7 possible (BUX, CROBEZ, IMOEX, PRAGUE PX and WIG), followed by PRAGUE PX with 4 causal relations out of 7 possible (BELEX, BUX, IMOEX and SBI TOP). In turn, causing 2 markets, in the Granger sense, out of the 7 possible, are followed by the BUX (ATX and WIG), the SBI TOP (BUX and WIG) and the WIG (IMOEX, PRAGUE PX) price indexes. The CROBEX only showed 1 causal relation with the remaining pairs of capital markets under analysis (PRAGUE PX). Finally, BELEX and IMOEX, during the Tranquil period, did not cause any market.

5. CONCLUSION

This paper aimed to investigate the movements between the capital markets of Austria (ATX), Serbia (BELEX 15), Hungary (BUX), Croatia (CROBEX), Russia (IMOEX), Czech Republic (PRAGUE PX), Slovenia (SBI TOP) and Poland (WIG), in the period from September 18th, 2017, to September 15th, 2022. To achieve more robust results, we divide the sample into two sub-periods: the quiet period from September 18th, 2017, to December 31st, 2019; the period from January 1st, 2020, to September 15th, 2022, marked by the global pandemic (Covid-19), the oil price war in 2020 and the Russian invasion in 2022, we call Stress Period.

The time series show non-normal distributions due to the presence of fat tails, a characteristic that is usual in periods of extreme volatility. The results of the VAR Granger Causality/Block Exogeneity Wald Tests model verified the existence of 16 pairs of markets showing co-movements between them, during the quiet subperiod, the market that causes more co-movements is the Austria stock market (ATX), while the Russia stock index (IMOEX) does not cause shocks in the markets under analysis. In the Stress subperiod, we verify the presence of 42 pairs of markets causing each other in the Grangerian sense, the stock indexes ATX, BUX, CROBEX and PRAGUE PX present 6 causal relations in 7 possible, while the Russian capital market (IMOEX) and the Polish capital market are the ones that cause less (4 in 7 possible).

Specifically, we find consistent movements in the daily returns of Central and Eastern European stock indexes during the period of financial market stress. This convergence could be a sign of development from countries that are in the process of virtual integration, but such findings could jeopardize the implementation of efficient portfolio diversification strategies and possibly some above-market gains due to arbitrage levels.

References

Bagão, M., Dias, R., Heliodoro, P., & Alexandre, P. (2020). The Impact of Covid-19 on European Financial Markets: an Empirical Analysis. *6th LIMEN Conference Proceedings (Part of LIMEN Conference Collection)*, *6*(July), 1–11. https://doi.org/10.31410/limen.2020.1

Breitung, J. (2000). The local power of some unit root tests for panel data. *Advances in Econometrics*. https://doi.org/10.1016/S0731-9053(00)15006-6

Cevik, E. I., Korkmaz, T., & Cevik, E. (2017). Testing causal relation among central and eastern European equity markets: Evidence from asymmetric causality test. *Economic Research-Ekonomska Istrazivanja*, 30(1). 381-393. https://doi.org/10.1080/1331677X.2017.1305774

Dias, R., da Silva, J. V., & Dionísio, A. (2019). Financial markets of the LAC region: Does the crisis influence the financial integration? *International Review of Financial Analysis*, *63(January)*, 160–173. https://doi.org/10.1016/j.irfa.2019.02.008

Dias, R., Heliodoro, P., & Alexandre, P. (2019). Risk transmission among stock markets in LAC Region: financial crises impact. 5th International Scientific-Business Conference – *LIMEN 2019 – Leadership, Innovation, Management and Economics: Integrated Politics of Research – SELECTED PAPERS*. 91–97. https://doi.org/10.31410/LIMEN.S.P.2019.91

Dias, R., Heliodoro, P., Alexandre, P., & Vasco, C. (2020). *The shocks between oil market to the BRIC stock markets: A generalized VAR approach*. 4th EMAN Conference Proceedings (part of EMAN conference collection). 25–31. https://doi.org/10.31410/eman.2020.25

Dias, R., Pereira, J. M., & Carvalho, L. C. (2022). Are African Stock Markets Efficient? A Comparative Analysis Between Six African Markets, the UK, Japan and the USA in the Period of the Pandemic. *Naše Gospodarstvo/Our Economy*, *68(1)*, 35–51. https://doi.org/10.2478/ngoe-2022-0004

Dias, R., & Santos, H. (2020). Stock Market Efficiency in Africa: Evidence from Random Walk Hypothesis. *6th LIMEN Conference Proceedings (Part of LIMEN Conference Collection)*, *6*(July), 25–37. https://doi.org/10.31410/limen.2020.25

Dias, R., Santos, H., Heliodoro, P., Vasco, C., & Alexandre, P. (2021). WTI Oil Shocks in Eastern European Stock Markets: A Var Approach. *5th EMAN Conference Proceedings (Part of EMAN Conference Collection)*, October, 71–84. https://doi.org/10.31410/eman.2021.71

Dias, R. T., & Carvalho, L. (2021a). Foreign Exchange Market Shocks in the Context of the Global Pandemic (COVID-19). *Handbook of Research on Financial Management During Economic Downturn and Recovery*, 359-373. https://doi.org/10.4018/978-1-7998-6643-5.ch020

Dias, R. T., & Carvalho, L. (2021b). The Relationship Between Gold and Stock Markets During the COVID-19 Pandemic: An Econophysical Approach. *Handbook of Research on Financial Management During Economic Downturn and Recovery*, 462-475. https://doi.org/10.4018/978-1-7998-6643-5.ch026

Dias, R. T., Pardal, P., Santos, H., & Vasco, C. (2021). COVID-19 Pandemic and Its Influence on Safe Havens: An Examination of Gold, Silver, and Platinum. *Handbook of Research on Reinventing Economies and Organizations Following a Global Health Crisis*, 289-303. https://doi.org/10.4018/978-1-7998-6926-9.ch016

Dickey, D., & Fuller, W. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica, 49(4)*, 1057–1072. https://doi.org/10.2307/1912517

Guedes, E. F., Santos, R. P. C., Figueredo, L. H. R., Da Silva, P. A., Dias, R. M. T. S., & Zebende, G. F. (2022). Efficiency and Long-Range Correlation in G-20 Stock Indexes: A Sliding Windows Approach. *Fluctuation and Noise Letters*. 21(04). https://doi.org/10.1142/S021947752250033X

Gujarati, D. N. (2004). *Basic Econometrics*. 4th Edition, McGraw-Hill Companies.

Hadri, K. (2000). Testing for stationarity in heterogeneous panel data. *The Econometrics Journal, 3(2)*, 148-161. https://doi.org/10.1111/1368-423x.00043

Horvath, R., & Petrovski, D. (2012). International Stock Market Integration: Central and South Eastern Europe Compared. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2078238

Jarque, C. M., & Bera, A. K. (1980). Efficient tests for normality, homoscedasticity and serial independence of regression residuals. *Economics Letters*, *6*(3), 255–259. https://doi.org/10.1016/0165-1765(80)90024-5

Jawadi, F., Chlibi, S., & Cheffou, A. I. (2019). Computing stock price comovements with a three-regime panel smooth transition error correction model. *Annals of Operations Research, 274(1-2)*, 331-345. https://doi.org/10.1007/s10479-018-2805-3

Karamti, C., & Belhassine, O. (2022). COVID-19 pandemic waves and global financial markets: Evidence from wavelet coherence analysis. *Finance Research Letters*, *45*. https://doi.org/10.1016/j.frl.2021.102136

Koseoglu, S. D., & Cevik, E. I. (2013). Testing for causality in mean and variance between the stock market and the foreign exchange market: An application to the major central and Eastern European Countries. *Finance a Uver - Czech Journal of Economics and Finance*, *63(1)*.

Maddala, G. S., & Wu, S. (1999). A comparative study of unit root tests with panel data and a new simple test. *Oxford Bulletin of Economics and Statistics*, *61*(SUPPL.), 631–652. https://doi.org/10.1111/1468-0084.0610s1631

Özer, M., Kamışlı, M., & Kamışlı, S. (2016). The Analysis of Volatility Spillovers between the German and Central and Eastern European (CEE) Stock Markets by Using Frequency Domain Causality Test. In *Europe and Asia: Economic Integration Prospects*.

Pardal, P., Dias, R., Šuleř, P., Teixeira, N., & Krulický, T. (2020). Integration in Central European capital markets in the context of the global COVID-19 pandemic. *Equilibrium, 15(4)*, 627-650. https://doi.org/10.24136/eq.2020.027

Pardal, P., Dias, R. T., Santos, H., & Vasco, C. (2021). Central European Banking Sector Integration and Shocks During the Global Pandemic (COVID-19). *Handbook of Research on Reinventing Economies and Organizations Following a Global Health Crisis*, 272-288. https://doi.org/10.4018/978-1-7998-6926-9.ch015

Shi, Y. (2022). What influences stock market co-movements between China and its Asia-Pacific trading partners after the Global Financial Crisis? *Pacific Basin Finance Journal*, *72*. https://doi.org/10.1016/j.pacfin.2022.101722

Silva, R., Dias, R., Heliodoro, P., & Alexandre, P. (2020). Risk Diversification in ASEAN-5 Financial Markets: An Empirical Analysis in the Context of the Global Pandemic (Covid-19). *6th LIMEN Selected Papers (Part of LIMEN Conference Collection)*, *6*(July), 15–26. https://doi.org/10.31410/limen.s.p.2020.15

Teixeira, N., Dias, R., Pardal, P., & Styles, L. (2022). The gold market as a safe haven when stock markets exhibit pronounced levels of risk: evidence during the China crisis and the COVID-19 pandemic. *Revista Gestão & Tecnologia, 21(1)*, 27–42. https://doi.org/10.12660/rgplp.v21n1.2022.82032

Zebende, G. F., Santos Dias, R. M. T., & de Aguiar, L. C. (2022). Stock market efficiency: An intraday case of study about the G-20 group. *Heliyon*, *8*(1), e08808. https://doi.org/10.1016/j.heliyon.2022.e08808

6th International Scientific Conference ITEMA 2022 – Selected Papers
DOI: https://doi.org/10.31410/ITEMA.S.P.2022.47

Impact of the 2020 and 2022 Events on the Efficiency of Europe's Capital Markets

Paula Heliodoro[1]
Rui Dias[2]
Nicole Horta[3]
Paulo Alexandre[4]
Mariana Chambino[5]

Received: October 11, 2022
Accepted: January 31, 2023
Published: June 12, 2023

Keywords:
European capital markets;
BDS;
DFA Random Walk;
Arbitrage

Abstract: *This paper intends to test efficiency, in its weak form, in the capital markets of the Netherlands (AEX), Belgium (BEL 20), France (CAC 40), Ireland (ISEQ 20), and Portugal (PSI 20), for the period from September 18th, 2017, to September 15th, 2022. Given the skewness and kurtosis coefficients, the time series shows signs of deviation from the normality hypothesis. We also observe that during the Tranquil and second Covid-19 wave subperiods, European equity markets are in equilibrium and that the (in) efficiency hypothesis, in its weak form, does not hold, implying that investors will struggle to achieve returns above the market average without incurring additional risk. When we examine the first Covid-19 subperiod, we find that all capital markets show long memories, indicating a propensity to forecast returns, particularly the Portuguese capital market shows the highest value of persistence (0.65), while the stock indexes of Belgium (BEL 20), France (CAC 40), Ireland (ISEQ 20) have exponents of 0.62, and the Netherlands 0.61. In the fourth sub-period that corresponds to the Russian invasion of Ukraine in 2022, we find that the efficiency hypothesis, in its weak form, is rejected for all stock indexes, except for the French capital market (CAC 40). When the sub-periods of the first wave of COVID-19 and the Russian invasion of Ukraine in 2022 are compared, we notice that markets exhibit more pronounced imbalances during the first wave of COVID-19, due in large part to uncertainty regarding the course of the 2020 pandemic. In addition, we emphasize that during subperiods of higher uncertainty in the global economy, prices do not fully reflect available information and that price fluctuations are not i.i.d. In other words, there is a reversion to the mean, and prices become predictable, allowing regional and international investors to achieve above-market average returns. The authors suggest that these findings are significant for regulators and supervisors of European capital markets to promote efforts to guarantee that available market information is rectified more effectively.*

1. INTRODUCTION

Most writers claim that a stock market is efficient when market agents act in the best interests of the market. Prices of securities traded in an efficient financial market reflect all available information and respond completely and rapidly to new information. In addition to the premise that market information is freely available (Fama, 1965, 1970, 1991).

One of the most fundamental assumptions in financial economics is the Efficient Market Hyp-othesis (EMH), which contends that rates of return have no memory (correlation),

1 School of Business and Administration, Polytechnic Institute of Setúbal, Portugal
2 School of Business and Administration, Polytechnic Institute of Setúbal, Portugal; Center for Studies and Advanced Training in Management and Economics (CEFAGE), University of Évora, Portugal
3 School of Business and Administration, Polytechnic Institute of Setúbal, Portugal
4 School of Business and Administration, Polytechnic Institute of Setúbal, Portugal
5 School of Business and Administration, Polytechnic Institute of Setúbal, Portugal

suggesting that agents cannot obtain returns above the market average without incurring additional risk (Ferreira & Dionísio, 2016).

One of the fundamental concepts of financial theory concerns the efficiency of markets, where the prices of financial assets provide the appropriate signals for the purchase of resources. The market efficiency hypothesis starts from the premise that an investor cannot obtain an extraordinary risk-adjusted return. However, several empirical studies have demonstrated that for the same level of risk, an investor may eventually achieve a return above the market average (Dias et al., 2022; Guedes et al., 2022; Teixeira et al., 2022; Zebende et al., 2022).

Given the events of 2020, the Covid-19 pandemic crisis, and the Russian invasion in 2022, it becomes pertinent to study the predictability of the stock indexes of the Netherlands (AEX), Belgium (BEL 20), France (CAC 40), Ireland (ISEQ 20), Portugal (PSI 20), in the period from September 18th, 2017, to September 15th, 2022. The results show that during the first wave of Covid-19, the markets exhibit significant imbalances caused by global economic uncertainty, implying that the prices of these regional markets could be predictable; similar results were also observed during the Russian invasion in 2022 but to a lesser extent. The results reveal that these markets are balanced during the Tranquil and second wave of Covid-19 sub-periods and that the informational hypothesis cannot be questioned.

This work is divided into five sections in terms of structure. Section 2 is a review of the literature on the efficient market theory in international financial markets. The methods and data are described in Section 3. The findings are presented in Section 4. Section 5 concludes.

2. LITERATURE REVIEW

The author Gibson (1889) produced the first concept of market efficiency, which demonstrated that information regarding stock value was not only complete but also free. In a complementary way, the mathematician Bachelier (1900), showed that asset prices fluctuate randomly and unpredictably, that is, they are independent of previous fluctuations, thus formulating the random walk hypothesis, contributing to what would become one of the most famous theories in finance, the market efficiency hypothesis. Later, the authors Cowles (1933), Cowles (1944), Working (1949) endorsed the random walk hypothesis, stating that investors cannot forecast future values based on previous prices.

Ferreira and Dionísio (2014) examined the predictability of 10 capital markets, showing that the stock indexes of Spain, Greece and Portugal present pronounced long memories, which may put into question the hypothesis of portfolio diversification. The authors Dias et al. (2019) analyzed the financial integration and persistence in Latin American capital markets in the period from 1999 to 2016. The authors show that markets are partially integrated in periods of crisis and non-crisis, and that time data do not reveal strong long memories from the subprime crisis, indicating a rebalancing in these regional markets beginning in 2013. Takyi and Bentum-Ennin (2021) examined the functioning of African capital markets from October 2019 to June 2020; the authors concluded that the global pandemic of 2020 had negative effects on efficiency in its weak form. In a complementary manner Aslam et al. (2020) studied 8 European stock markets, used intraday (5-minute) data, over the period from January 1st, 2020 to March 23rd, 2020, and found that the Spanish stock market is the most efficient, while the Austrian market the most (in)efficient. The authors show that the global pandemic of 2020 required a broad response from

regulators and supervisors in order to improve the market's informational efficiency during pandemic outbreaks.

Dias, Alexandre, Vasco, et al. (2021) and Dias, Heliodoro, Alexandre, et al. (2021) tested the commodities and stock markets during the 2020 global pandemic and show that the random walk hypothesis is rejected for the gold, platinum, and silver markets, as well as for the Asian stock markets. The authors demonstrate that returns are autocorrelated over time, which means that price fluctuations are not i.i.d., allowing investors to get above-average returns without incurring additional risk. Vasco et al. (2021) analyzed the efficient market hypothesis, in its weak form, in the capital markets of Brazil, China, South Korea, the USA, Spain, and Italy, in the period from December 2nd, 2019, to May 12th, 2020. The authors highlight that the analyzed markets present long memories, suggesting that the analyzed stock indexes present some predictability.

Guedes et al. (2022) investigated if the recent 20 years' financial crises lowered efficiency in its weak form in 19 stock markets belonging to the 20 most developed nations (G-20). The authors demonstrate, for the most part, that markets exhibit signs of (in) efficiency, such as asymmetries and non-Gaussian distributions, as well DFA exponents different from 0.5.

In a complementary manner, the authors Zebende et al. (2022) employed intraday data to measure market efficiency, in its weak form, in G20 capital markets. The authors show that for time scales less than 5 days, stock markets tend to be efficient, while for time scales longer than 10 days, stock markets tend to be inefficient.

The authors Dias et al. (2022) tested the random walk hypothesis in capital markets of Africa (namely, Botswana, Egypt, Kenya, Morocco, Nigeria, and South Africa) US, the UK, and Japan. The authors suggest that returns are autocorrelated over time, that is, the random walk hypothesis is rejected for all the markets under analysis, with no differences between mature and emerging markets.

In summary, this paper aims to contribute to providing information to investors and regulators of European capital markets, where individual and institutional investors seek diversification benefits, as well as to help promote the implementation of policies that contribute to the efficiency of international markets.

3. METHODOLOGY AND DATA

3.1. DATA

The data analyzed are the prices index of the capital markets of the Netherlands (AEX), Belgium (BEL 20), France (CAC 40), Ireland (ISEQ 20), Portugal (PSI 20), in the period from 18th September 2017 to 15th September 2022. To gauge the research question more efficiently we divided the sample into four sub-periods: the first sub-period we call Tranquil, which comprises the period from September 18th, 2017 to December 31st, 2019; the time-lapse of January 1st, 2020 to December 31st, 2020 represents the 1st Covid-19 Wave and for the 2nd Wave of the global pandemic we define the period from January 1st, 2021 to December 31st, 2021; the fourth sub-period we define the period from January 1st, 2022 to September 15th, 2022 and is related to the Russian invasion of Ukraine. The daily price indexes are derived from the Thomson Reuters Eikon platform and are in euros.

Table 1. The name of countries and their indexes used in this paper

Country	Index
Netherlands	AEX
Belgium	BEL 20
France	CAC 40
Ireland	ISEQ 20
Portugal	PSI 20

Source: Own elaboration

3.2. METHODOLOGY

The research will proceed in stages. In the first step, we will graph levels and returns to better understand the volatility of European capital markets between 2017 and 2022. To determine if the time series has a normal distribution, we will use traditional descriptive statistics, such as skewness and kurtosis estimates, as well as the Jarque and Bera (1980) test.

To determine if the turmoil in the capital markets caused structural breakdowns, we will estimate the Clemente et al. test (1998). To answer the study issue and evaluate efficiency in its weak form in European capital markets, we will use the BDS model to determine if the temporal data is nonlinear or has a strong nonlinear component (Brock & de Lima, 1996). This test is useful for detecting dependence in time series by evaluating the null hypothesis that a series is i.i.d. (independent and identically distributed).

The calculation of the BDS test comprises the following procedures:

1. Given a time series, with N observations, we calculate the first difference of the logarithms of the time series data;

$$\{x_j\} = [x_1, x_2, x_3, \dots, x_N] \tag{1}$$

2. Choosing a value of *m* (dip dimension), one plunges the series into the vectors of dimension *m*, choosing each of the m successive points in the series. This procedure converts the series of scalars into series of vectors;

$$x_1^m = (x_1, x_2, \dots x_m) \tag{2}$$

$$x_2^m = (x_2, x_3, \dots x_{m+1}) \tag{3}$$

$$x_{N-m}^m = (x_{N-m}, x_{N-m+1}, \dots x_N) \tag{4}$$

3. We calculate the correlation integral, in order to measure the spatial correlation of the points, by adding the number of pairs of the points (*i,j*), where $1 \leq i \leq N$ and $1 \leq j \leq N$, in the space of dimension m, which is closed, on the assumption that the points are within the tolerance radius, of ε , each.

$$C_{\varepsilon,m} = \frac{1}{N_m(N_m - 1)} \sum_{i \neq j} l_{i,j;\varepsilon}$$

where $l_{i,j;\varepsilon} = 1$ if $l_{i,j;\varepsilon} \left\| X_i^m - X_j^m \right\| \leq \varepsilon = 0$, otherwise: (5)

4. Brock and de Lima (1996) concluded that if a series is i.i.d., then:

$$C_{\varepsilon,m} \approx [C_{\varepsilon,1}]^m \tag{6}$$

And that the quantity $\left[C_{\varepsilon,m} - \left(C_{\varepsilon,1}\right)^m\right]$ follows a normal distribution, with mean zero and variance V(ε,m), defined as:

$$V_{\varepsilon,m} = 4\left[K^m + 2\sum_{j=1}^{m-1} K^{m-j}C_{\varepsilon}^{2j} + (m-1)^2 C_{\varepsilon}^{2m} - m^2 K C_{\varepsilon}^{2m-2}\right] \tag{7}$$

Where:

$$K = K_{\varepsilon} = \frac{6}{N_m(N_m-1)(N_m-2)}\sum_{i<j<N} h_{i,j,N;\varepsilon}; \tag{8}$$

And:

$$h_{i,j,N;\varepsilon} = \frac{\left[l_{i,j;\varepsilon}l_{j,N;\varepsilon} + l_{i,N;\varepsilon}l_{N,j;\varepsilon} + l_{j,i;\varepsilon}l_{i,N;\varepsilon}\right]}{3} \tag{9}$$

5. The BDS test statistic is as follows:

$$BDS_{\varepsilon,m} = \frac{\sqrt{N}\left[C_{\varepsilon,m} - \left(C_{\varepsilon,1}\right)^m\right]}{\sqrt{V_{\varepsilon,m}}} \tag{10}$$

Brock and de Lima (1996) determined that when a sample has more than 500 observations, like in the case of the series analyzed, this statistic follows the asymptotic normal distribution. The BDS test is two-sided, rejecting the null hypothesis if the value taken by the test statistic is higher than the critical value (for example, for 0,05 the corresponding critical value is ±1,96).

The Econophysical Detrended Fluctuation Analysis (DFA) model will be used to validate and robust the results. DFA is a method of analyzing time dependency in nonstationary time series. By assuming that the time series are non-stationary, this method prevents false conclusions when the study focuses on the long-run relationships of the time series. This approach was then used to investigate the behavior of financial series.

DFA has the following interpretation: $0 < \alpha < 0{,}5$: anti persistent series; $\alpha = 0{,}5$ series exhibits random walk; $0{,}5 < \alpha < 1$ persistent series. For a better understanding of this model see the articles developed by Dias et al. (2019), Dias et al. (2022), Zebende et al. (2022), Guedes et al. (2022).

4. RESULTS

Figure 1 shows the evolution, in levels, of the 5 capital markets, namely the AEX (Netherlands), BEL 20 (Belgium), CAC 40 (France), ISEQ 20 (Ireland), PSI 20 (Portugal) stock indexes, for the period from September 18th, 2017, to September 15th, 2022. Based on the observation of the graphs we realize that there is extreme volatility in the first quarter of 2020, evidencing possible breaks in structure. These findings are validated by the authors Dias, Heliodoro, Alexandre, et al. (2021), and Teixeira et al. (2022), who demonstrate the existence of structural fractures in international financial markets in their works.

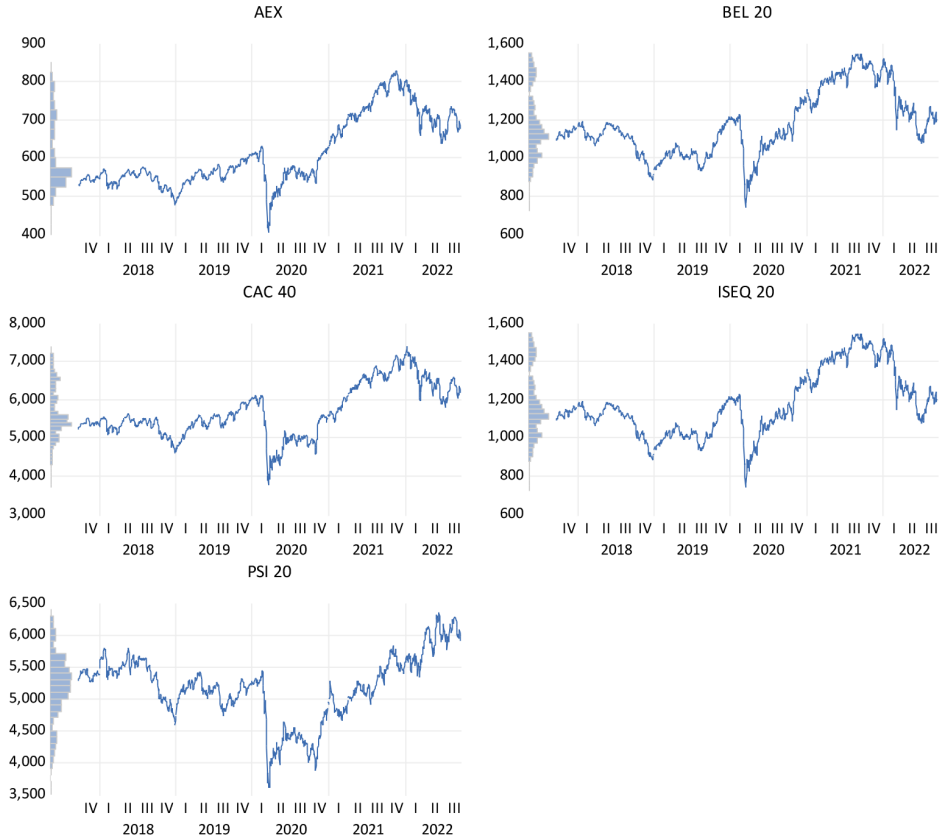


Figure 1. Evolution, in levels, of the 5 European capital markets for the period from 18th September 2017 to 15th September 2022

Source: Own elaboration

In figure 2 we can observe that the data series present a high dispersion around the mean, as well as the existence of sharp structure breaks, due to the sudden drop of stock prices in the analyzed markets. This evidence was also found by the authors, Silva et al. (2020), Vasco et al. (2021), Pardal, Dias, et al. (2021), and Dias et al. (2022).

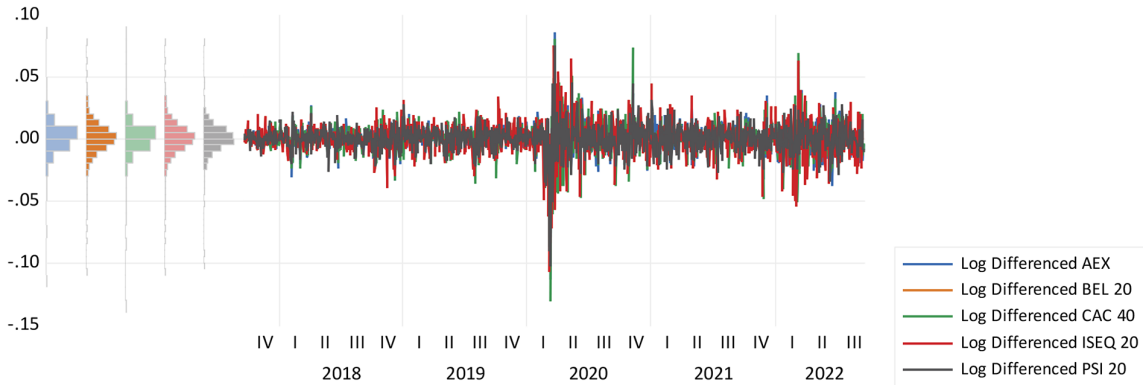


Figure 2. Evolution, in returns, of the 5 European capital markets for the period from September 18th, 2017, to September 15th, 2022

Source: Own elaboration

Table 2 shows the main descriptive statistics of the AEX (Netherlands), BEL 20 (Belgium), CAC 40 (France), ISEQ 20 (Ireland), PSI 20 (Portugal) stock indexes, for the period from September 18th, 2017, to September 15th, 2022. The markets under consideration had positive average returns,

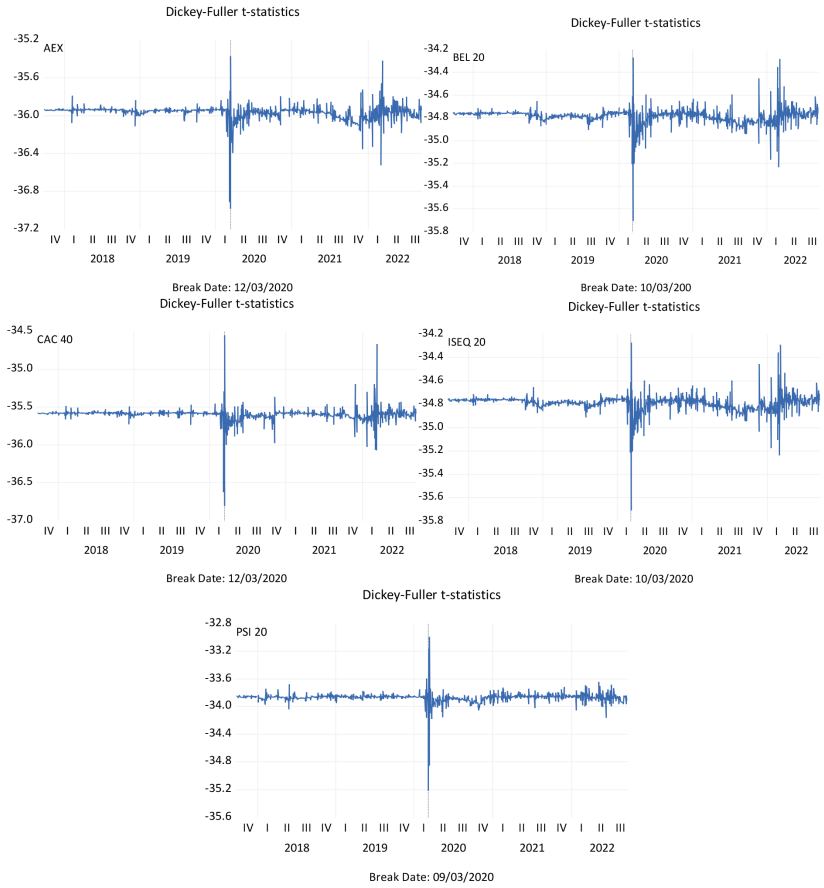
with the stock indexes of Belgium and Ireland (0.013579) having the highest standard deviation when compared to the other markets under consideration. The French stock market (CAC 40) has the most significant skewness (-1.075170) and Kurtosis (17.49855), as seen in the remaining time series. To confirm this evidence, we use Jarque and Bera's (1980) test, which demonstrates that data do not follow a normal distribution since H0 is rejected at a 1% significance level.

Table 2. Descriptive statistics, return, of the 5 European capital markets over the period from September 18th, 2017, to September 15th, 2022

	AEX	BEL 20	CAC 40	ISEQ 20	PSI 20
Mean	0.000189	6.83E-05	0.000127	6.86E-05	8.76E-05
Std.Dev.	0.011682	0.013579	0.012773	0.013579	0.010942
Skewness	-0.957693	-0.666450	-1.075170	-0.666485	-0.993261
Kurtosis	14.99638	10.38800	17.49855	10.38769	15.13170
Jarque-Bera	7871.026	3005.824	11457.70	3005.587	8059.975
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.242368	0.087369	0.163003	0.087746	0.112159
SumSq.Dev.	0.174530	0.235826	0.208652	0.235830	0.153137
Observations	1280	1280	1280	1280	1280

Note: ***. **. *. represent significance at 1%. 5% and 10%, respectively

Source: Own elaboration



Note: Lag Length (Automatic Length based on SIC) Break Selection: Minimize Dickey-Fuller t-statistic. The lateral values in parentheses refer to lags. ***. **. *. represent significance at 1%. 5% and 10%. respectively

Figure 3. Unit root tests, with structural breaks, of Clemente et al. (1998), concerning the 5 European capital markets for the period from September 18th, 2017, to September 15th, 2022

Source: Own elaboration

In Figure 3 we can observe the unit root tests with structural breaks of Clemente et al. (1998), conducted to the capital markets of the Netherlands (AEX) Belgium (BEL 20), France (CAC 40), Ireland (ISEQ 20), Portugal (PSI 20), in the period from September 18th, 2017 to September 15th, 2022. Based on the results we can evidence that the most significant break, during the sample period, occurs in March 2020, with no significant differences between markets. These findings are validated by the authors Pardal, Dias, et al. (2020), Bagão et al. (2020), Dias, Teixeira, Machova, et al. (2020), and Teixeira et al. (2022), who show that the uncertainty surrounding the 2020 pandemic outbreak (Covid-19) caused significant losses in international financial markets.

Table 3. BDS test applied to time series residuals, concerning the 5 European capital markets, for the period from September 18th, 2017, to September 15th, 2022

BDS Test for PSI 20					
Dimension	**BDS Statistic**	**Std. Error**	**z-Statistic**	**Prob.**	
2	0.018174	0.002338	7.774201	0.0000	
3	0.038447	0.003707	10.37036	0.0000	
4	0.051997	0.004405	11.80284	0.0000	
5	0.058456	0.004582	12.75786	0.0000	
6	0.060739	0.004409	13.77499	0.0000	
Raw epsilon		0.013870			
Pairs within epsilon		1151852.	V-Statistic	0.703035	
Triples within epsilon		1.12E+09	V-Statistic	0.536060	
Dimension	**C(m,n)**	**c(m,n)**	**C(1,n-(m-1))**	**c(1,n-(m-1))**	**c(1,n-(m-1))^k**
2	418725.0	0.512339	574523.0	0.702969	0.494165
3	314858.0	0.385854	573638.0	0.702985	0.347407
4	241391.0	0.296285	572779.0	0.703033	0.244288
5	187687.0	0.230730	572235.0	0.703467	0.172273
6	147581.0	0.181711	571168.0	0.703257	0.120972
BDS Test for AEX					
Dimension	**BDS Statistic**	**Std. Error**	**z-Statistic**	**Prob.**	
2	0.023786	0.002612	9.107616	0.0000	
3	0.050947	0.004143	12.29835	0.0000	
4	0.069855	0.004924	14.18570	0.0000	
5	0.082876	0.005124	16.17455	0.0000	
6	0.088175	0.004933	17.87396	0.0000	
Raw epsilon		0.014350			
Pairs within epsilon		1150938.	V-Statistic	0.702477	
Triples within epsilon		1.13E+09	V-Statistic	0.540174	
Dimension	**C(m,n)**	**c(m,n)**	**C(1,n-(m-1))**	**c(1,n-(m-1))**	**c(1,n-(m-1))^k**
2	422516.0	0.516978	573957.0	0.702276	0.493192
3	324014.0	0.397075	572933.0	0.702121	0.346128
4	255689.0	0.313834	572598.0	0.702811	0.243979
5	207277.0	0.254812	572011.0	0.703191	0.171936
6	170226.0	0.209593	571518.0	0.703688	0.121418
BDS Test for BEL 20					
Dimension	**BDS Statistic**	**Std. Error**	**z-Statistic**	**Prob.**	
2	0.017039	0.002522	6.756537	0.0000	
3	0.038910	0.004000	9.726749	0.0000	
4	0.052988	0.004755	11.14347	0.0000	
5	0.062637	0.004947	12.66050	0.0000	
6	0.065294	0.004763	13.70883	0.0000	
Raw epsilon		0.016811			
Pairs within epsilon		1151338.	V-Statistic	0.702721	
Triples within epsilon		1.13E+09	V-Statistic	0.538912	

Dimension	**C(m,n)**	**c(m,n)**	**C(1,n-(m-1))**	**c(1,n-(m-1))**	**c(1,n-(m-1))^k**
2	416974.0	0.510197	573937.0	0.702252	0.493157
3	314063.0	0.384880	572846.0	0.702015	0.345970
4	240780.0	0.295535	571756.0	0.701777	0.242547
5	189218.0	0.232612	570700.0	0.701580	0.169975
6	150322.0	0.185086	570235.0	0.702109	0.119791
BDS Test for CAC 40					
Dimension	**BDS Statistic**	**Std. Error**	**z-Statistic**	**Prob.**	
2	0.025278	0.002716	9.307648	0.0000	
3	0.051174	0.004313	11.86499	0.0000	
4	0.070954	0.005133	13.82197	0.0000	
5	0.082595	0.005348	15.44321	0.0000	
6	0.086794	0.005156	16.83338	0.0000	
Raw epsilon		0.014859			
Pairs within epsilon		1151922.	V-Statistic	0.703077	
Triples within epsilon		1.14E+09	V-Statistic	0.542880	
Dimension	C(m,n)	c(m,n)	C(1,n-(m-1))	c(1,n-(m-1))	c(1,n-(m-1))^k
2	424511.0	0.519419	574509.0	0.702952	0.494141
3	324960.0	0.398234	573447.0	0.702751	0.347060
4	256915.0	0.315339	572836.0	0.703103	0.244385
5	207574.0	0.255177	572440.0	0.703719	0.172582
6	169301.0	0.208454	571708.0	0.703922	0.121660
BDS Test for ISEQ 20					
Dimension	**BDS Statistic**	**Std. Error**	**z-Statistic**	**Prob.**	
2	0.017047	0.002522	6.760052	0.0000	
3	0.038926	0.004000	9.731058	0.0000	
4	0.053009	0.004755	11.14849	0.0000	
5	0.062645	0.004947	12.66269	0.0000	
6	0.065304	0.004763	13.71146	0.0000	
Raw epsilon		0.016812			
Pairs within epsilon		1151334.	V-Statistic	0.702719	
Triples within epsilon		1.13E+09	V-Statistic	0.538907	
Dimension	**C(m,n)**	**c(m,n)**	**C(1,n-(m-1))**	**c(1,n-(m-1))**	**c(1,n-(m-1))^k**
2	416978.0	0.510202	573935.0	0.702249	0.493154
3	314073.0	0.384892	572844.0	0.702012	0.345966
4	240795.0	0.295553	571754.0	0.701775	0.242544
5	189238.0	0.232636	570711.0	0.701593	0.169991
6	150341.0	0.185109	570246.0	0.702122	0.119805

Note: The method considered in the BDS test was the pair fraction, for a value of 0.7. The first column refers to the embedding dimension. The values presented in the table refer to z-Statistic.
***, ** represent significance at 1% and 5%, respectively

Source: Own elaboration

Table 3 shows the results of the BDS test, performed on the capital markets of the Netherlands (AEX), Belgium (BEL 20), France (CAC 40), Ireland (ISEQ 20) and Portugal (PSI 20), for the period from September 18th, 2017 to September 15th, 2022. Based on the findings, we show that the data is not independent and identically distributed (i.i.d.), indicating that the returns of the European capital markets under consideration are non-linear or have a strong non-linear component.

The rejection of the null hypothesis, may be explained, among other factors, by the existence of autocorrelation or heteroscedasticity in the stock market indexes under analysis. These findings may be verified in the works of the authors Santos et al. (2020), Santos et al. (2021), that show the existence of persistence in financial market returns.

The findings of the DFA exponents are shown in tables 4 and 5, and during the calm sub-period, the random walk hypothesis is not rejected in any of the European stock indexes. When we look at the first Covid-19 subperiod, we see that all financial markets have long memories, or a propensity to forecast returns. The Portuguese stock market has the highest value of persistence (0.65), while the stock indexes of Belgium (BEL 20), France (CAC 40), Ireland (ISEQ 20), and the Netherlands have exponents of 0.62 and 0.61, respectively.

In the second Covid-19 wave subperiod, we find that markets tend towards equilibrium, a finding validated by the non-rejection of the random walk hypothesis. In the fourth sub-period where we analyze the time-lapse of the Russian invasion of Ukraine in 2022, we find that the hypothesis of efficiency, in its weak form, is rejected in all stock indexes, except for the French capital market (CAC 40).

The BEL 20 and ISEQ 20 stock indexes are the most persistent, with exponents of 0.62 and 0.61, respectively, while the PSI 20 has an alpha of 0.57 and the Netherlands (AEX) has an alpha of 0.54. When we compare the sub-periods, we find that markets display more extreme imbalances during the first wave of Covid-19, owing to concern about the 2020 pandemic breakout.

Complementarily we also highlight that, during the sub-periods of the first wave Covid-19, and the Russian invasion in 2022, prices do not fully reflect available information and that fluctuations in prices are not i.i.d. This carries implications for investors, as some returns may be expected, creating arbitrage and abnormal profit opportunities. These results are validated by the authors Dias, Heliodoro, Teixeira, et al. (2020), Dias and Santos, (2020), Dias, Pardal, et al. (2021), and Santos et al. (2021) that suggest the presence of long memories in international financial markets.

Table 4. DFA exponent for index and return. The values of the linear adjustments for α DFA always had R2 > 0.99

Stock market	DFA exponent (Calm)	DFA exponent (1 Vacancy Covid-19)
AEX	0.52 ≅ 0.0067	0.61 ≅ 0.0574***
BEL 20	0.55 ≅ 0.0272	0.62 ≅ 0.0472***
CAC 40	0.52 ≅ 0.0064	0.62 ≅ 0.0406***
ISEQ 20	0.54 ≅ 0.0289	0.62 ≅ 0.0427***
PSI 20	0.53 ≅ 0.0126	0.65 ≅ 0.0327***

Note: The hypotheses are H0: $\alpha = 0.5$ and H1: $\alpha \neq 0.5$.
***. **. *. represent significance at 1%. 5% and 10%. respectively

Source: Own elaboration

Table 5. DFA exponent for index and return. The values of the linear adjustments for α DFA always had R2 > 0.99

Stock market	DFA exponent (2 Vacancy Covid-19)	DFA exponent (invasion 2022)
AEX	0.44 ≅ 0.0183	0.54 ≅ 0.0314**
BEL 20	0.49 ≅ 0.0280	0.62 ≅ 0.0234***
CAC 40	0.49 ≅ 0.0224	0.52 ≅ 0.0362*
ISEQ 20	0.49 ≅ 0.0289	0.61 ≅ 0.0234***
PSI 20	0.45 ≅ 0.0386	0.57 ≅ 0.0193***

Note: The hypotheses are H0: $\alpha = 0.5$ and H1: $\alpha \neq 0.5$.
***. **. *. represent significance at 1%. 5% and 10%. respectively

Source: Own elaboration

5. CONCLUSION

This paper tested efficiency, in its weak form, in the capital markets of the Netherlands (AEX), Belgium (BEL 20), France (CAC 40), Ireland (ISEQ 20), Portugal (PSI 20), in the period from September 18th, 2017 to September 15th, 2022.

The general conclusion to be retained and sustained in the results obtained, through the tests carried out with econometric and mathematical models demonstrated that the worldwide pandemic of 2020 (1st wave) and the Russian invasion in 2022 had a substantial impact on the memory properties of the European markets analyzed.

We also find that the European equity markets, under analysis, are in equilibrium during the Tranquil and second wave Covid-19 subperiods and that the (in) efficiency hypothesis, in its weak form, does not hold, implying that investors are unlikely to obtain returns above the market average without incurring additional risk. When we analyze the sub-period corresponding to the first wave of Covid-19, we find that all capital markets show long memories, which means that, there is a propensity to forecast returns, with the Portuguese capital market having the greatest persistence value (0.65).

For the period corresponding to the Russian invasion of 2022, we find that the hypothesis of efficiency, in its weak form, is rejected in all stock indexes, except for the French stock market (CAC 40). When we compare the sub-periods of the first wave of Covid-19 and the Russian invasion in 2022, we notice that markets exhibit more pronounced imbalances during the first wave of Covid-19, due in part to uncertainty about the developments of the 2020 pandemic outbreak.

Complementarily we also highlight that, during subperiods of greater uncertainty in the global economy, prices do not fully reflect available information and that price changes are not i.i.d. Put in other words there is a reversion to the mean, and prices become predictable, allowing regional and international investors to achieve above-market average returns.

The authors conclude that these findings are significant for regulators and supervisors of European capital markets to promote measures to ensure that available market information is corrected more efficiently.

References

Aslam, F., Mohti, W., & Ferreira, P. (2020). Evidence of Intraday Multifractality in European Stock Markets during the Recent Coronavirus (COVID-19) Outbreak. *International Journal of Financial Studies, 8(2)*, 31. https://doi.org/10.3390/ijfs8020031

Bachelier, L. (1900). Théorie de la spéculation. *Annales scientifiques de l'École normale supérieure, 17*, 21-86. https://doi.org/10.24033/asens.476

Bagão, M., Dias, R., Heliodoro, P., & Alexandre, P. (2020). THE IMPACT OF COVID-19 ON EUROPEAN FINANCIAL MARKETS: AN EMPIRICAL ANALYSIS. LIMEN - International Scientific-Business Conference - Leadership, Innovation, Management and Economics: Integrated Politics of Research, *6th LIMEN Conference Proceedings (Part of LIMEN Conference Collection)*, 6(July), 1–11. https://doi.org/10.31410/limen.2020.1

Brock, W. A., & de Lima, P. J. F. (1996). 11 Nonlinear time series, complexity theory, and finance. *Handbook of Statistics*, 317-361. https://doi.org/10.1016/s0169-7161(96)14013-x

Clemente, J., Montañés, A., & Reyes, M. (1998). Testing for a unit root in variables with a double change in the mean. *Economics Letters, 59(2)*, 175-182. https://doi.org/10.1016/s0165-1765(98)00052-4

Cowles, A. (1933). Can Stock Market Forecasters Forecast? *Econometrica, 1(3)*, 309. https://doi.org/10.2307/1907042

Cowles, A. (1944). Stock Market Forecasting. *Econometrica, 12(3/4)*, 206. https://doi.org/10.2307/1905433

Dias, R. T., Pardal, P., Santos, H., & Vasco, C. (2021). Testing the Random Walk Hypothesis for Real Exchange Rates. *Handbook of Research on Reinventing Economies and Organizations Following a Global Health Crisis*, 304-322. https://doi.org/10.4018/978-1-7998-6926-9.ch017

Dias, R., & Santos, H. (2020). Stock Market Efficiency in Africa: Evidence from Random Walk Hypothesis. *6th LIMEN Conference Proceedings (Part of LIMEN Conference Collection)*, *6*(July), 25–37. https://doi.org/10.31410/limen.2020.25

Dias, R., Alexandre, P., Vasco, C., Heliodoro, P., & Santos, H. (2021). Random Walks and Market Efficiency: Gold, Platinum, Silver Vs Asia Equity Markets. *5th EMAN Conference Proceedings (Part of EMAN Conference Collection)*, October, 55-70. https://doi.org/10.31410/eman.2021.55

Dias, R., da Silva, J. V., & Dionísio, A. (2019). Financial markets of the LAC region: Does the crisis influence the financial integration? *International Review of Financial Analysis, 63*, 160-173. https://doi.org/10.1016/j.irfa.2019.02.008

Dias, R., Heliodoro, P., Alexandre, P., Santos, H., & Farinha, A. (2021). Long memory in stock returns: Evidence from the Eastern European markets. *SHS Web of Conferences, 91*, 01029. https://doi.org/10.1051/shsconf/20219101029

Dias, R., Heliodoro, P., Teixeira, N., & Godinho, T. (2020). Testing the Weak Form of Efficient Market Hypothesis: Empirical Evidence from Equity Markets. *International Journal of Accounting, Finance and Risk Management*, *5(1)*. https://doi.org/10.11648/j.ijafrm.20200501.14

Dias, R., Pereira, J. M., & Carvalho, L. C. (2022). Are African Stock Markets Efficient? A Comparative Analysis Between Six African Markets, the UK, Japan and the USA in the Period of the Pandemic. *Naše gospodarstvo/Our economy, 68(1)*, 35-51. https://doi.org/10.2478/ngoe-2022-0004

Dias, R., Teixeira, N., Machova, V., Pardal, P., Horak, J., & Vochozka, M. (2020). Random walks and market efficiency tests: evidence on US, Chinese and European capital markets within the context of the global Covid-19 pandemic. *Oeconomia Copernicana, 11(4)*, 585-608. https://doi.org/10.24136/oc.2020.024

Fama, E. F. (1965). Random Walks in Stock Market Prices. *Financial Analysts Journal, 21(5)*, 55-59. https://doi.org/10.2469/faj.v21.n5.55

Fama, E. F. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. *The Journal of Finance, 25(2)*, 383. https://doi.org/10.2307/2325486

Fama, E. F. (1991). Efficient Capital Markets: II. *The Journal of Finance, 46(5)*, 1575-1617. https://doi.org/10.1111/j.1540-6261.1991.tb04636.x

Ferreira, P., & Dionísio, A. (2014). Revisiting serial dependence in the stock markets of the G7 countries, Portugal, Spain and Greece. *Applied Financial Economics, 24(5)*, 319-331. https://doi.org/10.1080/09603107.2013.875106

Ferreira, P., & Dionísio, A. (2016). How long is the memory of the US stock market? *Physica A: Statistical Mechanics and its Applications, 451*, 502-506. https://doi.org/10.1016/j.physa.2016.01.080

Gibson, G. R. (1889). *The Stock Markets of London, Paris and New York.* G.P. Putnam's Sons

Guedes, E. F., Santos, R. P. C., Figueredo, L. H. R., da Silva, P. A., Dias, R. M. T. S., & Zebende, G. F. (2022). Efficiency and Long-Range Correlation in G-20 Stock Indexes: A Sliding Windows Approach. *Fluctuation and Noise Letters, 21(04)*. https://doi.org/10.1142/s021947752250033x

Jarque, C. M., & Bera, A. K. (1980). Efficient tests for normality, homoscedasticity and serial independence of regression residuals. *Economics Letters*, *6*(3), 255–259. https://doi.org/10.1016/0165-1765(80)90024-5

Pardal, P., Dias, R. T., Santos, H., & Vasco, C. (2021). Central European Banking Sector Integration and Shocks During the Global Pandemic (COVID-19). *Handbook of Research on Reinventing Economies and Organizations Following a Global Health Crisis*, 272-288. https://doi.org/10.4018/978-1-7998-6926-9.ch015

Pardal, P., Dias, R., Šuleř, P., Teixeira, N., & Krulický, T. (2020). Integration in Central European capital markets in the context of the global COVID-19 pandemic. *Equilibrium, 15(4)*, 627-650. https://doi.org/10.24136/eq.2020.027

Santos, H., Dias, R., Heliodoro, P., & Alexandre, P. (2020). Testing the Empirics of Weak Form of Efficient Market Hypothesis: Evidence from Lac Region Markets. *Conference Proceedings (Part of ITEMA Conference Collection)*, 91–101. https://doi.org/10.31410/itema.2020.91

Santos, H., Dias, R., Vasco, C., Alexandre, P., & Heliodoro, P. (2021). Has the Global Pandemic of 2020 Led to Persistence in the Share Prices of Large Global Companies? *5th EMAN Selected Papers (Part of EMAN Conference Collection)*, October, 1–15. https://doi.org/10.31410/eman.s.p.2021.1

Silva, R., Dias, R., Heliodoro, P., & Alexandre, P. (2020). Risk Diversification in ASEAN-5 Financial Markets: An Empirical Analysis in the Context of the Global Pandemic (Covid-19). *6th LIMEN Selected Papers (Part of LIMEN Conference Collection)*, *6* (July), 15–26. https://doi.org/10.31410/limen.s.p.2020.15

Takyi, P. O., & Bentum-Ennin, I. (2021). The impact of COVID-19 on stock market performance in Africa: A Bayesian structural time series approach. *Journal of Economics and Business, 115*, 105968. https://doi.org/10.1016/j.jeconbus.2020.105968

Teixeira, N., Dias, R., Pardal, P., & Styles, L. (2022). The gold market as a safe haven when stock markets exhibit pronounced levels of risk: evidence during the China crisis and the COVID-19 pandemic. *Revista Gestão & Tecnologia 21(1)*, 27–42. https://doi.org/10.12660/rgplp.v21n1.2022.82032

Vasco, C., Pardal, P., & Dias, R. T. (2021). Do the Stock Market Indices Follow a Random Walk? *Handbook of Research on Financial Management During Economic Downturn and Recovery*, 389-410. https://doi.org/10.4018/978-1-7998-6643-5.ch022

Working, H. (1949). The investigation of economic expectations. *The American Economic Review.*

Zebende, G. F., Santos Dias, R. M. T., & de Aguiar, L. C. (2022). Stock market efficiency: An intraday case of study about the G-20 group. *Heliyon*, *8*(1), e08808. https://doi.org/10.1016/j.heliyon.2022.e08808

6th International Scientific Conference ITEMA 2022 – Selected Papers
DOI: https://doi.org/10.31410/ITEMA.S.P.2022.61

Recent Advances in Fintech: The Case of Italian Challenger Banks

Annalisa Baldissera[1]

Received: November 10, 2022
Accepted: February 8, 2023
Published: June 12, 2023

Keywords:
Financial technology;
Emerging finance;
Digitalization;
Economic performance

Abstract: *Fintech or financial technology is a relatively recent and expanding phenomenon, which identifies the application of technologies, in particular digital, in the financial sector. In the context of Fintech, a recently born sector is represented by challenger banks (CBs), i.e. banks that do not have branches but operate exclusively through apps and smartphones. There are currently 96 challenger banks in Europe, of which 12 are located in Italy. This study aims to analyze the performance of the Italian challenger banks in the three years 2019-2021 to grasp the strengths and weaknesses of their management. The study highlighted how Italian challenger banks have overcome the pandemic with satisfactory results compared to 2019. This is partly due to the advantages that digital services offer in conditions in which physical travel is limited or prohibited. However, income performance also grew in 2021 and confirms the progressive strengthening of the sector.*

1. INTRODUCTION

Fintech or Financial Technology is a relatively recent phenomenon. Although there is no single definition of Fintech, this term generally identifies the application of technologies, in particular digital, in the financial sector.

It should be noted in the introduction that, in general, the use of digital technologies can be defined with two similar terms but with different meanings. As evidenced by the literature, there is *a tendency of the definition of digitization towards explaining a technical process of data conversion, generation, storage, or processing. In contrast, digitalization was mainly referred to as a socio-technical phenomenon, the use of digital technologies, and their influence on societies, businesses, and personal lives* (Frenzel et al., 2021, p. 7).

This study refers to the concept of digitalization, in the sense defined above, and in particular, focuses on the effects that the use of digital technologies produces on companies and their management models. Digitalization, whose developments date back at least to the 1990s (Schallmo & Williams, 2018), has progressively affected a large part of the economic sectors and especially medium and large companies, both bringing advantages and creating new critical issues.

The advantages are linked not only to the possibility of obtaining a vast amount of updated data in real-time to support decisions but also to the introduction of new communication channels that facilitate the exchange of information inside and outside the company (i.e. with managers, customers, suppliers, shareholders, stakeholders).

The criticalities are instead mainly of two types: (a) the onerousness of digital technologies, linked to the investments required for their implementation and the costs of their management; (b) the cultural change required of the company so that new technologies can give their maximum benefit.

[1] Univeristy of Brescia, Department of Law, via San Faustino No. 41, Brescia, Italy

These two aspects, considered jointly, are equivalent in summary to the transformation of the business model and are able to modify even in depth the operating strategies and economic performance of the company, acting above all on the structure of costs and revenues.

In the financial field, the use of digital technologies is often defined through the term Fintech, which can be described as *a cross-disciplinary subject that combines Finance, Technology Management and Innovation Management* (Leong & Sung, 2018, p. 74).

In the banking sector, which represents a relevant segment of the overall financial market, the degree of depth with which digital technologies are applied can be more or less high and its extent is particularly useful in distinguishing traditional banks from challenger banks (CBs). Traditional banks generally integrate digital technologies within an operational structure that is based on physical presence, through branches and agencies with more or less widespread diffusion. In this management model, digital services represent additional options thanks to which banking operations, instead of being carried out in the various local offices, can be carried out online, via PC or smartphone.

Unlike traditional banks, a recently born sector is represented by the challenger banks, i.e. companies without branches, which are not materially present in the territory and operate exclusively through apps and smartphones, so much so that part of the literature assimilates them to information and communication companies (Bataev, 2019).

There are currently 96 challenger banks in Europe, of which 12 are located in Italy. After Great Britain, which has 37 challenger banks, Italy, together with France, is among the most represented countries, followed by Germany, with 8 banks and Spain, with 7 banks.

A characteristic of the challenger banks is their particular profitability structure, which has led the literature to highlight factors both favorable and contrary to the achievement of adequate levels of financial performance.

This study aims to analyze the performance of the Italian challenger banks in the three years 2019-2021 to grasp the strengths and weaknesses of their management. Compared to traditional banks, challenger banks have a very different structure of costs and revenues. This is since, on the one hand, the application of digital technologies represents an opportunity to improve performance, especially for the operational flexibility that it allows to obtain; however, on the other hand, it requires a careful evaluation of costs and revenues.

2. LITERATURE REVIEW AND RESEARCH QUESTIONS

The existing literature underlines how the particular business model of CBs can present both functional characteristics for achieving adequate levels of effectiveness, and structural connotations that make it difficult to obtain high levels of profitability.

According to the study by Bataev et al. (2019), a comparison with traditional financial institutions shows that CBs represent an effective and sustainable management model, capable of being economically efficient both in conditions of crisis and in conditions of market expansion.

The probabilities of obtaining adequate profitability, however, are strictly dependent on some fundamental variables, including in particular the ability to reach a large number of customers.

In this regard, Schepinin and Bataev (2019) have shown that with a capital investment of around 6 million dollars, efficiency can be achieved if during the first year of activity, the CBs are able to have a customer portfolio of at least 210,000 people.

The importance of the number of customers is also underlined by Gnevko (2020), who notes that the UK challenger banks show a considerable weakness in competition with international banking giants, which have unlimited sources of financing and achieve strong economies of scale and scope.

In this regard, some data are significant: *A huge part of the story is the rise of fintechs, which are encroaching on space traditionally occupied by bankers. Yet most challenger banks can only dream of reaching a big-bank customer base. Starling has tens of thousands of customers; N26, a leading mobile bank in Europe, has 850,000; Revolut has 1.5 million. Traditional banks number their customers in the tens of millions: Deutsche Bank (30 million), HSBC (38 million), or Bank of America (57 million)* (Naegele, 2020, p. 19).

The increase in the number of customers, although difficult, can be achieved by improving various aspects of the customer experience, for example, to focus on the most price-sensitive customers to whom to offer services at favorable or even free prices.

Digitalization undoubtedly facilitates the achievement of these goals as it significantly changes the competitive environment in which financial institutions operate, promoting mobility, innovation, flexibility and the ability to offer better services quickly. As pointed out by Sibanda et al. (2020) the advantages of Fintech are considerable and translate, in summary, into (a) faster processes, (b) increased online activity, (c) intense competition, (d) lower cost banking services, (e) smaller branches, (f) leaner workforce, (g) increased development through mergers, (h) more outsourcing, and (i) a more customer-oriented value chain.

Conversely, it should be remembered that the offerings of Fintech products are limited and the lack of territorial networks tends to place some limits on the ability of the challenger banks to replace traditional banks (Stulz, 2019).

In this regard, Johnson (2021) – starting from the consideration that one of the greatest strengths of CBs is the strong customer orientation – identifies the basic needs of consumers to highlight how not all these needs can be satisfied by the new banks better than traditional ones. In particular, challenger banks are lackluster in customer service and have little or no experience or products to meet lending and investment needs.

A further limitation is indicated by Hodson (2021) who points out how, for example in Germany, savings banks enjoy a series of advantages, such as the absence of a profit purpose, state aid and segmented regional markets, which make it difficult to stay on market and limit the ability to compete for banks to reach profitable positions.

In light of the characteristics of CBs, the future of the sector could lie not so much in competition with large banks, but rather in collaboration, thanks to which important synergies could be obtained. In fact, on the one hand, CBs can act as a driving force for the digital transformation of the sector, to improve the offer of financial products and services at lower costs and with greater operational efficiency. On the other hand, traditional banks can find strength not only in

their large size but also in the deep-rooted credibility they enjoy, especially by the stringent regulation to which they are subject (Wewege et al., 2020).

In this regard, the literature has also highlighted how the past experiences of some government policies (for example British) have tried to promote competition, especially with online (or challenger) banks, intending to increase the choices available to consumers and make the whole sector more efficient. However, such policies have led to a perverse outcome, leading to further consolidation and homogeneity (Froud et al., 2017).

Still from the perspective of coexistence, Letts (2017) also sees a sort of division of labor, or market division, in which the major banks can concentrate on wholesale, leaving the management of the interface with the consumer to the new challenger banks.

Although there are CBs with high profitability (Lu, 2017), as Biondo and Menegon (2020) underline, the sector is still in the initial phase of its development and the competition from the major banks is also due to the difficulties of customers of traditional financial institutions to transfer their deposits in favor of new players.

Added to this is the evolution of the traditional banks themselves, which have been able to seize the advantages of digital technologies and have consequently reduced the number of branches, in such a way as to reduce the fixed and variable costs of the operating offices (Polasik et al., 2021).

From what has been described above, it emerges that the literature has amply highlighted the advantages enjoyed by challenger banks and the factors of difficulty they encounter, especially in competition with the big and traditional players.

However, to fully understand the chances of success of CBs, the advantages and the factors of difficulty must not be considered separately, but rather must be studied jointly, especially in how they balance each other, and it seems that the studies on Fintech that adopt this type of approach are fewer.

The present analysis starts from this research gap and from the observation that the profitability scheme characterizing CBs is essentially based on the balancing of two variables. On the one hand, on the cost front, a significant strength is represented by the elimination of the costs associated with maintaining the branches; on the other hand, on the revenue side, an element of weakness is the low-profit margins on financial transactions, many of which are offered at no cost.

Furthermore, it is important to note that the reduction in branch costs certainly has a positive effect on profitability, but we must not forget the presence of a "substitution effect", linked to the need to make up for the lack of branches with other tools that allow offering customers a sufficiently satisfactory service. The absence of branches does not mean the elimination of operating costs, but rather the replacement of some types of costs, mainly linked to the presence of employees, with costs of different types, especially determined by the purchase outside the services that the bank is unable to produce internally.

In other words, the management's priority must consist in monitoring replacement costs, in the sense described above, in order to avoid the absence of branches becoming more expensive than their presence.

As far as revenues are concerned, the reduction in commissions applied to customers is a force factor because it attracts demand for the services offered by CBs. However, the decrease in unit revenues implies that in order to achieve sustainable levels of profitability, management must be able to acquire more customers than would be necessary if the commissions applied were higher.

The achievement of the break-even point can therefore represent a critical factor, but correct monitoring of costs and revenues, especially of the core business, can make CBs effectively profitable.

Based on the above observations, the study formulated the following research question:

RQ What are the characteristics of the economic performance and economic structure of the Italian challenger banks?

3. METHODOLOGY

a) Sample selection

To answer the research question, this study analyzes a sample made up of the top 5 Italian challenger banks, by volume of revenues, in the three years 2019-2021. The observed period is significant because it includes the year before the pandemic (2019), the year of the pandemic (2020), and the first year after the pandemic (2021). The analysis is based on the financial statements published by the banks on their websites, through which the study examines the trend in profitability and its composition, as well as the capital structure, with particular attention to the relationship between debt and equity.

The financial statements are prepared following the IAS/IFRS international accounting standards.

b) Empirical analysis

For empirical analysis, the financial statements data of the sample banks were aggregated for each year included in the observation period. In particular, the examination first concerned the income statement data and then the balance sheet data, based on the assumption that profitability is the main cause on which the financial balance depends. Table 1 presents the aggregate income statement data of the 5 sample banks, in the three years 2019-2021.

Table 1. Aggregate income statement data

Income statement item	2019	2020	2021
10. Interest and similar income	196,419,761	342,349,536	459,914,174
20. Interest and similar expense	-50,730,383	-90,467,863	-119,848,159
30. Interest margin	145,689,378	251,881,673	340,066,015
40. Fee and commission income	113,621,515	112,745,723	147,943,593
50. Fee and commission expense	-72,857,534	-61,741,061	-78,808,040
60. Net fee and commission income	40,763,981	51,004,662	69,135,553
70. Dividends and similar income	56,922	236,495	227,764
80. Profits (Losses) on trading	120,465	-389,878	3,176,193
90. Fair value adjustments in hedge accounting	-34,572	14,972	-37,267

100. Profits (Losses) on disposal or repurchase	42,248,912	38,682,818	29,087,545
110. Profits (Losses) on other financial assets and liabilities measured at fair value through profit or loss	-3,055,156	484,037	4,919,256
120. Net interest and other banking income	225,789,931	341,914,779	446,575,059
130. Net losses/recoveries for credit risks	-25,979,871	-15,543,817	-25,040,062
140. Profits (Losses) on changes in contracts without derecognition	-1,137	39,986	209,028
150. Net income from banking activities	199,808,923	326,410,948	421,744,025
160. Administrative expenses	-205,301,827	-229,646,963	-272,537,827
a) personnel expenses	-71,790,616	-84,172,785	-101,789,831
b) other administrative expenses	-133,511,211	-145,474,178	-170,747,996
170. Net provisions for risks and charges	-7,970,142	-8,403,317	-1,204,628
180. Net adjustments to / recoveries on property and equipment	-9,160,533	-9,579,683	-10,166,974
190. Net adjustments to / recoveries on intangible assets	-7,700,815	-11,896,989	-13,827,185
200. Other operating expenses (income)	17,754,447	19,873,181	36,317,774
210. Operating expenses	-212,378,870	-239,653,771	-261,418,840
220. Profits (Losses) on equity investments	0	-989,629	0
230. Valuation differences on property, equipment and intangible assets measured at fair value	-1,340,982	-1,092,300	-331,850
240. Goodwill impairment	0	0	0
250. Profits (Losses) on disposal of investments	-148	0	2,302,723
260. Income (Loss) before tax from continuing operations	-13,911,077	84,675,248	162,296,058
270. Taxes on income from continuing operations	5,222,600	-12,779,651	-29,121,624
280. Income (Loss) after tax from continuing operations	-8,688,477	71,895,597	133,174,434
290. Income (Loss) after tax from discontinued operations	0	0	253,275
300. Net income (loss)	-8,688,477	71,895,597	133,427,709

Source: Own elaboration

Table 2 presents the aggregate balance sheet data of the 5 banks in the sample, in the three years 2019-2021.

Table 2. Aggregate balance sheet data

Balance sheet item	**2019**	**2020**	**2021**
Assets			
10. Cash and cash equivalents	772,371,795	3,437,218,588	3,358,725,264
20. Financial assets measured at fair value through profit or loss	34,814,185	81,771,105	175,994,959
30. Financial assets measured at fair value through other comprehensive income	223,747,181	202,190,127	380,082,889
40. Financial assets measured at amortized cost	7,111,326,601	7,587,056,619	10,328,820,190
50. Hedging derivatives	1,611,674	0	3,864,836
60. Fair value change of financial assets in hedged portfolios (+/-)	-1,721,983	3,011,513	-4,196,392
70. Equity investments	1,093,269	23,926,235	119,248,556
80. Property and equipment	77,821,419	70,145,948	68,339,664
90. Intangible assets	70,723,701	83,448,023	98,973,368
100. Tax assets	66,958,608	64,338,712	70,506,597
110. Non-current assets held for sale and discontinued operations	0	0	43,322,184
120. Other assets	149,467,366	167,649,634	359,135,097
Total assets	8,508,213,816	11,720,756,504	15,002,817,212
Liabilities and shareholders' equity			
10. Financial liabilities measured at amortized cost	7,450,588,340	10,566,372,777	13,492,688,299
20. Financial liabilities held for trading	0	0	59,480

30. Financial liabilities designated at fair value	0	0	0
40. Hedging derivatives	0	3,133,560	21,226
50. Fair value change of financial liabilities in hedged portfolios (+/-)	0	0	0
60. Tax liabilities	6,028,304	10,141,950	25,670,608
70. Liabilities associated with non-current assets held for sale and discontinued operations	0	0	0
80. Other liabilities	138,602,115	164,985,991	224,103,394
90. Employee termination indemnities	4,372,539	5,448,152	6,734,376
100. Allowances for risks and charges	65,488,883	39,177,069	33,780,923
110. Valuation reserves	6,002,459	3,669,321	-3,910,332
120. Redeemable shares	0	0	0
130. Equity instruments	0	0	0
140. Reserves	42,315,561	45,348,887	146,127,574
150. Share premium reserve	535,774,584	542,991,111	653,207,271
160. Share capital	267,825,042	268,423,946	291,738,541
170. Treasury shares (-)	-95,534	-831,857	-831,857
180. Net income (loss) (+/-)	-8,688,477	71,895,597	133,427,709
Total liabilities and shareholders' equity	8,508,213,816	11,720,756,504	15,002,817,212

Source: Own elaboration

To evaluate profitability, the analysis considered (a) ROE, i.e. Return on Equity (net income to shareholders' equity) and (b) ROA, i.e. Return on Assets (net income to total assets), while for the examination of equity structure, the study used the Debt-to-Equity Ratio (total liabilities to shareholders' equity) and the Equity Ratio (shareholders' equity to total assets).

4. FINDINGS

Table 3 presents the results of the profitability analysis.

To better understand the significant growth in net profitability that took place in the year of the pandemic and the following one, it may be useful to analyze its components, as identified in Table 4.

As Table 4 shows, the improvement in overall profitability is due to the decisive strengthening of operating profitability, confirming that the growth in net results for the three years was determined by the core business and not by exceptional factors.

Table 5 presents the results of the analysis of the capital structure.

Table 3. Profitability indices

Index	**2019**	**2020**	**2021**
ROE	-0.01030	0.07718	0.10939
ROA	-0.00102	0.00613	0.00889

Source: Own elaboration

Table 4. Structure of profitability

Item	**2019**	**2020**	**2021**
Operating result	-12,569,946	86,757,177	160,325,185
± Extraordinary result	-1,341,130	-2,081,929	2,224,148
Result before tax	-13,911,076	84,675,248	162,549,333
- Taxes	5,222,599	-12,779,651	-29,121,624
Net income (loss)	-8,688,477	71,895,597	133,427,709

Source: Own elaboration

Table 5. Capitalization ratios

Ratio	2019	2020	2021
Debt-to-Equity Ratio	9.09118	11.58271	11.29982
Equity Ratio	0.09910	0.07947	0.08130

Source: Own elaboration

The ratios in Table 1 show a significant incidence of debts concerning shareholders' equity. Although CBs have been able to attract a huge amount of capital through Venture Capital, raising in Europe 11.6 billion Euros from 2016 to today (Mediobanca Report, July 2022), debt has grown throughout the three years.

The Debt-to-Equity Ratio has continuously increased and now stands above 11, while the Equity Ratio has decreased to stabilize around 0.08.

5. DISCUSSION

In the three years under review, the overall profitability of the Italian challenger banks showed strong growth, going from a loss in 2019 to a profit that in 2021 almost doubled compared to 2020.

Both profitability indices have continuously grown and demonstrate how the Italian challenger banks not only managed to resist the crisis but also reversed the negative trend before the pandemic, growing further in 2021.

In this regard, it is important to emphasize that the growth in profitability that took place in 2020 compared to the previous year may have been determined by the effects of the lockdown and the forced reduction of mobility that have enhanced the opportunities of the online, in which CBs are particularly well-established.

However, this improvement does not seem transitory, as the further growth of 2021 confirms that the break-even point has been reached stably, so demonstrating that the business model on which the CBs are based constitutes a potentially winning model.

The analysis of the determining factors of profitability showed that the economic equilibrium was achieved thanks to operational management and this indicates that the improvement in the performance of CBs was determined by the strengthening of the core business, i.e. by structural and non-contingent progress.

However, the analysis also highlighted a greater vulnerability of CBs concerning the capital structure, which is still very biased towards debt.

In this regard, it is anyway necessary to note that CBs are relatively recent, while the strengthening of equity generally requires rather long periods, during which management must be able to produce profits. Therefore, if on the one hand, the financial weakness of Italian CBs is physiological, that is linked to the phase of the life cycle in which they are today, on the other hand, this variable must be carefully monitored, especially since the cost of debt reduces profitability.

In particular, the aggregate income statement results show that interest expense has eroded around 26% of interest income in each of the years observed.

In summary, the study answered the research question by reaching two significant conclusions:

a. the performance of Italian CBs has continuously improved from the point of view of profitability, while overall debt has grown;
b. the profitability structure has reached a satisfactory balance, above all thanks to the operational management, while the financial structure continues to be substantially weak, with still underpowered equity.

6. CONCLUSION

Although the study uses a small sample size, due to the fact that not all financial statements are available for the period 2019-2021, it still includes the major Italian challenger banks.

The implications of the research lie above all in identifying the areas of management that most profoundly affect profitability and, consequently, the capital structure.

In this sense, the proposed analysis can contribute both to understanding the performance of this particular sector of Italian finance, and intercept its strengths and weaknesses.

The originality of this study is mainly due to the scarcity of research dedicated to the sector, especially in the Italian context. In fact, existing literature shows a prevalence of analyses referring to traditional banks, while investigations of challenger banks, and specifically of the economic structure of their business model, are less widespread.

Besides, although the literature generally tends to emphasize the advantages of digitalization, this study also highlights the elements of difficulty that the implementation of digital technologies can entail, especially where the business model is based entirely on it.

The analysis confirms that both aspects – advantages, and criticalities – highlighted by the literature on CBs are also present in the Italian case. However, a particularly positive signal is represented by the recovery of profitability which, if carefully combined with the continuous monitoring of debt, could in the future make this new business model effective and successful.

References

Bataev, A. V. (2019). Financial Technology: Efficiency Evaluation of Challenger Banks. 2019 *IEEE Conference of Russian Young Researchers in Electrical and Electronic Engineering (EIConRus),* IEEE, 1371-1375. https://doi.org/10.1109/eiconrus.2019.8657260

Bataev, A. V., Koroleva, L., & Gorovoy, A. (2019). Innovative approaches in the financial sphere: Assessment of digital banks' performance. *International Conference on Innovation and Entrepreneurship. Academic Conferences International Limited*, 141-149.

Biondo, I., & Menegon, A. (2020). FinTechs and Challenger Banks: Old Business, Brand New Approach. *Iason Research Paper Series, 25,* 5-16.

Frenzel, A., Muench, J. C., Bruckner, M. T., & Veit, D. (2021). Digitization or digitalization? - Toward an understanding of definitions, use and application in IS research. *AMCIS 2021.* Proceedings 18, 1-10.

Froud, J., Tischer, D., & Williams, K. (2017). It is the business model… Reframing the problems of UK retail banking. *Critical Perspectives on Accounting, 42*, 1-19. https://doi.org/10.1016/j.cpa.2016.04.001

Gnevko, S. (2020). UK Challenger Banks' Market Cools Down in Recession-Conditions and Scenarios. *Journal of Accounting & Finance*, *20(4)*, 150-164. https://doi.org/10.33423/jaf.v20i4.3125

Hodson, D. (2021). The politics of FinTech: Technology, regulation, and disruption in UK and German retail banking. *Public Administration, 99(4),* 859-872. https://doi.org/10.1111/padm.12731

Johnson, M. (2021). Challenger banks are dead, long live challenger banks. *Journal of Digital Banking*, *5(4),* 329-341.

Leong, K., & Sung, A. (2018). FinTech (Financial Technology): what is it and how to use technologies to create business value in fintech way?. *International Journal of Innovation, Management and Technology*, *9*(2), 74-78. https://doi.org/10.18178/ijimt.2018.9.2.791

Letts, A. (2017). What do consumers want from next generation banking, and how will challenger and established banks provide it? *Journal of Digital Banking*, *1*(4), 329-337.

Lu, L. (2017). Financial technology and challenger banks in the UK: Gap fillers or real challengers?. *Journal of International Banking Law and Regulation, 32*(7), 273-282. Available at SSRN: https://ssrn.com/abstract=2988599

Naegele, T. D. (2020). Are Banks Irrelevant? *Banking L. J.*, *137*, 3-28.

Polasik, M., Widawski, P., & Lis, A. (2021). Challenger bank as a new digital form of providing financial services to retail customers in the EU Internal Market: The case of Revolut. In A. Marszk & E. Lechman (Eds.), *The Digitalization of Financial Markets. The Socio-economic Impact of Financial Technologies*, (pp. 175-193). London: Routledge. https://doi.org/10.4324/9781003095354

Schallmo, D. R. A., & Williams, C. A. (2018). *Digital Transformation Now! Guiding the Successful Digitalization of Your Business Model*. SpringerBriefs in Business. https://doi.org/10.1007/978-3-319-72844-5

Schepinin, V., & Bataev, A. (2019). Digitalization of financial sphere: challenger banks efficiency estimation. *IOP conference series: materials science and engineering*, *497(1),* 1-6. https://doi.org/10.1088/1757-899x/497/1/012051

Sibanda, W., Ndiweni, E., Boulkeroua, M., Echchabi, A., & Ndlovu, T. (2020). Digital technology disruption on bank business models. *International Journal of Business Performance Management*, *21*(1-2), 184-213. https://doi.org/10.1504/ijbpm.2020.106121

Stulz, R. M. (2019). Fintech, bigtech, and the future of banks. *Journal of Applied Corporate Finance*, *31(4)*, 86-97. https://doi.org/10.1111/jacf.12378

Wewege, L., Lee, J., & Thomsett, M. C. (2020). Disruptions and digital banking trends. *Journal of Applied Finance and Banking*, *10*(6), 15-56.

6th International Scientific Conference ITEMA 2022 – Selected Papers
DOI: https://doi.org/10.31410/ITEMA.S.P.2022.71

Do Audit Opinions Affect Earnings Persistence?

Jovana Stojanović[1]
Milica Đorđević[2]

Received: December 20, 2022
Accepted: January 24, 2023
Published: June 12, 2023

Keywords:
Auditors' reports;
Audit modification;
Financial statements;
Earnings quality;
Investment decisions

Abstract: *In the professional literature, the largest number of studies focus on examining and analyzing the content of auditors' reports and their impact on the quality of financial statements, while a smaller number of authors examine the impact of audit opinions on earnings persistence. Since understanding the type of audit opinion undoubtedly allows investors to assess the quality of a company's earnings and predict future cash flows, this paper investigates whether they react differently when making capital investment decisions if the financial statements contain a modified opinion. By looking at the previous literature, the authors consider market reactions, especially when it comes to some kind of modified opinion, given that they can cause a negative reaction and affect the reduction of earnings persistence. The research results so far show, although inconsistent and unusual, still interesting results when it comes to the impact of the audit opinion on earnings persistence. By analyzing previous studies, the authors reveal whether investors give enough importance to the audit opinion when making financial and investment decisions, which could later affect the amount of additional capital, which is a necessary condition for development, especially in transition and developing countries. In addition to the conclusions of this paper being relevant for users of financial statements, especially investors, they are also significant for regulatory bodies, as they indicate the necessity of constant improvement of the accounting and auditing system.*

1. INTRODUCTION

The results of the business strategy and business decisions of the company's management are disclosed in a certain period in the form of various reports, and the most important and complex ones are financial statements. Companies' annual financial statements represent the basic source of information that different stakeholders, among which shareholders and investors stand out, use when making business decisions. They include plenty of useful information based on which it is possible to evaluate previous and future results, and, therefore, their reliability and objectivity must not be questioned. For these reasons, it is completely understandable that accountants focus on providing high-quality financial statements that represent the foundation of trust and mutual communication between companies and their stakeholders.

Audit plays a significant role in increasing the credibility of information in financial statements, as it provides independent assurance of their truthfulness and fair presentation. All communication regarding the performed external audit to the public takes place solely through the audit report. As the final product of the audit, this report is a very important document and the auditor's expressed opinion in it can certainly lead to a series of consequential reactions that affect not only the users of financial statements but also the company as an audit client. The impact of the auditor's opinion on future company operations can be reflected in different ways. More precisely, depending on the expressed opinion about the financial statements, there are different positive and negative reactions of the company's stakeholders, which ultimately affects the future company performance.

[1] University of Niš, Innovation Centre at University of Niš, Univerzitetski trg 2, Serbia
[2] University of Niš, Faculty of Economics, Trg kralja Aleksandra Ujedinitelja 11, Serbia

According to Doan et al. (2021), the amount of accounting earnings is one of the most important criteria for evaluating the performance and perspective of a company's operations; an issue that is of particular interest is the influence of the auditor's opinion on earnings persistence. Persistent earnings are those that come from the company's recurring core activity and which can be reliably expected to be sustainable in the following accounting periods as well (Miletić, 2021). A higher level of persistence indicates greater sustainability of earnings and cash flows, which can be useful when assessing the value of capital (Atwood et al., 2010). On the other hand, the lower quality of the reporting result, and, therefore, the lower level of persistence, is characteristic of companies facing business and financial difficulties. A qualified audit opinion, which reflects problematic items in financial statements, has the potential to influence investors' expectations on the capital market, by signaling the impairment of earnings sustainability, and thus a decrease in the earnings response coefficient (Choi & Jeter, 1992).

Since theory and practice have several times shown that persistence is connected with investor's reaction to information about report results (Lipe, 1990), in this paper, by looking at the existing professional literature and recapitulating previous research results, an attempt will be made to analyze the direction of the auditor's opinion influence on investment decisions, and, consequently, on earnings persistence.

Following the subject matter, the paper is structured as follows. After the introductory considerations, in the first part, the importance of the audit, audit report and expressed opinion for the purpose of quality control of financial reporting is pointed out. The second part of the paper refers to persistence and predictability, as two important earnings attributes. The third part of the paper examines the relationship between the information in the audit reports and earnings persistence since the auditor's opinion can influence the stakeholders' decision-making, which also affects the company's future performance. The conclusions, implications and limitations of the study are presented in the fourth part of the paper.

2. AUDIT AS A MECHANISM OF QUALITY CONTROL OF FINANCIAL REPORTING

The idea that auditing is the "cornerstone" of all efforts to hold companies accountable and make financial reporting useful has been around for a long time (Baah & Fogarty, 2016). The increased turbulence of the world economy since the beginning of the 21st century has not reduced the collective reliance on auditing. On the contrary, in today's business conditions, the external audit of financial statements, more than ever, is an indispensable element of the financial reporting system, without which the desired level of trust in financial statements cannot be achieved, and which is crucial for reducing the information risk of investors and the efficient capital market. That is why the audit profession must constantly maintain the quality at the required level in order to ensure stability in social and economic relations by removing doubts that individuals and companies may have. Otherwise, with the threat to its reputation and with the reduction of the level of quality, the audit service itself can lose its true sense and become worthless.

In order for the external audit to fulfill its role and provide reasonable assurance of the truthfulness and objectivity of financial statements, it is based on a complex process of gathering and evaluating evidence. This process is summarized in the audit report, through which all communication between external auditors and stakeholders takes place, and which assures users that the disclosed information has been processed and prepared following accepted accounting

standards. The audit report is of high quality if it is written in a way that clearly and unambiguously conveys the auditor's conclusions and responds to user needs, in terms of providing information, such as the type of audit opinion, as well as all other information that will be useful to users who read these statements.

Nevertheless, the auditor's opinion stands out as a key part of the report that gives credibility to the information in the financial statements in terms of their safe use for business decision-making (Andrić, 2004). Following the International Standards on Auditing (ISA), the auditor's opinion can be unmodified, that is, positive and modified. Auditors express a positive opinion when they are convinced that the financial statement truthfully and honestly shows the real state of affairs, profit, financial status, income, and expenses, per accounting standards. On the other hand, if the auditor concludes that the financial statement is not free from material misstatement or is unable to obtain sufficient appropriate audit evidence to conclude that the financial statement is free from material misstatement, then he gives a modified opinion. A modified opinion can be a qualified opinion, an adverse opinion and a disclaimer of opinion. What type of modification the auditor will apply is determined by the effect of the misstatement or limitations in the collection of evidence on the truthfulness and objectivity of the financial statements. If the auditor judges that misstatements have a material but not pervasive effect on the financial statements, he will express a qualified opinion. On the other hand, if the effect is material and pervasive, he will express an adverse opinion. If, on the other hand, the auditors are unable to gather sufficient adequate evidence, they will express a qualified opinion if those limitations have a material but not pervasive effect, that is, they will give a disclaimer of opinion if they have a material and pervasive effect on the financial statements (ISA 705). In order for the communication value of the audit report to be used to the maximum, a particularly important part of the report is the paragraph on key issues that provides additional information to the appropriate users and reduces the information asymmetry between the auditor and the information users (Vučković-Milutinović, 2019, p. 213).

Based on the audit opinion, capital owners should receive feedback on whether the financial statements truthfully and objectively depict the company's operations and, depending on this, be able to decide on capital investment. However, although the audit report, as the final product of the audit, is an important document, the question arises as to whether stakeholders really read and analyze this report in detail when making economic decisions. Carcello (2012) finds that as many as 91% of respondents, representatives of various investment organizations, do not read the unmodified audit report. One of the reasons may be that, although an external audit significantly ensures the credibility of financial statements by preserving investors' trust in them, the expectations of users of financial statements regarding the scope of external audit continuously exceed the benefits provided by the audit (Vučković Milutinović, 2018). The problem of the gap in expectations comes to the fore, especially in periods of crisis and periods in which corporate-financial scandals are immanent, and the reaction of the profession and regulatory bodies in such circumstances is necessary. Audit reporting is often singled out as one of the key areas of change to maintain and improve audit quality, which is particularly important because of the benefits it brings to the entire society, also enabling better dialogue and cooperation between auditors and stakeholders. This is because, when making business decisions, they rely on the information presented in the audited financial statements, and it can be said that the capital market practically depends on the quality of the audit service and the quality of the audit reports.

3. EARNINGS PERSISTENCE AND PREDICTIVE ABILITY OF FINANCIAL PERFORMANCE

After Graham and Dodd (1951) presented their theoretical views, and Ball and Brown (1968) confirmed them empirically, research related to the capital market became more and more frequently covered in the accounting literature. Although they are not new, earnings persistence and predictability are still considered relevant and interesting topics, both for practitioners and members of the academic community. In addition to persistence and predictability, volatility also belongs to the group of accounting qualitative attributes based on earnings trends in a series of consecutive accounting periods; however, due to the limited and predetermined scope of the paper, this attribute will not be subject to further analysis.

Persistence indicates the degree to which current earnings can maintain their value in subsequent accounting periods (Rajizadeh & Rajizadeh, 2014). With increasing persistence, the informative character of the reported result increases, which leads to a reduction of risk in business decision-making. According to Miletić (2021), earnings persistence is particularly important in the process of making investment decisions, as well as in capital valuation models, given that persistent results are sustainable, and as such highly valued by investors, so it should not be surprising that persistence is long also used as a synonym for quality.

Earnings predictability is closely related to persistence, and it derives from investment decision-making models, which are based on the assessment of the present value of the company. Since these models are based on the discounting of expected cash flows, the inputs of the model are of better quality if they are evaluated based on information that has a better predictive ability, and thus can influence the reduction of measurement errors (Miletić, 2021). Kothari (2001) states that the use of time series is important for understanding the role of earnings in making various assessments, considering their connection with the mentioned models. Previous literature indicates that persistence is measured using time series parameters in order to capture the proportion of earnings that are expected to be sustained in future accounting periods (Subramanyam & Wild, 1996). According to Stigler (1963), earnings persistence is the correlation of the rate of return at two different points in time, such as *t* and *t-1*. A high correlation indicates high persistence and vice versa.

The influence of certain aspects of quality on the perception of users of financial statements and their decisions are the subject of analysis by many authors. As Miletić (2021) states, in addition to the fact that persistence affects the reduction of information asymmetry and uncertainty, it also enables current earnings to better predict future earnings, and also for investors to notice business trends more simply. As investment decisions cannot be based only on the current amount of earnings, such as earnings in year *t*, investors use data on a series of earnings over a longer period, better known as "permanent earnings" (Pimentel & Lima, 2010). When it comes to the relationship between accounting results, investors' decisions and stock prices, the results of some studies show that companies that manage to maintain the previously achieved level of the reported result are "rewarded" by investors, and therefore have a higher P / E ratio (Barth et al., 1999). On the other hand, companies that are unable to meet investors' expectations in terms of accounting earnings result in lower share prices.

Proceeding from the theoretical positions that state that greater earnings sustainability should be associated with a more pronounced reaction of investors to reporting information and results,

Graham and Dodd (1951) conclude that the information contained in financial statements serves the purpose of making different types of assessments. However, the research results in Georgia (Pirveli, 2020) indicate that investors, creditors and lenders often make their decisions based on the amount of collateral or information from internet sites, and less on information from financial statements. Pirveli (2020) concludes that investors are largely uninterested in the information provided by financial statements and that the focus is increasingly shifting to tax authorities. The question is then, who are the disclosed financial statements intended for? Does this mean that quantitative information is increasingly being used for tax purposes and less by the actual users of financial statements?

While Dechow et al. (2010) advocate that persistence has a foothold in the repetitive activities of the company, as well as that accounting results are on average more persistent than cash flows, Moghaddam et al. (2016) come to different results with their research. They prove that relying on the current earnings allows investors, creditors and lenders to predict the earnings in the next accounting period with a probability of only 20%. Further analysis shows that cash flows from operating activities can be predicted in the next year with a probability of about 35%. The authors conclude that the possibility of predicting in Georgia based on accounting results and cash flows in the private sector is at a relatively low level. The research results further show that external stakeholders are poorly oriented to the use of information from financial statements, as well as that there are limitations in the accounting and auditing profession, which can significantly reduce investor confidence when it comes to assessments based on financial performance.

For economic and investment decisions to be based on true and fair financial statements, it is necessary to reduce the information risk to an acceptable level, which can be achieved through the external audit process. In the rest of the paper, by looking at the previous literature, we analyze the relationship between the external audit of financial statements and earnings persistence. We try to find out whether and how information signaled by auditors through audit reports, such as the type of audit opinion, can affect earnings sustainability.

4. THE RELATIONSHIP BETWEEN AUDIT OPINION AND EARNINGS PERSISTENCE

To analyze the relationship between information in audit reports and investors' reactions to the market, the authors proceed from the signaling theory, proposed by Spence (1973), which explains the behavior of two parties that have access to different information. In the financial market, more informed participants are better able to make business decisions that allow them to gain greater benefits compared to other participants. Contracts that are concluded in case of not having equal, or having equal but incorrect information, can lead to the wrong allocation of capital (Bini et al., 2011). Based on the signaling theory, according to which contracts are constantly made and renewed on the market, investors expect accurate information about the company's performance (Holden & Subrahmanyan, 1992).

The external audit comes to the fore as the most important mechanism for communicating the extent to which financial statements fairly depict the financial status, profit and loss and cash flows of companies, especially in economies where unreliable financial reporting is often a problem (Vučković-Milutinović, 2019). Given that company management and audit firms should send reliable signals to the market (Healy & Palepu, 2001), signaling theory has been widely used in both accounting and auditing research. Since the investor evaluates the disclosed and audited information either as a good or a bad sign, it is clear why quality audit reports are

considered an important signal that can play an enviable role in the allocation of capital on the market, while the audit process itself can represent one of the mechanisms for overcoming personal interests of managers (Hewage & Ediriwickrama, 2022).

When talking about accounting earnings, any modification related to them has the potential to influence the decisions of participants on the capital market, by indicating their reduced persistence, which is consequently reflected in the reduction of the earnings response coefficient. As studies concerning the relevant issues are of long-term interest to researchers in the field of financial accounting, the review of the literature finds interesting, but conflicting results.

Research results by numerous authors who believe that the auditor's opinion leads to a great extent to the consequent reactions of stakeholders that affect the company itself are given in the rest of the paper. Choi and Jeter (1992) indicate that an unmodified auditor's opinion can provide a positive signal to investors and result in positive market returns and that a qualified opinion (as a type of modification) is closely related to lower earnings response coefficients. Similarly, Vichitsarawong and Pornupatham (2015) indicate that audit qualifications signal to the market that the firm will undergo appropriate financial changes, which are likely to result in less persistent performance. Vučković-Milutinović (2019) indicates that the auditor's modified opinion is a sign that the reliability of the financial statements, as well as the investor's trust in the financial statements, has been impaired, which can lead to unfavorable consequences for the audited entity. According to Menon and Williams (2010), modified audit reports that express doubts about the continuation of business lead to a negative market reaction, which can be reflected in the decline in the company's share prices on the financial market. If investors show interest in the content of the modified audit report, it is expected that they will refrain from investing capital in the respective companies, where the weakened financial situation, reduced profitability and lower stability of earnings are already noticeable (Hewage & Ediriwickrama, 2022). The said auditor's opinion can potentially further increase the uncertainty in current and future earnings and lead to even lower earnings quality and persistence (Moghaddam et al., 2016). Frost (1997) finds that companies that receive a modified opinion in the audit report are weaker and show a significant decrease in profitability compared to companies that receive an unmodified opinion. Therefore, according to this author, the audit modifications reflect some problematic accounting items that have the potential to increase the degree of uncertainty in the current and future company earnings, which further results in a lower quality of the reporting result. Sundgren (2009) finds that different types of modification in audit reports create a higher possibility of bankruptcy. Accordingly, Lam and Mensah (2006) find that firms that receive an unmodified opinion are likely to survive afterward, while those that receive a qualified one experience more serious financial problems. The conditions for issuing such an opinion imply a lower degree of earnings sustainability.

Thus, the views of this group of authors support the understanding that by modifying the opinion, the auditor controls the work of managers and limits their opportunistic behavior (Barizah Abu Bakar et al., 2005) regarding the choice between accounting policies and estimates made possible by the flexibility of ISA/IFRS, as well as regarding the intentional omission of material facts. It certainly attracts the special attention of the company's stakeholders and affects their future business decisions, which are reflected in the company's future performance.

Contrary to these views, there are research results that state that the information contained in audit reports has little informational value for investors (Hewage & Ediriwickrama, 2022).

Moghaddam et al. (2016) analyzed companies on the Tehran Stock Exchange from 2009 to 2013, to conclude that there is no significant relationship between modified audit reports and earnings persistence. Such attitudes point to the conclusion that the company's stakeholders do not rely on audit reports when making business decisions, and consequently their decisions, and then the future performance of the company, are not conditioned by the expressed audit opinion (Anulasiri et al., 2015).

5. CONCLUSION

Since, according to the arguments in the previous professional literature, the auditor's opinion has significant abilities when it comes to expressing transparent business information, but also indicating the existence of financial difficulties for the company. The subject of the study is a qualitative analysis of the connection between the auditor's opinion and earnings persistence. Based on the review of the existing literature, the influence of information from audit reports, primarily the audit opinion, on investment decisions and the sustainability of the report result is examined. We find that for companies that receive some kind of modified audit opinion, earnings persistence is not immanent, which means that in such companies it cannot be reliably expected that the results will be sustainable in the following accounting periods, in contrast to companies where the auditors conclude that the financial statements truthfully and honestly present the real state of affairs, profit, financial status, income, expenses and that they are following accounting standards. In such companies, the unmodified opinion gives a positive signal to investors, which consequently leads to higher market returns. Based on the results of the analyzed studies, we conclude that there is a certain percentage of investors who do not rely on information from financial statements and audit reports, who are not aware of the importance of their informative value and who do not consider the content of those reports to a large extent when making business decisions.

This paper includes certain economic implications. First, emphasizing the importance of the quality of the audit report model is vital to providing users with adequate insight into the issues that are most significant in carrying out the audit. Raising the informative value of the audit report for users, especially for investors, and enabling a better understanding of the audited financial statements, is important because of their use in making economic decisions. With the support of information provided in a quality audit report, the future company performance and earnings quality can be predicted and financial and investment decisions can be made, which can be the basis for shaping future directions and the dynamics of modern economic flows. The inflow of domestic and foreign capital is important for company growth and development, earnings level and persistence, but also for the entire national economy, especially if it is a question of developing countries. It should be noted here that, unlike developed countries, where modified audit opinions appear less often in practice, in developing countries the mentioned opinion is not only more frequent, but also not treated seriously enough, both by regulatory bodies and by investors. Findings of this type are worrying, because modifications in the audit report may indicate a "red flag" that warns of various types of uncertainty in the operations of a specific company. That is why it is recommended that investors, as well as other users of the report, take an analytical approach to read the audit report before making a decision, and not recklessly make investments and thus make wrong moves that can sometimes have a negative impact on the entire national economy. Also, if we take into account the public nature of financial statements and audit reports, it is clear how much responsibility the regulatory bodies have, which should use their authoritative position to emphasize and highlight the importance of using audit reports.

Finally, we outline some of the limitations of this paper and potential ideas for future research. In this paper, no specific empirical research is conducted to examine the relationship between different types of audit opinions and earnings persistence. Also, the research subject refers solely to companies from the private sector. Studies that include an analysis of the impact of audit opinion on earnings persistence in the public sector are lagging. Bearing in mind the above, one of the interesting extensions of this study would be empirical research that would include private and/or public sector companies, first of all, on the territory of the Republic of Serbia, when the direction of influence of the auditor's opinion on the sustainability of the reporting result in these companies would be examined. The study could further be extended to the countries of the former Socialist Federal Republic of Yugoslavia (SFRY), considering that these countries once belonged to one state. Among the respective countries, some are members of the European Union (the Republic of Croatia and the Republic of Slovenia) and those that are not yet (the Republic of Serbia, the Republic of Montenegro, Bosnia and Herzegovina and North Macedonia), which could possibly lead to interesting differences in the results.

ACKNOWLEDGMENT

This research was financially supported by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia (Contract No. 451-03-47/2023-01/ 200371)

References

Andrić, M. (2004). Jednoobraznost revizorskih izveštaja i poverenje u verifikaciju [Uniformity of audit reports and confidence in verification]. In: *Izazovi računovodstvene profesije u uslovima globalizacije finansijskog izveštavanja*. Proceedings of the 35th Symposium of the Serbian Association of Accountants and Auditors. Zlatibor: Savez računovođa i revizora Srbije, 225-240.

Anulasiri, D. G. A. S., Ajward, R. A., & Dissa Bandara, P. H. (2015). The Effect of Qualified Auditors' Report on Share Prices: Evidence from Listed Companies of Sri Lanka. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2699712

Atwood, T. J., Drake, M. S., & Myers, L. A. (2010). Book-tax conformity, earnings persistence and the association between earnings and future cash flows. *Journal of Accounting and Economics, 50(1)*, 111-125. https://doi.org/10.1016/j.jacceco.2009.11.001

Baah, G. K., & Fogarty, T. J. (2016). What Auditors Think about Audit Quality - A New Perspective on an Old Issue. *SSRN Electronic Journal.* https://doi.org/10.2139/ssrn.2822565

Ball, R., & Brown, P. (1968). An Empirical Evaluation of Accounting Income Numbers. *Journal of Accounting Research, 6(2)*, 159-178. https://doi.org/10.2307/2490232

Barizah Abu Bakar, N., Rahim Abdul Rahman, A., & Majdi Abdul Rashid, H. (2005). Factors influencing auditor independence: Malaysian loan officers' perceptions. *Managerial Auditing Journal*, *20*(8), 804-822. https://doi.org/10.1108/02686900510619665

Barth, M. E., Elliott, J. A., & Finn, M. W. (1999). Market Rewards Associated with Patterns of Increasing Earnings. *Journal of Accounting Research, 37(2)*, 387-413. https://doi.org/10.2307/2491414

Bini, L., Giunta, F., & Dainelli, F. (2011). Signalling Theory and Voluntary Disclosure to the Financial Market - Evidence from the Profitability Indicators Published in the Annual Report. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.1930177

Carcello, J. V. (2012). What do investors want from the standard audit report? *The CPA Journal*, *82*(1), 22-28.

Choi, S. K., & Jeter, D. C. (1992). The effects of qualified audit opinions on earnings response coefficients. *Journal of Accounting and Economics, 15(2-3)*, 229-247. https://doi.org/10.1016/0165-4101(92)90019-x

Dechow, P., Ge, W., & Schrand, C. (2010). Understanding earnings quality: A review of the proxies, their determinants and their consequences. *Journal of Accounting and Economics, 50(2-3)*, 344-401. https://doi.org/10.1016/j.jacceco.2010.09.001

Doan, T. N., Ta, T. T., Pham, D. C., Nguyen, L. S., & Tran, H. N. (2021). Audit opinion and earnings management: Empirical evidence from Vietnam. *Investment Management and Financial Innovations*, *18*(4), 131-140. http://dx.doi.org/10.21511/imfi.18(4).2021.12

Frost, C. A. (1997). Disclosure policy choices of UK firms receiving modified audit reports. *Journal of Accounting and Economics, 23(2)*, 163-187. https://doi.org/10.1016/s0165-4101(97)00006-2

Graham, B., & Dodd, D. (1951). Security Analysis: Principals and Technique. McGraw-Hill, Inc., New York, NY.

Healy, P. M., & Palepu, K. G. (2001). Information asymmetry, corporate disclosure, and the capital markets: A review of the empirical disclosure literature. *Journal of Accounting and Economics, 31(1-3)*, 405-440. https://doi.org/10.1016/s0165-4101(01)00018-0

Hewage, Y. M., & Ediriwickrama, T. C. (2022). The effect of auditors' report on earnings persistence: Evidence from listed entities of Sri Lanka. *International Journal of Auditing and Accounting Studies*, *4(1)*, 1-20. https://doi.org/10.46791/ijaas.2022.v04i01.01

Holden, C. W., & Subrahmanyan, A. (1992). Long-Lived Private Information and Imperfect Competition. *The Journal of Finance, 47(1)*, 247-270. https://doi.org/10.1111/j.1540-6261.1992.tb03985.x

Kothari, S. P. (2001). Capital markets research in accounting. *Journal of Accounting and Economics, 31(1-3)*, 105-231. https://doi.org/10.1016/s0165-4101(01)00030-1

Lam, K. C. K., & Mensah, Y. M. (2006). Auditors' decision-making under going-concern uncertainties in low litigation-risk environments: Evidence from Hong Kong. *Journal of Accounting and Public Policy, 25(6)*, 706-739. https://doi.org/10.1016/j.jaccpubpol.2006.09.004

Lipe, R. (1990). The Relation between Stock Returns and Accounting Earnings Given Alternative Information. *The Accounting Review, 65(1)*, 49–71. http://www.jstor.org/stable/247876

Menon, K., & Williams, D. D. (2010). Investor Reaction to Going Concern Audit Reports. *The Accounting Review*, *85(6)*, 2075-2105. https://doi.org/10.2308/accr.2010.85.6.2075

Miletić, S. (2021). *Procena kvaliteta finansijskih izveštaja velikih preduzeća u Republici Srbiji primenom modela zasnovanih na agregatnim merama* (Evaluating quality of financial statements in Serbian large companies using aggregate measures) [PhD thesis, Belgrade: University of Belgrade, Faculty of Economics]. National Repository of Dissertations in Serbia. Retrieved from https://nardus.mpn.gov.rs/handle/123456789/18619

Moghaddam, A. G., Monavar, A., Mostafaei, Z., Ghased, B., & Kakhki, S. (2016). Investigating the relationship between audit opinion and earnings persistence of listed firms in Tehran Stock Exchange. *Specialty Journal of Accounting and Economics, 2*(1), 71-76.

Pimentel, R. C., & Lima, I. S. (2010). Time-series properties of earnings and their relationship with stock prices in Brazil. *Business and Economics Research Journal*, *1*(4), 43-65.

Pirveli, E. (2020). Sectoral analysis of the economic model of Georgia. *Economics and Business*, *2*, 115-116.

Rajizadeh, S., & Rajizadeh, S. (2014). Examining the factors affecting earnings persistency among the listed firms in Tehran Stock Exchange. *European Online Journal of Natural and Social Sciences*, *2*(3s), 2073–2079.

Spence, M. (1973). Job Market Signaling. *The Quarterly Journal of Economics, 87(3)*, 355-374. https://doi.org/10.2307/1882010

Stigler, G. J. (1963). *Capital and rates of return in manufacturing industries: A study by the National Bureau of Economic Research*, NY. Retrieved from https://www.nber.org/system/files/chapters/c0648/c0648.pdf

Subramanyam, K. R., & Wild, J. J. (1996). Going-Concern Status, Earnings Persistence, and Informativeness of Earnings. *Contemporary Accounting Research, 13(1)*, 251-273. https://doi.org/10.1111/j.1911-3846.1996.tb00500.x

Sundgren, S. (2009). Perceived audit quality, modified audit opinions and the likelihood of liquidating bankruptcy among financially weak firms. *International Journal of Auditing, 13*(3), 203-221. https://doi.org/10.1111/j.1099-1123.2009.00388.x

Vichitsarawong, T., & Pornupatham, S. (2015). Do audit opinions reflect earnings persistence? *Managerial Auditing Journal, 30(3)*, 244-276. https://doi.org/10.1108/maj-12-2013-0973

Vučković Milutinović, S. (2018). *Novi model revizorskog izveštaja posmatran kroz prizmu izmenjenih međunarodnih standarda revizije i regulative EU* [The new model of the audit report viewed through the prism of changed International Audit Standards and EU regulations]. In: *Implikacije finansijskog izveštavanja i oporezivanja na poslovanje realnog sektora, javnih preduzeća i korisnika budžetskih sredstava*. *Proceedings of the 49th Symposium of the Serbian Association of Accountants and Auditors* (174-189). Savez računovođa i revizora Srbije.

Vučković-Milutinović, S. (2019). Analysis of modifications to auditor's opinion on financial statements of listed companies in Serbia. *Ekonomika preduzeca, 67(3-4)*, 212-223. https://doi.org/10.5937/ekopre1904212v

6th International Scientific Conference ITEMA 2022 – Selected Papers
DOI: https://doi.org/10.31410/ITEMA.S.P.2022.81

Sustainability Reporting Practices of Real Estate Companies from Germany, Austria and Switzerland – First Insights from 2020

Dominika P. Gałkiewicz[1]

Received: November 19, 2022
Accepted: January 18, 2023
Published: June 12, 2023

Keywords:
Sustainability;
Report;
ESG;
Directive;
NFRD

Abstract: *In the last twenty years, sustainability became a strong movement leading to regulatory initiatives around the world. In this study, the European regulation is compared with common sustainability reporting practices in the Real Estate Sector in Germany, Austria, and Switzerland. The goal of the study is to show what type of information related to employees, and other social and governance issues are being provided and by how many firms in the year 2020. The findings show that more than half of the analyzed firms report the total number of employees, the share of women and the number of permanent full-time contracts. Furthermore, supervisory board members are listed by 37 out of 53 companies. More than a third of the 53 companies confirmed to have anti-corruption processes implemented and 25 firms state to have UN SDGs included in their reports. However, details on diversity and employee-related information are often, more than 50% of the time, missing (e.g. salary ratio of woman to man, average sick days/year, total number of trainees, executive pay ratio, total accidents, average age, proportion of female executives, % of woman on the board of directors, staff turnover rate, newly hired employees, employee-satisfaction, full-time employees and part-time employees). Moreover, the involvement of firms, customers, suppliers and employees in following human rights guidelines, ESG and Code of Conduct rules is low. Less than a third of companies stated to follow the human rights guidelines obtained a sustainability certificate or employee well-being certificate and provided ESG-specific employee training. Performing Code of Conduct training for employees, customer surveys, and implementing business partner Code of Conduct/Supplier Code of Conduct besides mentioning the cases of corruption and incidents of discrimination are reported by less than one-third of firms. These results are important for individuals, companies and politicians implementing new rules related to sustainability reporting in Europe.*

1. INTRODUCTION

In 1987, the United Nations (UN) defined sustainability, but it took another almost thirty years to underwrite the Paris agreement in 2015 when the UN created the **2030 Agenda** for Sustainable Development with **17 Sustainable Development Goals and 169 targets** (United Nations, 1987; United Nations General Assembly, 2015). Sustainability development has become a powerful movement in the last two decades. People and companies are aware of the necessity to fight climate change and to behave ethically correct when it comes to the interaction with communities, customers, suppliers and employees of the company.

This study analyzes the status quo of mandatory and voluntary sustainability reporting practices given the loosely formulated law in the European Union (EU). The study aims to show what type of information related to employees, and other social and governance issues are being provided and by how many firms. The information provided in annual reports or separate

[1] University of Applied Sciences Kufstein, Andreas Hofer-Str. 7, Kufstein, Austria

sustainability reports needs to be material for decision-making and comparable across firms. Thus, the focus of this study is to show the level of comparability of information for large publicly listed real estate companies stemming from Germany, Austria, and Switzerland. Real Estate (RE) companies are responsible for 30% of the global CO2-Emissions, thus, sustainability awareness, implementation of sustainable processes and reporting are key for the future of the world. Additionally, the European Real Estate Association (EPRA) offers recommendations on which measures to report and how to calculate them beforehand, especially the environmental ones (the latter are not discussed in this article). Finally, the goal of the analysis is to promote reporting best practices developed by the largest companies in the sample, for which sustainability reporting is mandatory.

This study focuses on 53 companies with a market capitalization above 100 MEUR providing an annual report or/and sustainability report in 2020. There are no studies explicitly looking at the Environmental, Social and Governance (ESG) reporting of real estate companies in the German-speaking area (Germany, Austria and Switzerland). Studies analyzing publicly listed firms emphasize investors' demand for ESG information (e.g., Holder-Webb et al., 2009; Khan et al., 2013; Reverte, 2009) and offer rough measures of stakeholders' sustainability orientation (e.g., Branco & Rodrigues, 2008; Campbell et al., 2006; Huang & Kung, 2010). The studies of Contrafatto (2014) and O'Dwyer and Unerman (2016) provide evidence on the drivers of mandatory corporate social responsibility (CSR) reporting by non-publicly listed firms. Previous studies also show, for example, that firms may un- or intentionally influence political decision-making through their ESG reporting (Morsing & Roepstorff, 2015; Shirodkar et al., 2018; Weyzig, 2009; Zhao, 2012) and consumer behavior (Asay et al., 2022; Carrigan & Attalla, 2001; Vogel, 2005). Therefore, the results of the underlying study guide companies from various industries on how to report sustainability measures related to employees, and other social and governance issues based on best practices from the real estate industry in German-speaking countries. There is also a contribution to the literature by showing how scarce voluntary sustainability reporting was in the real estate sector in the year 2020. These differentiated findings offer implications for political actions.

The rest of the study is organized as follows. Section 2 provides the regulatory background, while in section 3 the data and methodology are described. The discussion of the empirical results is provided in section 4. Section 5 concludes the study.

2. BACKGROUND ON SUSTAINABILITY REGULATION AND REPORTING REQUIREMENTS

The UN defined sustainability/sustainable development in 1987 as "a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs." (United Nations, 1987, p. 17). In 1992, the Earth Summit of the UN took place and the UN advised within the sustainable development action plan Agenda 21 "the establishment of better measurement [methods]." (United Nations, 1992, § 8.41) In 1992, sustainability was an abstract and immeasurable concept as tools for quantifying sustainable action did not exist (Caradonna, 2014; Thaler, 2021).

In 2005, the UN World Summit recommended using the model with three Es, namely environment, economy and social equity, and intersection S=Sustainability. This was the turning point

as Corporate Social Responsibility (CSR) and Triple Bottom Approaches got replaced. Next, the UN formulated Millennium Development Goals (MDGs) before arriving at the recently widely applicable Sustainable Development Goals (SDGs) for responsible investing. In 2015, the Paris Agreement was resolved and the UN created the 2030 Agenda for Sustainable Development with SDGs and 169 targets. The goal of this agenda is "to end poverty and hunger everywhere; to combat inequalities within and among countries; to build peaceful, just and inclusive societies; to protect human rights and promote gender equality (...) and to ensure the lasting protection of the planet and its natural resources." (United Nations General Assembly, 2015, p. 3). Edmans (2019) emphasizes that the primary objective of businesses is to serve society instead of merely focusing on profit maximization.

The global risks report 2020 by the World Economic Forum (WEF) shows the top five long-term risks, which are all environmental: extreme weather, climate action failure, natural disasters, biodiversity loss and human-made ecological disasters (WEF, 2020). All these developments let sustainability reporting became more important. Sustainability standards provide the opportunity to take action against environmental and social issues and simultaneously create a sustainable economy. Sustainability reporting is interdisciplinary as all economic, environmental and social aspects have to be included. Sustainable activities can be assessed with quantitative indicators, qualitative metrics and additional information (e.g. Edmans (2021):

- hard (quantitative) information (e.g. the number of workplaces created can be counted),
- soft (qualitative) information (e.g. job quality can only be indirectly approximated).

In general, there are three major categories of sustainability standards (Behnam & MacLean, 2011):

- principle-based standards (e.g. UN Global Compact),
- certification-based standards (e.g. external auditors certify reaching minimum requirements for the environmental standard ISO 14001),
- reporting standards (e.g. provide a framework for disclosure and transparency like The Global Reporting Initiative (GRI)).

Regulation in the EU - In 2001, the European Commission (EC) referred in the first policy paper on CSR as activities undertaken voluntarily, before in 2011, the EC recommended the EU supporting enhancements concerning companies' reporting and disclosure of social and environmental activities (European Commission, 2011). In consequence, Directive 2014/95/EU, known as CSR Directive or Non-Financial Reporting Directive (NFRD) obliged public interest entities to improve the comparability of non-financial disclosure from 2017 on. Comparability of non-financial disclosure should be improved and EU Member states were requested to implement it by 6 December 2016. The NFRD applies to public interest entities with more than 500 employees on average, a balance sheet total of more than €20 million, or net revenue of more than €40 million during a financial year. Public interest entities are credit institutions, insurance undertakings, firms listed and traded on a market of an EU Member State, or entities determined to be of public interest (European Parliament and the Council of the European Union, 2014; Thaler, 2021). These entities are required to either incorporate a non-financial statement into their management report or issue a separate report (sustainability report) to the public. Legal auditors should only verify that the organizations have delivered the non-financial report.

European Reporting Requirements Shown in Detail - Minimum reporting is required on **environmental, social and employee concerns, human rights, anti-corruption and bribery**

issues, and diversity policies. Further comments should refer to the business model, a presentation of the organization's policies, risks and risk management concerning all the aspects listed before, its due diligence practices, the result of those policies and non-financial key performance indicators, depending on its nature. The NFRD regulations lead to amendments within the Third Book of the German Commercial Code (Handelsgesetzbuch), in particular § 289b to § 289e and § 315b to § 315d Handelsgesetzbuch (HGB). The content, which is required for the non-financial statement or sustainability report, is written down in § 289c of the German Commercial Code/HGB. Moreover, it is recommended that organizations rely on recognized national and international standards when disclosing this information and indicate which one was used. The NFRD lists the Eco-Management and Audit Scheme (EMAS), the United Nations Global Compact (UNGC), the Guiding Principles on Business and Human Rights, the Organization for Economic Co-operation and Development (OECD) Guidelines for Multinational Enterprises, the framework for social responsibility ISO 26000 of the International Organization for Standardization ISO and the GRI. In sum, the NFRD implies six fundamental principles:

(1) Material, decisive information,
(2) presented in a fair, balanced, unbiased and understandable way,
(3) presented in a comprehensive but concise manner,
(4) providing insights on future strategy and processes,
(5) including all stakeholders' requirements,
(6) consistent over time and coherent (European Commission, 2017a).

In 2017 and 2019, the European Commission (EC) published guidelines for non-financial reporting and extended these to applicable sustainability standards, e.g. the Carbon Disclosure Project (CDP) and the German Sustainability Code (GSC) included (European Commission, 2017b, 2021b). On the 21st of April 2020, the EC adopted a proposal for the Corporate Sustainability Reporting Directive (CSRD) applicable from 2023-2024 on. Its goal is to modify and amend the already existing directives to include a broader scope of companies and audits of the reports, and increase and refine reporting requirements (European Commission, 2021a). On the 3rd of November 2021, the IFRS Foundation Trustees created the **International Sustainability Standard Board (ISSB)** headquartered in Frankfurt. It aims to develop a global baseline for sustainability-related disclosure standards.

Regulation in Austria - On the 17th of January 2017, the CSR Directive or Non-Financial Reporting Directive (NFRD) was implemented into Austrian law retrospectively for 2017. The Sustainability and Diversity Improvement Law (Nachhaltigkeits- und Diversitätsverbesserungsgesetz, NaDiVeG) came into effect on 6 December 2016. The non-financial reporting amendment is visible in §§ 243b and 267a in the Austrian Commercial Code (Unternehmensgesetzbuch) with some occasional amendments placed in the Austrian Stock Corporation Act and the GmbH-law (Bernhard & Riedlberger, 2021; Thaler, 2021). Similar rules to those described for Germany also apply to Austria. On the 21st of April 2020, the EC adopted a proposal for the CSRD to modify and amend the already existing directives to include a broader scope of companies and audits of the reports and increase/refine reporting requirements from 2023 on – these rules equally apply to Germany and Austria.

Regulation in Switzerland - There is no regulatory obligation for reporting, but in 2014 the Swiss Code of Best Practice for Corporate Governance was extended by ESG recommendations. Additionally, the Six Swiss Exchange introduced the possibility for sustainable reporting (an opt-in option). Four standards are accepted by the exchange: Global Reporting Initiative

(GRI), United Global Compact (UNGC), Sustainable Accounting Standard Board (SASB) and European Real Estate Association (EPRA) (Kleibold & Veser, 2019). In 2015, the Swiss Federal Council published a position paper and an action plan concerning CSR. It required transparency and non-financial reporting of companies' sustainability activities but remained voluntary (Baumüller et al., 2018). The Federal Assembly provided an indirective counterproposal with the following two new regulations for the Code of Obligations (German Obligationenrecht) in 2020 (Schweizerische Eidgenossenschaft, 2020). First, the obligation of non-financial reporting is introduced for organizations similarly defined as under the NFRD. Public interest entities with at least 500 employees for two successive financial years, a balance sheet total of more than 20 million francs, or net revenue of more than 40 million francs are affected. The report needs to be made available to the public for ten years with content that is similar to the NFRD requirements. Second, it obliges firms to perform due diligence and reporting of conflict minerals and child labor. This reporting and due diligence obligation applies to companies that import materials from areas of conflict or high-risk zones and to firms offering products or services potentially associated with child labor. The risks need to be defined and countermeasures must be established (Schweizerische Eidgenossenschaft, 2020; Thaler, 2021). The indirective counterproposal entered into force and had to be applied for the first time for the financial year 2022.

3. DATA AND METHODOLOGY

In the following several analyses on sustainability reporting practices of 53 publicly listed (Market capitalization above 100 MEUR) Real Estate companies from Germany, Austria and Switzerland region from 2020 are shown. Their annual reports or sustainability reports, if provided separately, are compared concerning the comparability of the employee, and other social and governance measures. Ideally, following EU law sustainability reporting is informative (materiality) and comparable. The three largest German real estate companies are Vonovia (XTRA: VNA), Deutsche Wohnen SE (XTRA: DWNI) and LEG Immobilien AG (XTRA: LEG), while in Austria it is CA Immobilien Anlagen AG (WBAG: CAI), IMMOFINANZ AG (WBAG: IIA), S IMMO AG (WBAG: SPI). In Switzerland, the relevant counterparts are Swiss Prime Site AG (SWX: SPSN), PSP Swiss Property AG (SWX: PSPN) and Allreal Holding AG (SWX: ALLN).

The applied methodology is known as a content analysis based on investigating individual documents like non-financial statements or sustainability reports (Wooldridge, 2013). As stated in German law and similarly in Austrian law, **minimum reporting is required on environmental, social and employee concerns, human rights, anti-corruption and bribery issues, and diversity policies** (e.g. § 289c of the German Commercial Code/HGB). This minimum reporting on the employee and other social and governance issues are being further investigated as it is not further specified. However, it is worth remembering that most of the companies provide the information **voluntarily** as their number of employees lies below 500, thus, no mandatory disclosure is required unless a company is classified as a public interest entity, which is not the case here.

4. RESULTS

The aforementioned real estate companies from the German-speaking region provide common sustainability reporting practices and best practices. **Table 1** shows how many firms provided employee, other social, and governance-related information together with the type of information provided. More than 50% of the analyzed firms mentioned the total number of employees, the share of women and the number of permanent full-time contracts. More than a third of the

53 companies commented on the proportion of female executives, % of women on the board of directors, staff turnover rate, newly hired employees, full-time employees, and part-time employees. Finally, less than a third of firms provided information on the salary ratio of women to men, average sick days/year, the total number of trainees, executive pay ratio, total accidents, average age, and employee satisfaction. This is surprisingly low given the fact that the latter information does not seem to be too difficult to be obtained from internal data.

Table 1. Overview of the Number of Firms Reporting Employee, Other Social and Governance Information – Part I (53 Sample Firms)

Information type	No. of reporting firms	Information type	No. of reporting firms
Number of Employees	49	Average sick days per year	11
Share of woman	28	Total number of trainees	14
Employees with permanent contract	28	Executive pay ratio	7
Proportion of female executives	21	Total Accidents	10
% of woman on the board of directors	18	Average age	14
Salary ratio of woman to man	12	Full-time employees	23
Staff turnover rate	20	Part-time employees	19
Newly hired employees	20	Employee-Satisfaction	8

Source: Author

Interestingly, over 90% of firms provided information on the total number of employees and the proportion of women workers was identified by 28 out of 53 firms to lie between 27% and 74%. The percentage of women in executive positions is generally low and that is partially the reason why the gender pay ratio information is seldom provided. Generally, the staff turnover rate lies between 2% and 30% and there is a low rate of accidents reported.

Table 2. Overview of the Number of Firms Reporting Employee, Other Social and Governance Information – Part II (53 Sample Firms)

Information type	No. of reporting firms	Information type	No. of reporting firms
Proportion of employees with Code of Conduct training	7	ESG-specific training (Yes or No)	11
Violations of the Code of Conduct	1	Customer Survey (Yes or No)	10
Regional sponsoring projects	8	Well-being certificate (Yes or No)	5
Supervisory Board members	37	Business partner Code of Conduct/ Supplier Code of Conduct	13
Proven Case of corruption	21(0)	Own Sustainability Performance Index (Yes or No)	4
Incidents of discrimination	16(0)	Board Compensation tied to Sustainability measures (Yes or No)	2
Safety inspection of buildings	5	Anti-Corruption processes implemented (Yes or No)	22
Total No. Of Suppliers	4	Human-rights issues commented/ followed (Yes or No)	14
Share of expenses for local suppliers (%)	2	Sustainability Certificates (Yes or No)	14
		UN SDG's Included in the Report	25

Source: Author

Table 2 shows further information provided regarding employee, and other social and governance measures. Summing up, most of the companies (37 out of 53) list their supervisory board members. More than a third of the 53 companies confirm to have anti-corruption processes

implemented and the proven cases of corruption and incidents of discrimination are shown to be zero (caveat: firms are not willing to comment on these issues). Furthermore, 25 firms directly relate their activities to the SDGs. Less than a third of companies confirm to follow the human rights guidelines (14 out of 53). The same amount of companies obtained a sustainability certificate, but only 4 firms have developed their Sustainability Performance Index with 2 firms planning to tie board compensation to sustainability measures shortly. In addition, 11 companies mention to offer ESG-specific employee training and 5 firms obtained a well-being certificate to confirm offering good working conditions for their workforce. Another 7 companies provide information on employees examining a Code of Conduct training, while 1 company reports violations of the Code of Conduct. 10 firms undertook customer surveys to further improve service/product quality and on the supplier side, 13 firms report having business partner Code of Conduct/Supplier Code of Conduct rules established. Finally, eight companies engaged in regional sponsoring projects. Overall, the involvement of firms, customers, suppliers and employees in following human rights guidelines, ESG and Code of Conduct rules can and should be extended to more companies. The usefulness of these rules in all parts of the world is due to globalization clear.

Soft Information Relating to SDGs. The numbers placed below the icons indicate how many firms out of 53 relate their activities to the SDGs of the UN (broad context). The sample firms refer to 11 out of 17 SDGs.

Figure 1. Overview of the Number of RE-Firms Relating Their Activities to SDGs

Most of the firms relate their activities to the SDG Climate Action (25 out of 53), SDG Affordable and Clean Energy (23 out of 53), SDG Sustainable Cities and Communities (21 out of 53), SDG Industry Innovation and Infrastructure (19 out of 53) and SDG Good Health and Well-Being (19 out of 53). Thus, real estate companies seem to be very aware of their responsibility for sustainable development and the future.

After having analyzed the content tables one can say that the comparability of the employee and other social and governance measures is limited. There is a lot of room for improvement, but how to increase sustainability reporting quality? Basic sustainability reporting, as the one shown in this article, should become mandatory for a wide range of firms. In the long run, one can expect that sustainability indicators will be generated in the finance department under the supervision of the Chief Financial Officer (CFO). Moreover, the sustainability trend can be seen as an opportunity for becoming innovative and publishing ESG indicators or scorecards with business transformation metrics. By disrupting the industry/business one can differentiate the

own firm from the competition and overhaul the own business model to implement in-depth changes (e.g. the firm's operations including the value chains and interactions with society). Finally, linking compensation to sustainability measures would be another motivational move (Edmans, 2021; Rajgopal, 2021). For instance, Phillip Morris International (PMI) publishes goals and metrics focused on the number of adult users that have switched to IQOS and the related number of markets (Rajgopal, 2021). Furthermore, it reports the proportion of revenue from smoke-free products (ca. 24%) together with the proportion of R&D devoted to smoke-free products (ca. 99%). In the case of PMI, the compensation is tied to revenues from business transformation related to net revenues of smoke-free products and non-combustible product volumes (Rajgopal, 2021). Out of the group of analyzed real estate companies, only a few are planning to tie compensation to sustainability measures or self-developed indices in the coming years. The new EU regulation which comes into effect in 2023 should help to support a faster advancement in sustainability reporting from then on.

5. CONCLUSION

This study aimed to show common sustainability reporting practices including the best practices of real estate companies in 2020 given prevailing European regulation. It remains unclear, whether firms on purpose establish sustainable processes or whether they argue existing structures into being sustainable? This is partially the case because sustainability became a buzzword and sustainability reporting is often perceived as a marketing tool. In reality, however, transformative work needs to be done. Investors and consumers are aware of the necessity to go green, but the developments on country and company levels are often premature.

Overall, it is difficult to compare the reported sustainability measures focused on employees, and other social and governance issues across firms stemming from one industry in one country (e.g. Real Estate in Germany). In Germany, Austria and Switzerland most data can be found on employees and governance issues, while other social issues are seldom commented on. The reader usability of sustainability reporting seems to be rather low.

In fact, sustainability standards and measures play an essential role as they allow corporations to evaluate and disclose their sustainability-related activities. It is problematic that the number of sustainability standards is constantly increasing, while one global comprehensive system for companies is still missing (it is also problematic that recommendations from associations are often ignored). Establishing the ISSB and extending the sustainability reporting requirements from 2023 on at the EU level may improve reporting quality in the long term.

References

Asay, H. S., Hoopes, J. L., Thornock, J. R., & Wilde, J. H. (2022). Tax boycotts. Working Paper.

Baumüller, J., Mühlenberg-Schmitz, D., & Zöbeli, D. (2018). Die Umsetzung der CSR-Richtlinie und ihre Bedeutung für die Schweiz: Zu den Folgen der EUweiten Gesetzesreformen im deutschsprachigen Raum, Expert Focus 92(12), 981–986. Retrived from https://www.swiss-sauditmonitor.ch/wp-content/uploads/2019/04/Die-Umsetzung-der-EU-CSR-Richtlinie-und-ihre-Bedeutung-fuer-die-Schweiz.pdf

Behnam, M., & MacLean, T. L. (2011). Where Is the Accountability in International Accountability Standards?: A Decoupling Perspective. Business Ethics Quarterly, 21(1), 45-72. https://doi.org/10.5840/beq20112113

Bernhard, B., & Riedlberger, N. (2021). Nichtfinanzielle Berichterstattung österreichischer nichtfinanzieller Unternehmen im Jahr 2019. Statistiken - Daten & Analysen Q1/21, 18(1), 39–47.

Branco, M. C., & Rodrigues, L. L. (2008). Factors Influencing Social Responsibility Disclosure by Portuguese Companies. Journal of Business Ethics, 83(4), 685-701. https://doi.org/10.1007/s10551-007-9658-z

Campbell, D., Moore, G., & Shrives, P. (2006). Cross-sectional effects in community disclosure, Accounting, Auditing and Accountability Journal 19(1), 96–114.

Caradonna, J. L. (2014). Sustainability: A History, Oxford University Press. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&db=nlabk&AN=806526

Carrigan, M., & Attalla, A. (2001). The myth of the ethical consumer - do ethics matter in purchase behaviour? Journal of Consumer Marketing, 18(7), 560-578. https://doi.org/10.1108/07363760110410263

Contrafatto, M. (2014). The institutionalization of social and environmental reporting: An Italian narrative. Accounting, Organizations and Society, 39(6), 414-432. https://doi.org/10.1016/j.aos.2014.01.002

Edmans, A. (2019). The purpose of profit. London Business School Review, 30(2-3), 18-21. https://doi.org/10.1111/2057-1615.12304

Edmans, A. (2021). Grow the Pie: How Great Companies Deliver Both Purpose and Profit, 2nd edition, Cambridge University Press.

European Commission. (2011). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A renewed EU strategy 2011-14 for Corporate Social Responsibility. Retrieved 06/05/2021, from https://eur-lex.europa.eu/legalcontent/EN/TXT/PDF/?uri=CELEX:52011DC0681&from=EN

European Commission. (2017a). Communication from the Commission. Guidelines on non-financial reporting (methodology for reporting non-financial information).
Retrieved 10/01/2022, from https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52017XC0705(01)&from=EN

European Commission. (2021a). Proposal for a Directive of the European Parliament and of the Council amending Directive 2013/34/EU, Directive 2004/109/EC, Directive 2006/43/EC and Regulation (EU) No 537/2014, as regards corporate sustainability reporting. Retrieved 10/01/2022, from https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021PC0189&from=EN

European Commission. (2021b). European Commission. (2017b). EMAS User's Guide.
Retrieved 15/01/2022 from https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX: 02013D0131-20171212&from=EN

European Parliament and the Council of the European Union. (2014). Directive 2014/95/EU of the European Parliament and of the Council of 22 October 2014 amending Directive 2013/34/EU as regards disclosure of non-financial and diversity information by certain large undertakings and groups. Retrieved 10/01/2022, from https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0095&from=EN

Holder-Webb, L., Cohen, J. R., Nath, L., & Wood, D. (2009). The Supply of Corporate Social Responsibility Disclosures Among U.S. Firms. Journal of Business Ethics, 84(4), 497-527. https://doi.org/10.1007/s10551-008-9721-4

Huang, C.-L., & Kung, F.-H. (2010). Drivers of Environmental Disclosure and Stakeholder Expectation: Evidence from Taiwan. Journal of Business Ethics, 96(3), 435-451. https://doi.org/10.1007/s10551-010-0476-3

Khan, A., Muttakin, M. B., & Siddiqui, J. (2013). Corporate Governance and Corporate Social Responsibility Disclosures: Evidence from an Emerging Economy. Journal of Business Ethics, 114(2), 207-223. https://doi.org/10.1007/s10551-012-1336-0

Kleibold, T., & Veser, M. (2019). Corporate Social Responsibility: Aktuelle Entwicklungen in der Schweiz, Zeitschrift für Internationale Rechnungslegung IRZ, 325-329.

Morsing, M., & Roepstorff, A. (2015). CSR as Corporate Political Activity: Observations on IKEA's CSR Identity-Image Dynamics. Journal of Business Ethics, 128(2), 395-409. https://doi.org/10.1007/s10551-014-2091-1

O'Dwyer, B., & Unerman, J. (2016). Fostering rigour in accounting for social sustainability. Accounting, Organizations and Society, 49, 32-40. https://doi.org/10.1016/j.aos.2015.11.003

Rajgopal, S. (2021). Does Philip Morris International (PMI) Provide The Managerial Playbook for Western Oil Majors, published in Forbes 19.12.2021, Retrieved 21/01/2022, from https://www.forbes.com/sites/shivaramrajgopal/2021/12/19/does-philip-morris-international-pmi-provide-the-managerial-playbook-for-western-oil-majors/?sh=23b27b4a8ce2

Reverte, C. (2009). Determinants of Corporate Social Responsibility Disclosure Ratings by Spanish Listed Firms. Journal of Business Ethics, 88(2), 351-366. https://doi.org/10.1007/s10551-008-9968-9

Schweizerische Eidgenossenschaft. (2020). Obligationenrecht: Indirekter Gegenvorschlag zur Volksinitiative «Für verantwortungsvolle Unternehmen – zum Schutz von Mensch und Umwelt»). Retrieved 10/01/2022, from https://www.parlament.ch/centers/eparl/curia/2016/20160077/Schlussabstimmungstext%5C%202%5C%20NS%5C%20D.pdf

Shirodkar, V., Beddewela, E., & Richter, U. H. (2018). Firm-Level Determinants of Political CSR in Emerging Economies: Evidence from India. Journal of Business Ethics, 148(3), 673-688. https://doi.org/10.1007/s10551-016-3022-0

Thaler, A. (2021). Sustainability Standards in Business: An Integrated Perspective for Companies in the DACH Region [Master Thesis, University of Applied Sciences Kufstein Tirol].

United Nations. (1987). Report of the World Commission on Environment and Development: Our Common Future. Retrieved 19/12/2021, from http://www.undocuments.net/our-common-future.pdf

United Nations. (1992). AGENDA 21: United Nations Conference on Environment & Development Rio de Janerio, Brazil, 3 to 14 June 1992. Retrieved 19/12/2021, from https://sustainabledevelopment.un.org/content/documents/Agenda21.pdf

United Nations General Assembly. (2015). Transforming our world: the 2030 Agenda for Sustainable Development. Retrieved 15/01/2022, from https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E

Vogel, D. J. (2005). Is There a Market for Virtue? The Business Case for Corporate Social Responsibility. California Management Review, 47(4), 19-45. https://doi.org/10.2307/41166315

Weyzig, F. (2009). Political and Economic Arguments for Corporate Social Responsibility: Analysis and a Proposition Regarding the CSR Agenda. Journal of Business Ethics, 86(4), 417-428. https://doi.org/10.1007/s10551-008-9855-4

World Economic Forum. (2020). The Global Risks Report 2020 (15). Retrieved 10/01/2022, from http://www3.weforum.org/docs/WEF_Global_Risk_Report_2020.pdf

Wooldridge, J. M. (2013). Introductory econometrics: A modern approach, 5th Edition, Mason OH: South Western Cengage Learning.

Zhao, M. (2012). CSR-Based Political Legitimacy Strategy: Managing the State by Doing Good in China and Russia. Journal of Business Ethics, 111(4), 439-460. https://doi.org/10.1007/s10551-012-1209-6

DOI: https://doi.org/10.31410/ITEMA.S.P.2022.91

Anxiety Due to COVID-19 and the Role of Obsession, Job Location Selection and the Number of Children in Hospitality Employees

Konstantinos Krikonis[1]
Ioannis Konstantaras[2]

Received: November 20, 2022
Accepted: January 23, 2023
Published: June 12, 2023

Keywords:
Coronavirus anxiety;
Obsession with COVID-19;
Job location selection;
Hospitality employees

Abstract: *Under the framework of the Transactional Theory of Stress and Coping, stress is formulated ultimately from our interaction with the situations we find ourselves in. During COVID-19, hospitality workers experienced high levels of stress due to instability and the constant lack of infection. This survey examines the moderating role of "job location selection" and "number of children" on the direct effect of "obsession with COVID-19" on "Coronavirus anxiety". To address the above, we utilized "Partial Least Squares Structural Equation Modelling (PLS-SEM)" on collected data from 403 hospitality employees working seasonally in Greece. The results uncovered the dynamic of "job location selection" in reducing the stressor "obsession with COVID-19", moderating its effect on "Coronavirus anxiety". Moreover, the "number of children" can negatively affect this relationship adding more anxiety to workers. Such insights can offer practical implications to each worker individually.*

1. INTRODUCTION

December 2019 marked the start of the COVID-19 pandemic, which caused great disruption to humanity as it affected several sectors, including workers in the tourism industry. Hospitality workers faced extremely difficult conditions as countries around the world restricted travel to slow the spread of COVID-19. These conditions posed a significant threat to the mental health of hospitality workers due to uncertainty about their employment and the fear of being infected with Covid-19 (Duarte Alonso et al., 2020; Filimonau et al., 2020; Yan et al., 2021).

It has been reported that working adults, particularly hospitality workers, face mental health challenges, including anxiety, depression, loneliness, and obsessive-compulsive behavior due to the COVID-19 pandemic (Calderwood et al., 2022; Graham et al., 2021; Murray, 2020; Zhang et al., 2020). Several employees were concerned about the negative effects of potentially dangerous working conditions. Also, unsafe workplace and exposure to hazardous working conditions was one of the most common reasons for changing their work environment (Demirović Bajrami et al., 2021).

Meanwhile, during the COVID-19 pandemic, workers in the tourism and hospitality sector were identified as particularly vulnerable to Covid-19 (Chinazzi et al., 2020). The state of global panic caused by the threat of disease spread accompanied by the introduction of strict security measures, causes anxiety and frustration (Mao et al., 2021), especially among hospitality workers. Fear was one of the dominant emotions during the pandemic, as the biology and implications of COVID-19 remained unknown (Al-Hanawi et al., 2020). Such emotions were even more acute in remote overcrowded tourist attractions, where there was restricted access to health facilities. Therefore, to overcome workplace dread, during the pandemic, several individuals chose jobs

[1] Department of Business Administration, University of Macedonia, Thessaloniki, Greece
[2] Department of Business Administration, University of Macedonia, Thessaloniki, Greece

in locations where sanitary facilities and low viral load are available. Subsequently, our first hypothesis is based on whether job selection location can moderate workers' anxiety over COVID.

Undoubtedly, the global pandemic COVID-19 can be a stressor, particularly for workers who are parents and have increased responsibilities. For example, in several countries, the pandemic caused a severe burden on mental health (e.g., Marazziti et al., 2020; Pierce et al., 2020), especially on parents increasing levels of anxiety and depression.

In addition, the uncertainty caused by the pandemic among workers, especially in families facing significant financial pressure, further increased stress levels. Therefore, the second hypothesis mentions that family responsibility (number of children) can exacerbate the impact of obsession with anxiety over COVID.

To sum up, the present study explores the factors that contributed to the increased levels of anxiety due to the pandemic obsession, while examining the factors that mitigate the stressor (anxiety).

2. METHODOLOGY

For our analysis, we used an online platform with 7.000 members offering seasonal jobs in Greece collecting data from May to June of 2022. The representative sample consisted of 403 candidates and accounted for specialization, residence, age, and gender.

Finally, to examine the moderating role of " job location selection" and "number of children" on the direct effect of " obsession with COVID-19" on " Coronavirus anxiety " we used the "Partial Least Squares Structural Equation Model (PLS-SEM)"

3. RESULTS

The descriptive analysis returned that the majority of the candidates (N=203 50.0%) were graduates of professional studies in tourism or acquire a university degree, while most of the participants were single (N= 256, 63.5%). Regarding parenthood, levels of obsession and anxiety differ between people who have children and those who do not. Specifically, we observe that those with children had higher mean levels of obsession (7.8) and anxiety with Covid-19 (5.7). (Table 2)

Table 1. Sociodemographic characteristics of participants

Attribute	Categories	N	%
Gender	Female	190	47.1%
	Male	213	52.9%
	Total	403	100.0%
Educational Level	Elementary/High School graduate	43	10.7%
	High/Vocational high school graduate	103	25.6%
	Graduate of vocational studies (except the specialty of Tourism & Food)	53	13.2%
	Graduate of vocational studies in Tourism or Food (Cooks, Confectioners, Bakers, etc)	113	28.0%
	University Graduate (excluding Tourism and Food)	51	12.7%
	Graduate of School of Tourism (University)	40	9.9%
	Total	403	100.0%

Marital status	Not Married	256	63.5%
	Married	89	22.1%
	Divorced	42	10.4%
	Something else	16	4.0%
	Total	403	100.0%
Children in the family	No	297	73.7%
	Yes	106	26.3%
	Total	403	100.0%
Number of Children	1	44	41.5%
	2	39	36.8%
	3	22	20.8%
	>=4	1	0.9%
	Total	106	100.0%

Source: Own research

Table 2. Results regarding children

Do you have children?		**N**	**Mean**	**SD**	**t**	**Sig.**
Obsession COVID-19	No	297	3.2	3.3	-10.3***	<0.01
	Yes	106	7.8	4.2		
Coronavirus Anxiety Scale	No	297	4.0	3.6	-3.7***	<0.01
	Yes	106	5.7	4.3		

Source: Own research

While the choice of workplace has a negative correlation with both obsession and anxiety, candidates that can choose their workplace witness lower obsession and anxiety levels, due to Covid-19 (Table 3).

On the other hand, there is a positive correlation between the number of children and the level of Covid-19 obsession and anxiety. Therefore, the more children one has the higher levels of Covid-19 anxiety and obsession experiences (Table 3).

To elaborate more on the results of Table 3 we utilized the logistic regression method. In the first model, the dependent variable is " Obsession " and the independent variables are "number of children" and " Choice of the job location in 2022". While in the second, the dependent is "anxiety" examined under the same independent variables.

According to the moderation analysis, we observe that the number of children cannot act as a moderator on the effect of persistence on anxiety.

In contrast, the choice of workplace can act as a moderator on the effect of persistence on anxiety. Therefore, if individuals can choose where to work based on the criteria, they consider necessary, they can significantly reduce the occurrence of anxiety and obsession.

Table 3. Correlations

		Job location selection	**Number of Children**
Obsession with COVID-19 score	rho[1]	-.303**	.481**
	sig.	<0.01	<0.01
	N	403	403
Coronavirus Anxiety Scale score	rho[1]	-.540**	.234**
	sig.	<0.01	<0.01
	N	403	403

Source: Own research

Table 4. Logistic regression using obsession and anxiety

Obsession	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Number of children	1.33***	0.17	64.86	1	<0.01	3.79	2.74	5.25
Choice of the job location in 2022 season?	-0.44***	0.10	21.26	1	<0.01	0.64	0.53	0.78
Constant	-0.38	0.33	1.34	1	0.25	0.68		
Anxiety	**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**	**95% C.I. for EXP(B)**	
Number of children	0.91***	0.15	35.45	1	<0.01	2.49	Lower	Upper
							1.85	3.37
Choice of the job location in 2022 season?	-0.58***	0.13	20.34	1	<0.01	0.56	0.43	0.72
Constant	-0.80	0.38	4.36	1	0.04	0.45		

* p < .05, ** p< .01, ***p<.001

Source: Own research

Table 5. Moderation analysis

Number of children						
Variables	**coeff**	**se**	**t**	**p**	**LLCI**	**ULCI**
constant	2.2	0.25	8.91	<0.001	1.73	2.7
Obsession with COVID-19	0.5	0.05	9.14	<0.001	0.37	0.57
Number of children	-0.8	0.4	-1.85	0.065	-1.54	0.05
Interaction	0.1	0.04	2.87	<0.001	0.04	0.21
Model summary	R-sq	F	p	R2-chng	F	p
	0.36	76.15	<0.001	0.013	8.24	<0.001
Job location selection						
Variables	**coeff**	**se**	**t**	**p**	**LLCI**	**ULCI**
constant	3.6	0.49	7.39	<0.001	2.65	4.58
Obsession with COVID-19	0.9	0.08	11.48	<0.001	0.71	1.01
Choice of workplace	-0.4	0.13	-3.01	<0.001	-1.14	-0.76
Interaction	-0.2	0.02	-6.08	<0.001	-0.19	-0.99
Model summary	R-sq	F	p	R2-chng	F	p
	0.52	144.91	<0.001	0.044	36.99	<0.001

Source: Own research

The marginal analysis reveals that the relationship between hospitality workers' risk perception and the likelihood of experiencing anxiety is significantly different for workers whose choice of place of employment takes on greater value.

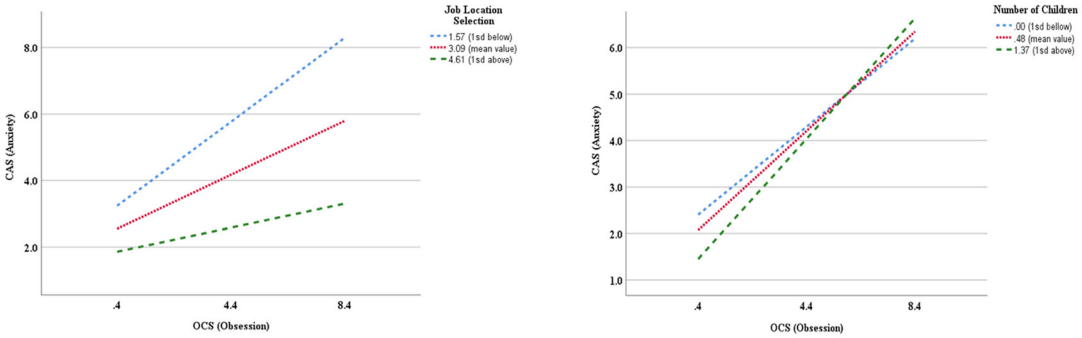


Figure 1. Interactive effects

Source: Own research

4. FUTURE RESEARCH DIRECTIONS

Future studies could focus on performance ratings to examine the impact of intense stress and obsession with Covid-19 on employees' productivity as well as their job satisfaction. Finally, future research could include hospitality workers working abroad and compare the results with the corresponding findings of this study.

5. CONCLUSION

The outbreak of the Covid-19 pandemic has caused great disruption in the tourism and hospitality sector, imposing harsh protection measures on workers. One of the main effects of the pandemic was an increase in stress due to uncertainty about the future of workers. It was a particularly stressful period for parent workers who had to manage family responsibilities.

Therefore, this study examined the factors that act as a moderator of anxiety over Covid-19 and cause stress on hospitality employees. The findings of the study revealed the potential of "job location selection" in reducing the stressor "obsession with COVID-19" by mitigating its effect on "Covid-19 anxiety". Finally, "number of children" was found to positively affect both obsession and anxiety.

References

Al-Hanawi, M. K., Mwale, M. L., Alshareef, N., Qattan, A. M., Angawi, K., Almubark, R., & Alsharqi, O. (2020). Psychological Distress Amongst Health Workers and the General Public During the COVID-19 Pandemic in Saudi Arabia. *Risk Management and Healthcare Policy, Volume 13*, 733-742. https://doi.org/10.2147/rmhp.s264037

Calderwood, C., Breaux, R., ten Brummelhuis, L. L., Mitropoulos, T., & Swanson, C. S. (2022). When daily challenges become too much during COVID-19: Implications of family and work demands for work-life balance among parents of children with special needs. *Journal of Occupational Health Psychology, 27(5)*, 516-527. https://doi.org/10.1037/ocp0000333

Chinazzi, M., Davis, J. T., Ajelli, M., Gioannini, C., Litvinova, M., Merler, S., Pastore y Piontti, A., Mu, K., Rossi, L., Sun, K., Viboud, C., Xiong, X., Yu, H., Halloran, M. E., Longini, I. M., Jr., & Vespignani, A. (2020). The effect of travel restrictions on the spread of the 2019 novel coronavirus (COVID-19) outbreak. *Science, 368(6489)*, 395-400. https://doi.org/10.1126/science.aba9757

Demirović Bajrami, D., Terzić, A., Petrović, M. D., Radovanović, M., Tretiakova, T. N., & Hadoud, A. (2021). Will we have the same employees in hospitality after all? The impact of COVID-19 on employees' work attitudes and turnover intentions. *International Journal of Hospitality Management, 94*, 102754. https://doi.org/10.1016/j.ijhm.2020.102754

Duarte Alonso, A., Kok, S. K., Bressan, A., O'Shea, M., Sakellarios, N., Koresis, A., Buitrago Solis, M. A., & Santoni, L. J. (2020). COVID-19, aftermath, impacts, and hospitality firms: An international perspective. *International Journal of Hospitality Management, 91*, 102654. https://doi.org/10.1016/j.ijhm.2020.102654

Filimonau, V., Derqui, B., & Matute, J. (2020). The COVID-19 pandemic and organisational commitment of senior hotel managers. *International Journal of Hospitality Management, 91*, 102659. https://doi.org/10.1016/j.ijhm.2020.102659

Graham, M., Weale, V., Lambert, K. A., Kinsman, N., Stuckey, R., & Oakman, J. (2021). Working at home: The impacts of COVID 19 on health, family-work-life conflict, gender, and

parental responsibilities. *Journal of Occupational and Environmental Medicine*, *63*(11), 938-943. https://doi.org/10.1097/JOM.0000000000002337

Mao, Y., He, J., Morrison, A. M., & Andres Coca-Stefaniak, J. (2021). Effects of tourism CSR on employee psychological capital in the COVID-19 crisis: from the perspective of conservation of resources theory. *Current Issues in Tourism, 24(19)*, 2716-2734. https://doi.org/10.1080/13683500.2020.1770706

Marazziti, D., Pozza, A., Di Giuseppe, M., & Conversano, C. (2020). The psychosocial impact of COVID-19 pandemic in Italy: A lesson for mental health prevention in the first severely hit European country. *Psychological Trauma: Theory, Research, Practice, and Policy, 12(5)*, 531-533. https://doi.org/10.1037/tra0000687

Murray, E. J. (2020). Epidemiology's Time of Need: COVID-19 Calls for Epidemic-Related Economics. *Journal of Economic Perspectives, 34(4)*, 105-120. https://doi.org/10.1257/jep.34.4.105

Pierce, M., Hope, H., Ford, T., Hatch, S., Hotopf, M., John, A., Kontopantelis, E., Webb, R., Wessely, S., McManus, S., & Abel, K. M. (2020). Mental health before and during the COVID-19 pandemic: a longitudinal probability sample survey of the UK population. *The Lancet Psychiatry, 7(10),* 883-892. https://doi.org/10.1016/s2215-0366(20)30308-4

Yan, J., Kim, S., Zhang, S. X., Foo, M.-D., Alvarez-Risco, A., Del-Aguila-Arcentales, S., & Yáñez, J. A. (2021). Hospitality workers' COVID-19 risk perception and depression: A contingent model based on transactional theory of stress model. *International Journal of Hospitality Management, 95,* 102935. https://doi.org/10.1016/j.ijhm.2021.102935

Zhang, J., Lu, H., Zeng, H., Zhang, S., Du, Q., Jiang, T., & Du, B. (2020). The differential psychological distress of populations affected by the COVID-19 pandemic. *Brain, Behavior, and Immunity, 87,* 49-50. https://doi.org/10.1016/j.bbi.2020.04.03

6th International Scientific Conference ITEMA 2022 – Selected Papers
DOI: https://doi.org/10.31410/ITEMA.S.P.2022.97

Virtual Reality Experience Marketing (Nissan Sakura Case Study in Vrchat Application)

Marcin Gurtatowski[1]
Doris Antczak[2]
Natalia Gluza[3]

Received: November 20, 2022
Accepted: February 1, 2023
Published: June 12, 2023

Keywords:
Virtual reality;
Automotive market;
Experience economy;
Experience marketing

Abstract: *The article aims to analyze the possibility of using virtual reality (VR) technology as an experience marketing tool, enabling the building of ties between the brand and the consumer, based on deep emotions, translating into an increased liking for the company and attachment to its commercial offer. The analysis was based on a literature study on social communication, marketing communication and VR, as well as a case study of the Nissan Sakura electric car brand in the VRChat application, which was launched in May 2022, simultaneously on the Japanese market and in the Metaverse. The analysis of VR technology, carried out on the example of the VR experience „NISSAN SAKURA Driving Island" in the VRChat application shows that VR meets in practice the assumptions of experience marketing and can potentially be an effective tool for shaping attitudes and behaviors influencing the purchasing decisions of consumers on the automotive market. Nevertheless, due to the innovative nature of the tool, it does not currently provide the possibility of reaching a mass audience with the marketing message. The application nature of the work is related to the indication of the conditions, benefits and limitations of the use of VR technology in activities aimed at shaping attitudes and behaviors, influencing the purchasing decisions of consumers in the automotive market. Contrary to the literature in the field of social and marketing communication and the automotive market, which is very wide, issues related to VR technology are the area of interest of only a small group of researchers. Given the growing popularity of VR technology, knowledge of the possibility of using it to shape attitudes and behaviors that influence consumer purchasing decisions in the automotive market may turn out to be valuable both for theoreticians and marketing practitioners.*

1. THE EXPERIENCE ECONOMY AND MARKETING

At the turn of the 20th and 21st centuries, a new type of economy was born, referred to as the 'experience economy', which was driven by the enrichment and technological development of societies, enabling enterprises to provide consumers with a variety of experiences (Pine & Gilmore, 1998). Le et al. (2019) note that consumption is now less and less associated with the purchase of goods and services, and is increasingly associated with the enjoyment of the very act of consumption. Contemporary societies are thus becoming societies of sensations. Wikström (2008) notes that the change in which consumers prefer sensations while resigning from the consumption of material goods results from the increase in individualism and attitude of individuals towards self-realization. The two main forces responsible for the change in consumption patterns are, on the one hand, the increase in the economic well-being of societies and saturation with mass consumption, and on the other hand, individualism and liberalism of values manifested in the consumer attitude of expecting more choice. The above changes have led to the emergence of a new type of consumers on the market, called 'prosumers' (Sioshansi,

[1] Poznan University of Economics and Business; Al. Niepodległości 10, 61-875 Poznań, Poland
[2] Poznan University of Economics and Business; Al. Niepodległości 10, 61-875 Poznań, Poland
[3] Poznan University of Economics and Business; Al. Niepodległości 10, 61-875 Poznań, Poland

2019). They are less sensitive than classic consumers to traditional marketing activities. A positive brand image and high quality of products are treated by 'prosumers' as obvious values that should be unconditionally guaranteed by producers and sellers of products and services. According to 'prosumers', the variety of experiences offered by enterprises differentiates commercial offers more than the tangible properties of products and services.

The concept that plays a key role in the experience economy paradigm is experience marketing. The above term means such activities of the company, which, based on experiences important to the customer, build bonds between the brand and the consumer, based on deep emotions, which translates into increased sympathy for the company and attachment to its commercial offer (Dziewanowska & Kacprzak, 2013). Consumer involvement should be built on several levels: rational, emotional, sensory and physical (Rosado-Pinto & Loureiro, 2020). According to Krishna and Schwarz (2014), in order to create an engagement effect, the experiences created by the company should affect both: the mind and the senses of consumers. Marketing activities should engage all the senses of consumers and evoke previously assumed positive associations and reactions. The goal of experience marketing is to create unique experiences that are transferred from short-term memory to long-term memory and evoke brand attachment in the consumer on a deeper, emotional level (Manthiou et al., 2014).

2. VIRTUAL REALITY TECHNOLOGY AS AN INSTRUMENT OF EXPERIENCE MARKETING

Virtual reality (VR) technology is a tool that allows in practice to meet the postulates of the sensation economy paradigm and can be used as an instrument of experience marketing. This term means a simulation of reality created using information technology. It consists of multimedia creation of a computer vision of objects, space and events. This simulation can represent both elements of the real world and a completely fictional one (Han et al., 2022). Contemporary VR technology consists of two elements. The first is hardware, meaning a VR system composed of several components: goggles with a head-mounted display, motion controllers and additional peripheral devices that extend the capabilities of the VR system. The second element is software that provides a virtual simulation environment (Grudzewski et al., 2018).

Virtual reality allows its user to evoke a sense of immersion in a virtual simulation environment (Makransky & Petersen, 2021). The latest generation of VR equipment has functionalities not present in earlier models, which can significantly increase the sense of immersion (Meta, 2022). Modern mobile VR equipment does not require a wired connection to a desktop computer, which makes it possible to provide the user with full freedom of movement in the physical space. The functionality of 6 degrees of freedom (6DOF) allows tracking the movements of the user's entire body in three-dimensional space. The display installed in the goggles allows to present the user a three-dimensional image (3D) and the natural scale of objects in a virtual environment. The speakers installed in the goggles enable the transmission of positional sound, which allows simulation of the change of the position of the sound source in three-dimensional space.

In May 2022, the market premiere of the Nissan Sakura electric car took place simultaneously on the Japanese market and in virtual reality (Nissan, 2022). Nissan has released a virtual world called 'NISSAN SAKURA Driving Island' (Lululuharu, 2022) on the VRChat social app, featuring life-scale functional replicas of Nissan Sakura cars. As part of the virtual experience, VRChat users can look at the details of the exterior and interior of the Nissan Sakura in virtual

reality, take a test drive, charge the car at an electric vehicle charging station and interact with other VRChat users.

In the example of the VR experience 'NISSAN SAKURA Driving Island' in the VRChat application, the virtual reality technology was analyzed in terms of benefits and limitations concerning the possibility of using it as a practical instrument of experience marketing. The application nature of the work is related to the indication of the conditions, benefits and limitations of the use of VR technology in activities aimed at shaping attitudes and behaviors that affect the purchasing decisions of consumers in the car market.

3. BENEFITS

The VR experience 'NISSAN SAKURA Driving Island' strongly stimulates the senses of sight and hearing of the user. The user can explore the virtual environment - the island, along with its nature, road infrastructure, buildings and equipment, including - an electric vehicle charging station. The island is divided into areas corresponding to the four seasons. In each of the zones, the user is surrounded by nature in a different stage of bloom, appropriate for a given season. There are different locations on the island that the user can explore: a teahouse, a coffee shop, a beach, and a snow dome. The user can move between locations by car, on foot, or by using shortcuts on the map, allowing them to immediately move to a given place. The virtual environment includes detailed life-scale models of Nissan Sakura electric cars. The user can look at the details of their external appearance, as well as enter their interior, which has also been reproduced in detail.

Visual and auditory stimuli are provided to the user through VR goggles (Head Mounted Display, HMD) equipped with speakers. A stereoscopic image reaches the user's eyes, giving the impression of the depth of space and the three-dimensionality of objects - car models, surroundings and user avatars. The user hears binaural surround sound, which allows the sound source to be localized in the virtual environment, making conversation with other users of the virtual experience feel natural and intuitive. Bhide et al. (2019) note that by using this sound technique it is possible to control the user's attention and direct it to a specific element of the narrative, in accordance with the intention of the virtual experience designer. The intense sensory experience provided by VR technology increases the user's sense of immersion in the virtual environment (Flavián et al., 2019). This sense of immersion translates into better memorization of the content presented to the user of the virtual experience (Mania & Chalmers, 2001).

The participant of the VR experience can interact with many elements of the virtual environment of 'NISSAN SAKURA Driving Island'. The user can take any seat in the car and look at the details of the car interior from any perspective. It is also possible for the user to test drive the car and simulate the process of charging the car at an electric vehicle charging station. Nissan Sakura car models have the functionality of opening and closing all doors and the car's charging lid. It is possible to adjust the height and depth of the seats. The car model can move forward and backward, adjust the speed and change the direction of travel using the steering wheel. Users can interact not only with predefined elements of the virtual environment but also with each other. Interactions between users take place through avatars. The body movements and voice of the user in the real world are transmitted via the Internet and translated into the movements and speech of the avatar representing the user in virtual reality. Users can get in the same car and take a test drive together in virtual reality, regardless of whether in the real world they are in the same physical space or places far apart. The use of interactive elements in the VR experience

has a positive effect on evoking an emotional reaction in the recipient (Pallavicini et al., 2018). Alsharif et al. (2021) note that strong emotional relationships of consumers, caused by the content and form of the marketing message, can have a positive impact on better-remembering information about the product brand and commercial offer by the consumer.

Participants in the virtual experience of 'NISSAN SAKURA Driving Island' can also compete against each other by taking part in a car race. The use of elements taken from traditional computer games in the VR experience can increase the level of consumer engagement and shape the consumer's positive attitude towards the product brand (Hsu & Chen, 2018).

4. LIMITATIONS

The technological exclusivity of virtual reality is one of the main reasons for the limitations of using VR as an instrument of experience marketing. Despite the constantly growing number of users of VR equipment, it is still relatively expensive and not very popular even among the representatives of the younger generation. For this reason, VR technology currently has a small range of reaching the recipients of marketing messages. The VR technology market is now becoming more and more competitive due to the expanding range of VR hardware and software offered by manufacturers from different countries around the world (Henriques & Winkler, 2021). The increase in competition may lead to a decrease in the prices of VR hardware and software on the market, which may be an opportunity for the dissemination of VR technology and increase its range of reaching users with a marketing message.

The 'NISSAN SAKURA Driving Island' virtual reality experience is currently only available through the VRChat social media app, available to users of Meta Quest hardware and software. The VRChat application is actually available for desktop computers through web browsers, but it is a different kind of experience that does not have the highly immersive properties characteristic of virtual reality.

The Nissan's virtual experience is only available in Japanese and English - manuals for car models and a map of the island in virtual reality were written in these languages. The lack of other language versions may be an additional barrier for application users.

The 'NISSAN SAKURA Driving Island' experience does not provide haptic stimulation, despite the fact that the VRChat social platform supports such functionality. In some VR experiences of a similar type, when the user touches objects in the virtual environment, he or she feels the vibrations emitted by the motion controllers held in their hands. The use of such a solution could increase the range of sensory experiences of the user and give the VR experience an additional dimension of interaction, thus increasing the sense of immersion in the virtual environment (Flavián et al., 2019).

5. CONCLUSION

The analysis of VR technology carried out on the example of the VR experience 'NISSAN SAKURA Driving Island', indicates that VR meets the assumptions of experience marketing in practice and can potentially be an effective instrument for shaping attitudes and behaviors influencing the purchasing decisions of consumers on the car market. Nevertheless, due to the innovative nature of the tool, it currently does not provide the possibility of reaching the mass

recipient with the marketing message. The chance to increase the reach of the marketing message in virtual reality lies in the potential increase in popularity and affordability of VR technology in the future.

It is worth considering conducting empirical scientific research aimed at verifying the potential of the 'NISSAN SAKURA Driving Island' VR experience to shape attitudes and behaviors that affect the purchasing decisions of consumers in the car market.

References

Alsharif, A. H., Md Salleh, N. Z., & Baharun, R. (2021). Neuromarketing: Marketing research in the new millennium. *Neuroscience Research Notes, 4(3)*, 27-35. https://doi.org/10.31117/neuroscirn.v4i3.79

Bhide, S., Goins, E., & Geigel, J. (2019). Experimental Analysis of Spatial Sound for Storytelling in Virtual Reality. *Interactive Storytelling, 3-7.* https://doi.org/10.1007/978-3-030-33894-7_1

Dziewanowska, K., & Kacprzak, A. (2013). *Marketing doświadczeń*, Wydawnictwo Naukowe PWN, Warszawa.

Flavián, C., Ibáñez-Sánchez, S., & Orús, C. (2019). Integrating virtual reality devices into the body: effects of technological embodiment on customer engagement and behavioral intentions toward the destination. *Journal of Travel & Tourism Marketing, 36(7)*, 847-863. https://doi.org/10.1080/10548408.2019.1618781

Grudzewski, F., Awdziej, M., Mazurek, G., & Piotrowska, K. (2018). Virtual reality in marketing communication - the impact on the message, technology and offer perception - empirical study. *Economics and Business Review, 4(18)(3)*, 36-50. https://doi.org/10.18559/ebr.2018.3.4

Han, D.-I. D., Bergs, Y., & Moorhouse, N. (2022). Virtual reality consumer experience escapes: preparing for the metaverse. *Virtual Reality, 26(4)*, 1443-1458. https://doi.org/10.1007/s10055-022-00641-7

Henriques, A. C., & Winkler, I. (2021). The Advancement of Virtual Reality in Automotive Market Research: Challenges and Opportunities. *Applied Sciences, 11(24)*, 11610. https://doi.org/10.3390/app112411610

Hsu, C.-L., & Chen, M.-C. (2018). How gamification marketing activities motivate desirable consumer behaviors: Focusing on the role of brand love. *Computers in Human Behavior, 88*, 121-133. https://doi.org/10.1016/j.chb.2018.06.037

Krishna, A., & Schwarz, N. (2014). Sensory marketing, embodiment, and grounded cognition: A review and introduction. *Journal of Consumer Psychology, 24(2)*, 159-168. https://doi.org/10.1016/j.jcps.2013.12.006

Le, D., Scott, N., & Lohmann, G. (2019). Applying experiential marketing in selling tourism dreams. *Journal of Travel & Tourism Marketing, 36(2),* 220-235. https://doi.org/10.1080/10548408.2018.1526158

Lululuharu. (2022). NISSAN SAKURA Driving Island, VRChat, https://vrchat.com/home/world/wrld_1ccb70f3-f75e-4c6e-b6d9-ce2a96bd1ad1

Makransky, G., & Petersen, G. B. (2021). The Cognitive Affective Model of Immersive Learning (CAMIL): a Theoretical Research-Based Model of Learning in Immersive Virtual Reality. *Educational Psychology Review, 33(3)*, 937-958. https://doi.org/10.1007/s10648-020-09586-2

Mania, K., & Chalmers, A. (2001). The Effects of Levels of Immersion on Memory and Presence in Virtual Environments: A Reality Centered Approach. *CyberPsychology & Behavior, 4(2)*, 247-264. https://doi.org/10.1089/109493101300117938

Manthiou, A., Lee, S., Tang, L. R., & Chiang, L. (2014). The experience economy approach to festival marketing: vivid memory and attendee loyalty. *Journal of Services Marketing, 28(1)*, 22-35. https://doi.org/10.1108/jsm-06-2012-0105

Meta. (2022). https://www.meta.com

Nissan. (2022). https://global.nissanstories.com/en/releases/nissan-goes-virtual-with-the-sakura

Pallavicini, F., Pepe, A., Ferrari, A., Garcea, G., Zanacchi, A., & Mantovani, F. (2018). What Is the Relationship Among Positive Emotions, Sense of Presence, and Ease of Interaction in Virtual Reality Systems? An On-Site Evaluation of a Commercial Virtual Experience. *Presence: Teleoperators and Virtual Environments, 27(2)*, 183-201. https://doi.org/10.1162/pres_a_00325

Pine II, B.J., & Gilmore, J.H. (1998). *Welcome to the Experience Economy*, *Harvard Business Review*, July–August, s. 97-105.

Rosado-Pinto, F., & Loureiro, S. M. C. (2020). The growing complexity of customer engagement: a systematic review. *EuroMed Journal of Business, 15(2)*, 167-203. https://doi.org/10.1108/emjb-10-2019-0126

Sioshansi, F. (2019). *Consumer, prosumer, prosumager: How service innovations will disrupt the utility business model*. https://doi.org/10.1016/c2018-0-01192-5

Wikström, S. R. (2008). A consumer perspective on experience creation. *Journal of Customer Behaviour, 7(1)*, 31-50. https://doi.org/10.1362/147539208x290334

6th International Scientific Conference ITEMA 2022 – Selected Papers
DOI: https://doi.org/10.31410/ITEMA.S.P.2022.103

Online Learning during the COVID-19 Pandemic

Silva Kostić[1]
Nada Ratković Kovačević[2]
Marija Zajeganović[3]
Đorđe Dihovični[4]
Ivana Krulj[5]
Dragan Kreculj[6]

Received: November 20, 2022
Accepted: February 1, 2023
Published: June 12, 2023

Keywords:
E-learning;
Blended Learning;
LMS Platforms;
Virtual Meeting Platforms

Abstract: *In the 21st century almost every higher education course includes some type of digital learning. Many universities provide blended, online or e-learning courses. Many LMS platforms are used for online learning and testing students in various fields. Several virtual meeting platforms are used for online learning and communication. The use of these platforms at universities skyrocketed during the Covid-19 pandemic. This paper focuses on teachers' experience and satisfaction with different tools for online learning in comparison with traditional, face-to-face teaching methods. The authors surveyed three academies of applied studies in Serbia. According to the survey, most teachers used online learning platforms as well as virtual meetings during the Covid-19 pandemic and they were satisfied. The results of the survey imply that the majority of teachers find blended learning to be the optimal method of teaching in the future.*

1. INTRODUCTION

E-learning made learning possible anytime and anywhere as a result of technological advancement, particularly the development of computer networks and end devices. Many universities worldwide have accredited distance learning study programs and provide blended or online courses. Numerous LMS platforms are used for online learning and testing students. Different virtual meeting platforms are widely used for communication and collaboration. The use of both types of platforms in the teaching process soared during the Covid-19 pandemic since it was the only possible method of teaching during the lockdown when there was an urgent need to overcome the problem of mandatory social distancing. After two years of online learning, the digital competence of teachers and students has increased and e-learning has advanced in many settings.

This paper gives an overview of the basic terms regarding e-learning, learning management systems and virtual meeting platforms followed by the results of a survey on teachers' experience, and satisfaction with online learning and the conclusion of the research.

[1] Academy of Technical and Art Applied Studies Belgrade, Department School of Information and Communication Technologies, Zdravka Čelara 16, Belgrade, 11000, Serbia
[2] Academy of Applied Technical Studies Belgrade, Department of Computer-Mechanical Engineering, Blv. Zorana Djindjića 152 a, Belgrade, 11070, Serbia
[3] Academy of Technical and Art Applied Studies Belgrade, Department School of Information and Communication Technologies, Zdravka Čelara 16, Belgrade, 11000, Serbia
[4] Academy of Applied Technical Studies Belgrade, Department of Computer-Mechanical Engineering, Blv. Zorana Djindjića 152 a, Belgrade, 11070, Serbia
[5] Academy of Applied Technical and Preschool Studies, Department Vranje, Filipa Filipovica 20, Vranje, 17500, Serbia
[6] Academy of Applied Technical Studies Belgrade, Department of Computer-Mechanical Engineering, Blv. Zorana Djindjića 152 a, Belgrade, 11070, Serbia

2. E-LEARNING, ONLINE, BLENDED, SYNCHRONOUS AND ASYNCHRONOUS LEARNING

The term eLearning was coined by Elliot Masie in 1999. E-learning or electronic learning implies *training, learning, or education delivered online through a computer or any other digital device* such as tablets or mobile phones connected to the internet which makes it easy for users to learn anytime and anywhere (Lawless, 2018). It appeared in the 2000s with the development of internet technologies and it occurs remotely and online via information and communication technologies (Rise up, 2022). However, it can successfully be offered offline as well (Lawless, 2018).

There are various models of e-learning, the most common of which are: (a) enhanced or adjunct model – acts as an assistant in classroom face-to-face learning, providing relative independence to students; (b) blended e-learning model – integration of classroom face-to-face learning experiences with online learning; and (c) pure online or fully-online model – without traditional face-to-face learning, providing maximum independence to students (Garrison & Kanuka, 2004). The fully online model is further divided into individual and collaborative learning, with the collaborative learning model being subdivided into asynchronous and synchronous learning models (Regmi & Jones, 2020). Synchronous (face-to-face) learning refers to a method of teaching which enables students to interact with teachers via the Internet in real-time, similar to in-person learning (Khan, 2006). The asynchronous (text-based internet) teaching method implies that students and teachers do not have to meet on the web in real-time. It allows students to learn *anytime and anywhere* (Khan, 2005).

Blended learning (hybrid learning) combines the benefits of e-learning (it is time-saving, cost-effective and flexible) with the benefits of face-to-face learning (human interactions, sharing ideas, and motivation). It can involve a combination of e-learning modules, virtual classes, in-person training, collaborative exercises via web chats or forums, etc. It makes training courses more flexible and adaptable as well. For instance, theory can be taught via e-learning modules, while practical exercises can be done at face-to-face sessions (Rise up, 2022).

3. LMS PLATFORMS AND VIRTUAL MEETING PLATFORMS

A learning management system (LMS) is a software application or web-based technology used to plan, implement and assess a specific learning process. The primary use of a learning management system is for knowledge management. Some popular LMSs used by educational institutions include Moodle, Blackboard Learn and Schoology (Brush, n.d.). Learning Management Systems are platforms that include learning systems, course management systems, content management systems, portals, and instructional management systems (Coates et al., 2005). LMS platforms allow students to upload assignments and download grades, interact with each other, their teachers, or learning tools, share knowledge and take online exams and quizzes (Jurubescu, 2008).

LMS platforms are used to create teaching materials, digital textbooks, various activities, tests, etc. Digital textbooks can contain videos, movies, animations, 3D models, tests and quizzes. They are better adapted to student needs than traditional textbooks and provide multimedia and special-purpose tools. They are cheap, always available and occupy little space (Kreculj et al., 2019).

LMS platforms are used to keep a record of student activities and progress and communicate with students on forums as well. The most common Learning Management Systems (LMS)

used in the teaching and learning processes in higher education institutions are: Moodle, ATutor, Blackboard and SuccessFactors (Kasim & Khalid, 2016). Most higher education institutions in Serbia use Moodle platform, which is an open-source, customizable LMS, developed in 2001 (Moodle, 2022). It is user-friendly, accessible and flexible.

A virtual meeting is a form of communication that enables people in different physical locations to use their mobile or internet-connected devices to meet in the same virtual room. There are different types of virtual meetings such as: video conferences (face-to-face interaction, high-quality video and audio, best suited for team building), web conferences (brainstorming sessions and collaboration on projects by using sharing and whiteboarding), webinars (a one-way seminar with hosts or panelists presenting to attendees), teleconferences (the simplest, audio-only meetings, best suited for quick and informal calls) (Webex, 2022).

Virtual meeting platforms are used in online learning as well. They enable communication and collaboration in real-time. The most common ones are Google Meet, Zoom, MS Teams, and Cisco Webex.

Apart from video chat, virtual meeting applications offer interactive tools such as digital whiteboards or even VR (virtual reality), newer and emerging technologies that allow meeting participants to create an avatar that sits in virtual space alongside colleagues' avatars, which might be a very fun and creative experience. Presenters can also share YouTube videos and create polls. Most video and web conferencing software include additional features such as a built-in messaging system, *hand raise* (a non-interrupting way to inform the speaker you wish to ask a question), the ability to mute, turn the video on/off, and control these options for participants, etc. (Tovuti, 2022).

The benefits of using a virtual meeting platform in online learning are infinite, from increased productivity and interaction with students and instructors to technical conveniences such as the possibility of recording meetings and facilitated collaboration with features such as breakout rooms, messaging and sharing documents and computer screens (Tovuti, 2022).

The main drawbacks of virtual meetings are technical problems, learning curve issues for new participants and the impression of being less personal than in-person meetings (Webex, 2022).

4. SURVEY

The authors surveyed three academies of applied studies, two in Belgrade and one in Niš. All three academies are technical and their predominant scientific field is engineering and technology. The focus of our research was teachers' experience and satisfaction with e-learning platforms and virtual meetings. The research aimed to determine the teaching model with the best outcome in a state of emergency and under normal circumstances. 85 teachers participated in the survey which had 8 questions. All the teachers who took part in the survey had a chance to use the platforms during the pandemic, therefore the results of the survey can be considered valid.

5. RESULTS

The first question in the survey referred to the use of e-learning platforms in the teaching process during the pandemic. Most teachers used Moodle, 10% of them used Google Classroom, whereas 20% used various virtual meeting platforms. Only 13% of the teachers did not use any e-learning platforms.

The second question addressed the complexity of using LMS platforms. 54.1% of the participants used them before the pandemic and they find that tool easy to use. The participants of the survey work at technical academies and such a result is expected. Most of the teachers without previous experience with e-learning platforms (31.8%) find them easy to use as well. A small percentage of the participants, 5.9%, find them complicated to use and 8.2% of them do not use e-learning platforms in the teaching process, as shown in Figure 1.

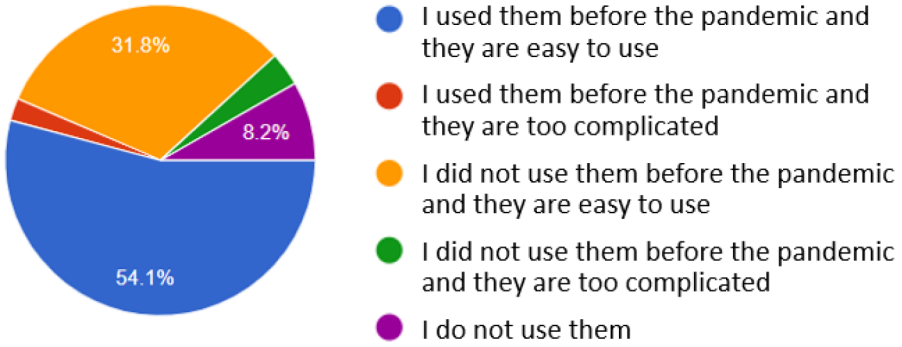


Figure 1. Complexity of using e-learning platforms

Source: Own research

The third question dealt with teachers' satisfaction with the features of e-learning platforms. The participants mostly used the platforms to create lectures (83.5%). 36.5% of the teachers used them for testing students and 40% of them to keep a record of student activities. The majority of the participants were satisfied with the features they used. Only 10.6% of the participants did not use any e-learning platforms in the teaching process, as shown in Figure 2.

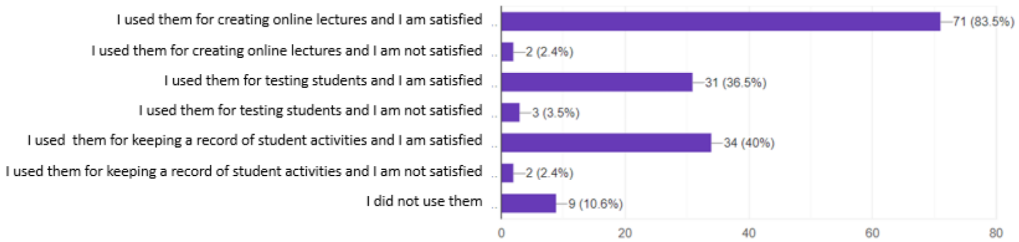


Figure 2. Features of e-learning platforms

Source: Own research

The fourth question of the survey focused on the use of virtual meeting platforms in the teaching process. The participants mostly used Google Meet (47.1%), Zoom (45.9%), MS Teams (25.9%) and Cisco Webex (16.5%). Only 9.4% of them did not use any virtual meeting platforms for teaching, as shown in Figure 3.

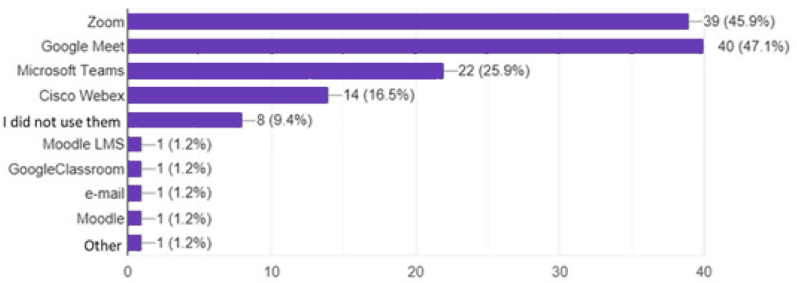


Figure 3. Virtual meeting platforms

Source: Own research

The answers to the fifth question show that the participants mostly used virtual meeting platforms for giving synchronous online lectures (71.8%). 22.4% of the teachers who took part in the survey used the platforms to give synchronous online lectures and record them (22.4%). 11.8% of them used virtual meeting platforms to record lectures offline. A small number of the participants (14.1%) do not use any virtual meeting platforms in the teaching process, as shown in Figure 4.

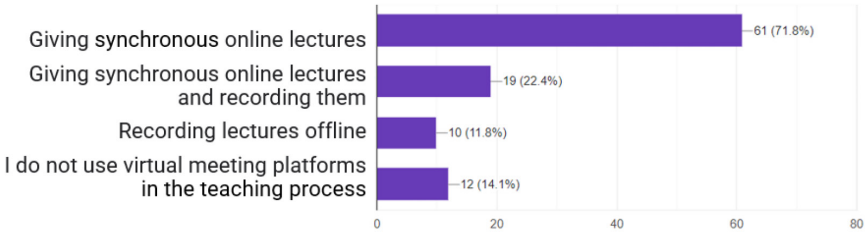


Figure 4. Different uses of virtual meeting platforms in the teaching process

Source: Own research

The sixth question referred to the complexity of the use of virtual meeting platforms in the teaching process. The results are as expected. Whether the participants used them before the pandemic or not, they find them easy to use (84.7%). 11.8% of the participants do not use them in the teaching process and only 3.6% of them find them too complicated to use, no matter if they used them before or not, as shown in Figure 5.

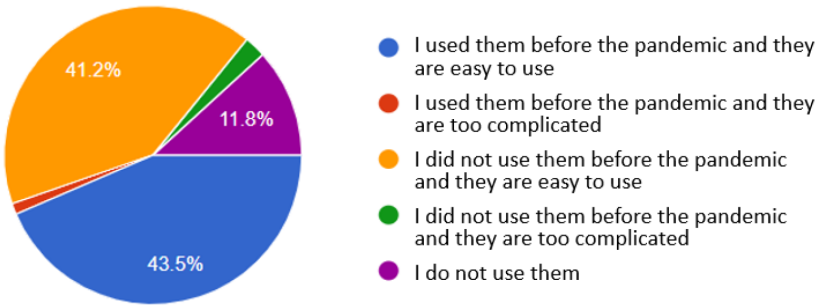


Figure 5. Complexity of using virtual meeting platforms

Source: Own research

The last two questions addressed the best teaching method in a state of emergency and under normal circumstances. 74.1% of the participants find synchronous online learning with the use of e-learning platforms to be the best method of teaching when classroom teaching is not possible. 15.3% of them opted for online learning without using e-learning platforms while 10.6% of the teachers prefer distance, i.e. asynchronous learning, as shown in Figure 6.

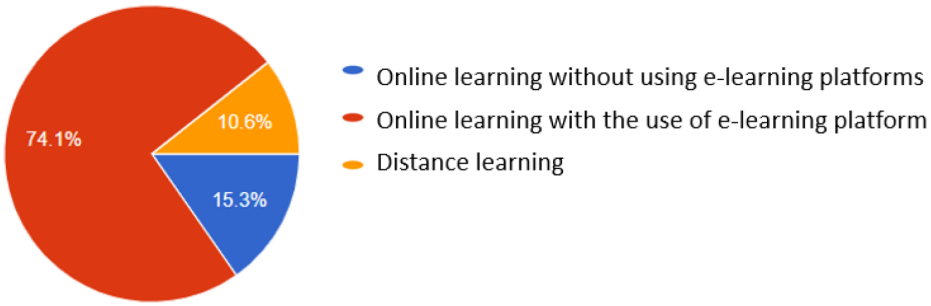


Figure 6. Model of teaching with the best outcome (when classroom teaching is not possible)

Source: Own research

Most teachers (68.2%) find face-to-face learning with the use of e-learning platforms to be the best method of teaching under normal circumstances. 21.2% of the teachers who took part in the survey would give in-person lectures without using e-learning platforms. 5.9% of the participants would choose the same method of teaching as the one considered best during the pandemic, i.e. online learning with the use of e-learning platforms. Only 1.2% find distance learning, i.e. asynchronous learning to be the best model of teaching even under normal circumstances. For 3.5% of the teachers online learning without using e-learning platforms would give the best outcome, as shown in Figure 7.

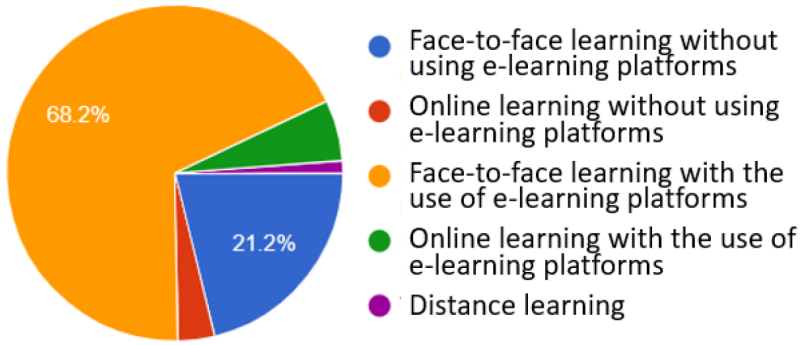


Figure 7. Model of teaching with the best outcome (when classroom teaching is possible)
Source: Own research

6. CONCLUSION

Most of the participants in the survey find e-learning platforms and virtual meeting ones easy to use no matter if they previously used them or not. The majority of them believe that LMS platforms should be used not only in a state of emergency but also under normal circumstances. A great number of the teachers who took part in the survey find online learning with the use of e-learning platforms to be the best method of teaching in a state of emergency. According to the majority of participants in the survey, blended learning is the best method of teaching under normal circumstances. During the Covid-19 pandemic, teachers were faced with a challenge that they managed to overcome.

References

Brush, K. (n.d.). Learning management system (LMS). Tech Target Network. SearchCIO. https://www.techtarget.com/searchcio/definition/learning-management-system

Coates, H., James, R., & Baldwin, G. (2005). A critical examination of the effects of learning management systems on university teaching and learning. Tertiary Education and Management, 11(1), 19-36. https://doi.org/10.1080/13583883.2005.9967137

Garrison, D. R., & Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *The Internet and Higher Education, 7(2)*, 95-105. https://doi.org/10.1016/j.iheduc.2004.02.001

Jurubescu, T. (2008). Learning Content Management Systems. *Informatica Economica*, *4(48)*, 91–94.

Kasim, N. N. M., & Khalid, F. (2016). Choosing the Right Learning Management System (LMS) for the Higher Education Institution Context: A Systematic Review. *International Journal of Emerging Technologies in Learning (iJET), 11(06)*, 55. https://doi.org/10.3991/ijet.v11i06.5644

Khan, B. H. (2005). *Managing e-learning: Design, delivery, implementation and evaluation.* Philadelphia (PA): Information Science Publishing.

Khan, B. H. (2006). *Flexible Learning in an Information Society.* Philadelphia (PA): Information Science Publishing.

Kreculj, D., Ljubojević, D., & Vorkapić, M. (2019). Digital textbooks in the classroom. In Trebinjac, B. & Jovanović, S. (Eds.) *Proceedings*. Paper presented at 10th International Conference on eLearning, eLearning 2019, Belgrade Metropolitan University, Belgrade, September 26-27, 2019 (128–131). Belgrade: Belgrade Metropolitan University. Retrieved from https://www.metropolitan.ac.rs/files/2020/03/eConference-2019-Zbornik_FINAL.pdf

Lawless, C. (2018). What is eLearning? *LearnUpon*. https://www.learnupon.com/blog/what-is-elearning/

Moodle. (2022). What is Moodle LMS? Fully customisable online learning management system. https://moodle.com/moodle-lms/

Regmi, K., & Jones, L. (2020). A systematic review of the factors - enablers and barriers - affecting e-learning in health sciences education. *BMC Medical Education, 20(1)*. https://doi.org/10.1186/s12909-020-02007-6

Rise up. (2022). Infographic: e-learning vs blended learning. https://blog.riseup.ai/en/differences-e-learning-blended-learning

Tovuti. (2022, February 22). 5 reasons why remote learning needs a virtual meeting platform. https://www.tovutilms.com/blog/virtual-meeting-platform

Webex. (2022). What is a virtual meeting? https://www.webex.com/virtual-meetings-guide.html

DOI: https://doi.org/10.31410/ITEMA.S.P.2022.111

Successful E-learning: Wishful Thinking or Reality?

Zoran Ježić[1]
Renee Škulić[2]

Received: December 1, 2022
Accepted: January 24, 2023
Published: June 12, 2023

Keywords:
Digital Technology;
ICT;
Education;
UNIRI;
SWOT

Abstract: *Technology is developing at an unprecedented pace, and this is affecting the education system as well. This is especially true in the context of the COVID-19 pandemic, the consequences of which we are still feeling. Basically, COVID-19 has accelerated the inevitable change that has already begun and that has received an incredible boost on the way to the introduction of e-learning. In this paper, the authors explore the question of whether e-learning at the University of Rijeka (UNIRI) Constituents' is really at a level where it can be said to be e-learning in the true sense of the word and whether it can be classified as successful. Since e-learning is an upcoming educational trend, it deserves special attention and a concrete assessment of its current status so that policymakers can direct their actions toward improvements. Regardless of the outcome of this research, one thing is very clear: education and educational policy will never be the same again.*

1. INTRODUCTION

Online learning is described as education that occurs partially or completely online and makes information or knowledge accessible to users regardless of time constraints or proximity to the instructor (Sun et al., 2008). Moreover, any formal educational strategy involving instructors and students interacting remotely over the Internet is known as e-learning (Beqiri et al., 2009; Fazlollahtabar & Muhammadzadeh, 2012; Pham et al., 2018). Therefore, e-learning brings together the two key domains of learning and technology, however, it is not a novel learning model since the phrase was first used already in 1983 by Mary Alice White (Aparicio, et al., 2016). Information and communication technology (ICT) developments are transforming all industries and sectors, including higher education (Pham et al., 2019). Concerning globalization, the majority of businesses are relocating to a worldwide marketplace, and the rise of e-learning platforms has proportionately raised the demand for online and remote learning programs in higher education institutions (Harper et al., 2004). Information technologies, such as e-learning management platforms, have witnessed a gain in power and a decline in cost due to technological innovation, which has contributed to their high acceptance rate (Lee, 2021). E-learning supports the digitization of universities and the development of a technologically advanced society, while equal access to educational opportunities can promote individual stability, community security, and economic growth (Pham et al., 2019; Taylor, 2007; Zaghar, 2022). Therefore, it is crucial to establish the current state of e-learning to develop education policies oriented to the increase of advanced technological society, higher rate of graduates and more accessible education in order to contribute to economic growth and development. The flexibility provided by the e-learning platform appeals to students who are employed or have families (McEwen, 2001). However, implementing e-learning comes with challenges for both students and professors (Gopal et al., 2021). The COVID-19 epidemic, according to 86.7% of students worldwide, caused

[1] University of Rijeka, Faculty of Economics and Business Department of National Economy and Development, Ivana Filipovića 4, Rijeka, 51000, Croatia
[2] University of Rijeka, Faculty of Economics and Business Department of National Economy and Development, Ivana Filipovića 4, Rijeka, 51000, Croatia

the cancellation of onsite classes (Aristovnik et al., 2020). Due to the COVID – 19 pandemics and the fast transition from in-person to online learning several difficulties for both higher education institutions and students were identified considering e-learning. Nonetheless, students indicated higher levels of satisfaction in all areas of their academic performance and daily lives (Ravšelj et al., 2021).

There is a growing number of e-learning courses around the world and more and more universities are promoting this type of learning programmes. Two years ago, the education system had to face a fast transition to e-learning due to the COVID-19 pandemic. Mostly the transition came fast and unstructured; it was a huge shock for the education system worldwide. Moreover, there are ongoing debates about the quality of e-learning and therefore it is necessary to assess the current state of it. This paper aims to investigate the current state of e-learning at the University of Rijeka (UNIRI) taking into consideration other factors besides technology, such as people and processes. In addition, this paper will determine the main advantages and disadvantages of e-learning at UNIRI in order to be able to give recommendations for improvement. Finally, the research question that arises is: Is the University of Rijeka ready to fully implement e-learning successfully?

2. SHORT OVERVIEW OF THE PRESENT STATE

In 2021 in Croatia there were 77% of PC users and 85% of the population had internet access (Croatian Bureau of Statistics, 2021). The data for this paper was gathered in 2020 so to be consistent the number of student Internet users in 2020 was 91%, but already in 2021, all students and pupils used the Internet (Croatian Bureau of Statistics, 2021). Croatia has 116 study programmes in English but zero online and 17 online studies in Croatian with accreditation in 2022 (Croatian Ministry of Science and Education, n.d.). Before 2020, there were only seven online study programmes and according to Ježić (2021) before the pandemic, most universities in Croatia have never truly accepted the concept of e-learning. This is clearly an indicator that something went well with e-learning during the so-called "forced transition" to it due to the circumstances. Moreover, UNIRI has 17 constituents and in 2020, it had almost 16.700 students. UNIRI has 15 study programmes in English, out of which zero are online. However, it does have three Croatian online study programmes with full accreditation. It is important to emphasize that the Faculty of Economics and Business (EFRI) had 100% of its courses online on Merlin already in 2013/2014. In 2015/16, it has started with the online university graduate programme that lasts two years and in 2019/20 with the online university undergraduate programme of three years. The third online programme starts this year as a one-year university graduate programme at the Faculty of Tourism and Hospitality Management (FMTU).

3. RESULTS AND DISCUSSION

The data in this paper are from the research done by the Quality assurance and improvement committee at UNIRI. After analysing the data from the Quality Committee, the authors present an independently made SWOT analysis and give comments about e-learning at the UNIRI and how to improve it. The aim was to assess the quality of e-learning during the COVID-19 pandemic. The research was focused on teaching staff' and students' perception and experience of the new learning model. There were two questionnaires open from March to May 2020. The response rate for students is 18% (N=2.747) and for the teaching staff 36% (N=461).

The following Table 1 and Table 2 present the assessment of the quality of teaching in an online environment from the point of view of teachers and students.

Table 1. Teaching staff assessment of the quality of teaching in online environment

Constituent	N	Mean	SD
APURI	72	3.6	1.0
EFRI	523	4.4	1.0
FDM	31	3.7	1.1
FFRI	193	3.3	1.2
FMTU	313	4.5	0.8
FZS	137	3.0	1.2
GRADRI	66	3.4	1.0
MEDRI	217	3.2	1.3
OBRI	39	3.5	1.1
OFRI	34	3.5	0.9
OIRI	43	3.6	0.9
OMRI	60	3.5	1.0
PFRI	148	3.0	1.4
PoliRI	41	3.8	1.1
PRAVRI	258	3.7	1.1
RITEH	138	3.7	1.0
UFRI	88	3.3	1.2
UNIRI	2401	3.8	1.2

Source: Quality Assurance and Improvement Committee at UNIRI, 2020.

Table 2. Student assessment of the quality of teaching in online environment

Constituent	N	Mean	SD
APURI	18	4.1	0.8
EFRI	27	4.4	0.4
FDM	6	4.3	0.3
FFRI	68	4.4	0.4
FMTU	25	4.5	0.3
FZS	10	4.1	0.9
GRADRI	25	4.5	0.3
MEDRI	34	4.1	0.8
OBRI	12	4.1	0.5
OFRI	13	4.2	0.5
OIRI	10	4.7	0.3
OMRI	5	4.4	0.3
PFRI	16	4.5	0.4
PoliRI	2	5.0	0.1
PRAVRI	20	4.4	0.5
RITEH	32	4.4	0.6
UFRI	12	4.5	0.3
Unknown	45	4.3	0.4
UNIRI	380	4.4	0.5

Source: Quality Assurance and Improvement Committee at UNIRI, 2020.

The overall mean for the teaching staff at UNIRI is 4.4 out of 5 and for students 3.8. From these tables, it is noticeable how teachers and students perceive and value quality differently. However, it must be emphasized that this transition to e-learning was quick, unplanned and forced, therefore these grades were more than satisfactory.

The next figure depicts the difference between the quality assessments of the two groups.

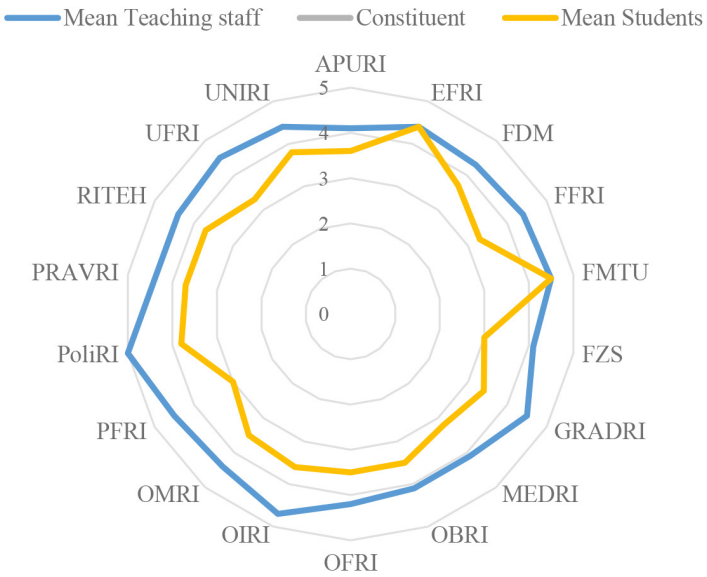


Figure 1. Comparison of teaching staff and students' assessment of teaching quality in the online environment

Source: Quality Assurance and Improvement Committee at UNIRI, 2020.

Figure 1 clearly illustrates that students in general assessed the quality with approximately one grade less than their professors did. However, it can also be noticed that the only two constituents, with which teachers' and students' grades match, are EFRI and FMTU, which are the only two Faculties at UNIRI that have accredited online study programmes. Figure 2 outlines the teacher grades for different particles regarding holding online classes.

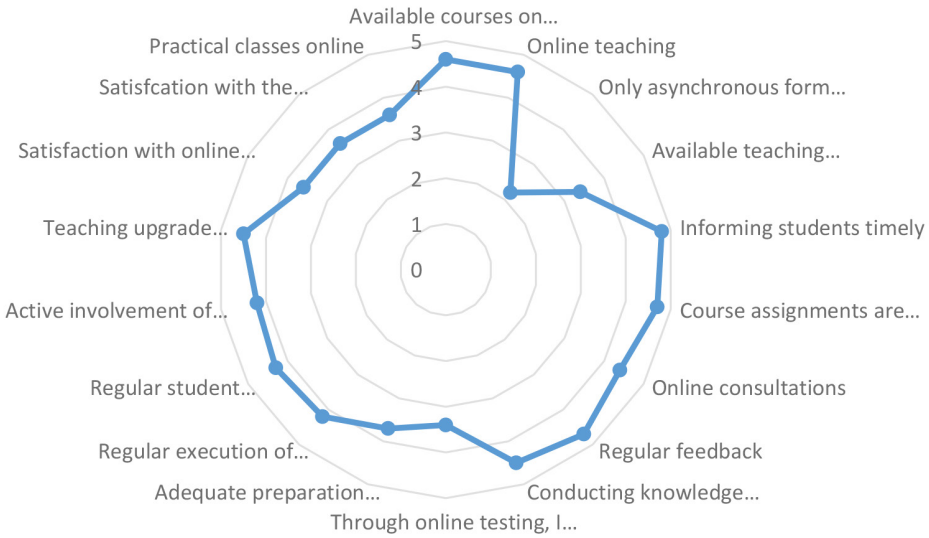


Figure 2. Teaching staff grades of particles regarding holding online classes

Source: Quality Assurance and Improvement Committee at UNIRI, 2020.

In early 2020, almost everyone had available courses on digital platforms and used online teaching. An asynchronous form of teaching was barely used and the biggest challenges for the teaching staff were the objectivity of checking the individual knowledge and holding practical classes online, which is in line with the literature.

Figure 3 illustrates the students' assessment of the particles related to online classes.

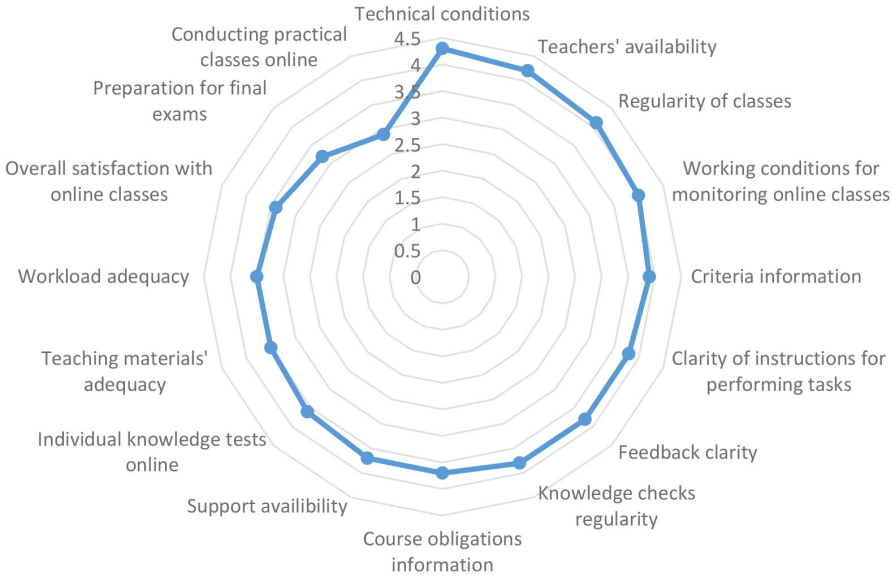


Figure 3. Student grades of particles regarding holding online classes
Source: Quality Assurance and Improvement Committee at UNIRI, 2020.

Student grades are mostly consistent throughout the questionnaire. They were most satisfied with the technical conditions and teacher availability, which is consistent with the findings of Aristovnik et al. (2020) who even state that Europe and Oceania were the global frontrunners at the time. The students were least satisfied with the preparation for final exams and practical classes, which is in correlation with the teachers' assessment as well.

Table 3 presents strengths, weaknesses, opportunities and threats that were identified as crucial following this research and previous literature.

To identify just a few strengths, it is crucial to emphasise the practice in online teaching, available courses on digital platforms, and available licenses for videoconferencing tools. It is interesting to see that following this research technical challenges and lack of knowledge and training of the teaching staff are not emerging as problematic even though in the literature these are often addressed as the biggest challenges in e-learning. It is also important to emphasise that the lack of experience in online classes cannot be used as an excuse anymore since most of the world faced the transition to online teaching environment during the COVID-19 pandemic.

Moreover, Coursera, which is an online learning platform where UNIRI students can enroll in a huge number of courses worldwide, can be seen as a source of competitive advantage over the Universities without that possibility as well as a step towards internationalization and making knowledge more available. The flexibility of e-learning enables students to become more independent and rationalise their time more effectively.

Some of the identified weaknesses are the objectivity of teaching evaluation procedures, objectivity in evaluating individual knowledge and difficulties with practical classes. This indicates that greater effort has to be directed toward the evaluation aspects of e-learning. It is necessary to develop standardized and structured guidelines and educate the faculty about the various possibilities in that field. Moreover, it is necessary to understand that some practical classes cannot be done remotely, however, it could be possible to use different technological tools to get close enough depending on the field of study. It is also strongly recommended to combine

different teaching techniques and technological advancement to provide the best experience for the students with the best effect. The latter might have an effect on lowering the number of student dropouts in an e-learning environment.

Table 3. SWOT analysis

STRENGTHS	WEAKNESSES
• Available courses on digital platforms • Practice in holding online classes • Technical conditions • Achieving all learning outcomes • Students' competencies for using online platforms • Institutional support • Referral to existing online education • Available Licenses for videoconferencing tools • Coursera available for all employees and students at UNIRI • Increased student activity and independence • Gaining new experience and developing digital skills • Flexibility • Geographical independence • Time rationalisation • Teaching staff availability • Good pedagogical/didactic/methodical knowledge of teachers	• Objectivity in evaluating individual knowledge • Practical classes, laboratory classes, practicum classes • Preparing for online classes is more time-consuming • The objectivity of teaching evaluation procedures in a way that reflects students' competencies • Organized collaborative support • Provided technical support in the preparation of online classes • Overload and greater time engagement • High drop-outs of students
OPPORTUNITIES	**THREATS**
• Establishment of institutional platforms for online teaching • Institutional guidelines on establishing and conducting online classes • Organized education for teachers and associates • Merlin system upgrade • Larger pool of potential students • Increased collaboration - YUFE • Competitive advantage • Cost reduction • Decrease in student migration	• Social isolation • Health issues due to excessive online work • Self-motivation and proper time management • Total focus on productivity • The questionable credibility of the knowledge assessment • New online programmes from competing universities • Technology advancement • ICT prices • Internet subscription prices • Integrity of online programmes

Source: Authors' compilation

Considering the opportunities, collaboration, larger pool of potential students and competitive advantage are emerging as most interesting ones. For sure, e-learning can attract a larger number of students and provide an important source of competitive advantage in times of demographic issues and an increase in the number of educational institutions. In this regards, it is recommended to think about increasing the number of online courses and programmes and it is highly advisable to consider increasing the number of study programmes in English. This would allow a faster integration in the European and world education area, higher internationalization and an even larger number of possible students. UNIRI is also a part of YUFE[3] network (Young universities of the future of Europe) and this presents big opportunities for the future as well. Finally, it is also important to point out the financial implications, namely, e-learning is known to reduce the costs of education. However, it does imply bigger investments in infrastructure, IT equipment and staff education at the beginning but it does generally decrease the costs in the

[3] https://yufe.eu/

long term. Moreover, e-learning is contributing to lowering the students' migrations due to the possibility of remote participation in education. So not only that e-learning is making education more available but at the same time these students might contribute to the development of their local communities by being present there and applying the newly gained knowledge. Since these students are not migrating and leaving the possibility of returning to their local communities open and often questionable, they are able to start developing their environment much earlier. With activities such as volunteering, internship, local engagement, knowledge sharing, and informal education to name a few, one can contribute to local economic growth and development, which is why it is important to have educated and capable people in every community.

Finally, some of the identified threats are social isolation, self-motivation problems and the integrity of online programmes. It would be helpful to establish mental health centres within the universities to provide professional support for the students facing some difficulties regarding the identified threats as well as any other not mentioned in this paper. The integrity of the programmes can be tackled together with the evaluation problem mentioned within the weaknesses since these two are highly correlated. By constantly improving and innovating e-learning programmes it is possible to minimize the threat of new online programmes from competing universities.

UNIRI, as well as everyone else included in the education system, has to work on eliminating the weaknesses and mitigating the threats systematically and intuitively, while at the same to exploiting their strengths and seizing opportunities.

4. FUTURE RESEARCH DIRECTIONS

Considering e-learning as a global phenomenon, the change came fast, it was applied even faster and it is here to stay. The first proposition for future research is to apply this study to other samples. It is possible to analyse other Universities in Croatia and other countries and then make a comparative study in order to be able to generalize the results globally. Moreover, it is recommended to examine the situation after the COVID-19 pandemic. Finally, it would be interesting and scientifically important to make a comparative study observing the pre and post-pandemic situation based on the used methodology.

5. CONCLUSION

There is an increase in the number of online study programmes all around the world. Moreover, the content delivery is transitioning from linear to interactive. The biggest identified challenge of e-learning is the evaluation of students. Therefore, it is necessary to educate the teaching staff about evaluation methods that are efficient in e-learning. Models of effective evaluation in the online environment are already being discussed on numerous quality forums, and new and efficient evaluation models will be developed in the upcoming period. Moreover, it has to be emphasized that e-learning enables universities to integrate into the European education area and facilitates the transformation of society. Consequently, it is crucial to work constantly on its improvement in order to be competitive and in line with market trends and needs. E-learning is still in its infancy in Croatia, however, there are some examples of good practices that lead to changes and pave the way for progress for other institutions in Croatia, as well as in the region. The University of Rijeka is not quite ready to fully implement e-learning successfully but most of the conditions are there. Now it is necessary to work on the identified difficulties and

put more effort into assuring all the conditions are met because UNIRI is almost there. However, there already are bright examples at the University, such as EFRI and FMTU that have been accredited and are successfully conducting studies exclusively in the online environment. Considering UNIRI, EFRI is emerging as a leader of change and an initiator of digital progress (e-learning). In light of the post-pandemic educational trends and consequences, it is possible to state that the higher education system has faced serious challenges and adapted to new modes of operation that will for sure stay at least partially integrated into the education system of the future. To conclude, the authors do not consider successful e-learning as wishful thinking, but rather a very possible reality in the near future, both at UNIRI and worldwide.

ACKNOWLEDGMENT

This research was funded by the University of Rijeka, project (E-)education and Human Resources Development, grant number ZIP-UNIRI-130-9-20 and as a part of the project "MI – jučer, danas, sutra" (UP.04.2.1.06.0018) financially supported by the European Union within the European social fund.

References

Aparicio, M., Bacao, F., & Oliveira, T. (2016). An e-Learning Theoretical Framework. *Journal of Educational Technology & Society, 19(1)*, 292–307. http://www.jstor.org/stable/jeductechsoci.19.1.292

Aristovnik, A., Keržič, D., Ravšelj, D., Tomaževič, N., & Umek, L. (2020). Impacts of the COVID-19 Pandemic on Life of Higher Education Students: A Global Perspective. *Sustainability, 12(20)*, 8438. https://doi.org/10.3390/su12208438

Beqiri, M. S., Chase, N. M., & Bishka, A. (2009). Online Course Delivery: An Empirical Investigation of Factors Affecting Student Satisfaction. *Journal of Education for Business, 85(2)*, 95-100. https://doi.org/10.1080/08832320903258527

Croatian Bureau of Statistics. (2021). Primjena informacijskih i komunikacijskih tehnologija (IKT) u kućanstvima i kod pojedinaca u 2021. https://podaci.dzs.hr

Croatian Ministry of Science and Education. (n.d.). Official Register of Study Programmes Accredited in the Republic of Croatia. https://hko.srce.hr/usp/index?lang=en

Fazlollahtabar, H., & Muhammadzadeh, A. (2012). A Knowledge-Based User Interface to Optimize Curriculum Utility in an E-Learning System. *International Journal of Enterprise Information Systems, 8(3)*, 34-53. https://doi.org/10.4018/jeis.2012070103

Gopal, R., Singh, V., & Aggarwal, A. (2021). Impact of online classes on the satisfaction and performance of students during the pandemic period of COVID 19. *Education and Information Technologies, 26(6)*, 6923-6947. https://doi.org/10.1007/s10639-021-10523-1

Harper, K., Chen, K., & Yen, D. (2004). Distance learning, virtual classrooms, and teaching pedagogy in the Internet environment. *Technology in Society, 26(4)*, 585-598. https://doi.org/10.1016/s0160-791x(04)00054-5

Ježić, Z. (2021). Utjecaj pandemije COVID-19 na visoko obrazovanje ekonomista u Republici Hrvatskoj – koliko smo se digitalizirali?. *Zbornik radova znanstvenog skupa Utjecaj pandemije COVID 19 na hrvatsko gospodarstvo – dvije godine poslije*, Sveučilište u Zagrebu, Ekonomski fakultet Zagreb, 31-45.

Lee, C. M. (2021). Descriptive SWOT Analysis about Online Learning. *https://www.researchgate.net/publication/350621868_*

McEwen, B. C. (2001). Web-assisted and Online Learning. Business Communication *Quarterly, 64(2)*, 98-103. https://doi.org/10.1177/108056990106400211

Pham, L., Limbu, Y. B., Bui, T. K., Nguyen, H. T., & Pham, H. T. (2019). Does e-learning service quality influence e-learning student satisfaction and loyalty? Evidence from Vietnam. *International Journal of Educational Technology in Higher Education, 16(1)*. https://doi.org/10.1186/s41239-019-0136-3

Pham, L., Williamson, S., & Berry, R. (2018). Student Perceptions of E-Learning Service Quality, E-Satisfaction, and E-Loyalty. *International Journal of Enterprise Information Systems, 14(3)*, 19-40. https://doi.org/10.4018/ijeis.2018070102

Ravšelj, D., Obadic, A., & Aristovnik, A. (2021). Digital Transformation of Higher Education during Covid-19: Croatia and Slovenia in Comparative Perspective. In *10th International Scientific Symposium on Region, Entrepreneurship, Development (RED)*, 234-247.

Sun, P.-C., Tsai, R. J., Finger, G., Chen, Y.-Y., & Yeh, D. (2008). What drives a successful e-Learning? An empirical investigation of the critical factors influencing learner satisfaction. *Computers & Education, 50(4)*, 1183-1202. https://doi.org/10.1016/j.compedu.2006.11.007

Taylor, P. S. (2007). Can clickers cure crowded classes? Maclean's, 120(26–27), 73.

Zaghar, F. (2022). Higher Education in Times of Pandemic: An Exploration of Teachers and EFL Learners' Perceptions of the Shift to Online Instruction Option. *Arab World English Journal (8)*, 205-213. https://doi.org/10.24093/awej/call8.14

ISBN 978-86-80194-64-6