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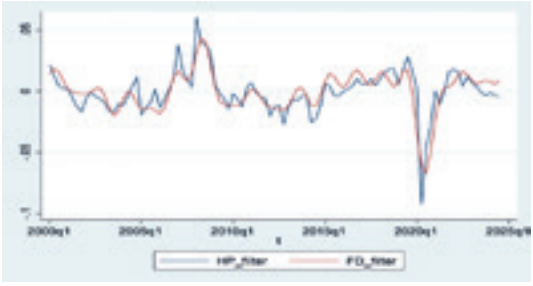
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RECREATIONAL ACTIVITIES AS AN INVESTMENT: IMPACT ON STRESS, JOB SATISFACTION AND ECONOMIC EFFICIENCY OF A COMPANY

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Abstract: *In the modern business environment, job satisfaction is a fundamental variable that encourages employees to increase their efficiency, engagement, and focus on achieving organizational goals. Workplace stress is one of the key challenges of modern organizations, negatively affecting productivity, employee satisfaction, and overall well-being. Numerous studies confirm that regular physical activity, especially recreational sports, can be an effective tool for managing stress and improving the psychological and physical resilience of employees. Additionally, an organizational culture that encourages sports contributes to a sense of belonging, which in the long term reduces employee turnover and increases organizational loyalty. The aim of this paper is to investigate employee perceptions of the role of recreational and sports activities in the workplace, with a special emphasis on their impact on reducing stress, increasing job satisfaction, and work efficiency. The paper also analyses the degree of employee support for strategic investment in such activities, which contributes to reducing costs associated with sick leave and absenteeism. For the purposes of this paper, a survey was conducted via an online questionnaire from February to March 2025, in which 94 respondents (N=94) participated. The research methodology is based on the use of a survey questionnaire, and the collected data were processed using the JASP software tool, using descriptive statistics, contingency tables, chi-square test and Bayesian analysis. The results obtained can be applied for promoting sports activities within the company, improving greater job satisfaction and then the work performance of employees and can be a support in including sports activities in strategic investments of the company.*

Keywords: *business efficiency, employee productivity, investment in human capital, economic effects of recreation, strategic investment in sports activities*

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INTRODUCTION

Recreational activities and physical activity are increasingly seen as an important factor in promoting employee well-being and reducing costs associated with absenteeism and sick leave.

In conditions of market instability, both employees and managers are faced with continuous pressure from employers who strive to achieve superior results and achieve strategic goals. Under this pressure, employees, either unconsciously or under duress, take on multiple tasks, which results in stress, or burnout. Although this approach to work can sometimes generate positive outcomes, in most cases it leads to negative consequences. These include excessive working hours, physical and mental fatigue, depletion of energy resources, and a general decrease in job satisfaction and morale. If you are stretched and overloaded, you cannot think strategically about your time, and certainly not about others .

Physical activity, in addition to having proven benefits for physical health, also plays a significant role in improving mental health. Today, physical activity, or exercise, is increasingly used as a therapeutic intervention in the treatment of stress. Numerous studies confirm its effectiveness in alleviating symptoms of anxiety disorders, depression, and in reducing stress. In addition to its direct impact on neurotransmitter systems by stimulating the secretion of endorphins and other hormones, exercise contributes to increasing self-esteem and self-confidence, and improving cognitive functions and socialization in patients. A systematic review of the literature has determined that there are recommendations from the World Health Organization (WHO), recommending physical activity for at least 30 minutes a day or, alternatively, at least three times a week for one hour. Therefore, regular physical activity is a key factor in improving the quality of life of modern people, especially in the context of preserving and improving psychophysical health. Given the above, it is crucial to find the optimal way of physical exercise adapted to individual preferences. Choosing an activity that an individual enjoys allows for effective reduction of tension and stress, especially in a demanding work environment.

The implementation of such activities results in significant positive changes in the overall health of the individual, including physical and mental well-being . The main goal of sports and recreation programs for employees is to improve health through prevention, alleviation and elimination of ailments and compensation and correction of other negative effects that are a consequence of various workloads at the workplace. Therefore, when developing guidelines for designing sports and recreation programs, it is necessary to consider the characteristics of the job first. In addition, for the programs to be accepted by employees, it is useful to consider their interests .

BURNOUT SYNDROME AT WORK

Burnout syndrome is a stress reaction that develops in people exposed to high work demands and was first mentioned in the 1970s, during a study of emotional stress in workers engaged in auxiliary professions in healthcare .

Emotional exhaustion, negative attitudes and feelings towards clients, and insecurity in professional competence were observed in the workers at that time. Burnout is often associated with chronic stress or unfulfilled expectations. In diagnostics, it is important to distinguish burnout syndrome from stress. Stress is a temporary condi-

tion, while burnout is a long-term process that can have serious consequences . Burnout syndrome is a mental health disorder caused by chronic stress at work

Burnout syndrome usually manifests itself when individuals, despite their exceptional dedication to work, realize that their engagement is not enough to achieve their desired professional goals. Long-term stress and frustration, combined with ineffective strategies in working with clients, significantly contribute to the development of this syndrome. Emotional exhaustion, which results from excessive work obligations and unfavourable working conditions, results in a feeling of mental and physical fatigue. Reduced personal achievement refers to the loss of perception of one's own competence, especially in the context of interpersonal interactions. People affected by this condition often express doubt in their own abilities, a feeling of chronic fatigue, depression, cynicism, irritability, and negative attitudes towards work and co-workers. Burnout syndrome is also closely related to self-image - a construction that is formed through perceptions, cognitions, experiences, and self-evaluation. Already in early childhood, through positively shaped upbringing, the basis of self-confidence is formed, but in people who experience burnout, the self-image remains average and largely depends on external recognition.

Burnout syndrome can be interpreted as an individual's failed effort to achieve the achievements that are crucial for maintaining stable self-confidence, with research showing that self-perception and self-evaluation in affected individuals are extremely unstable and prone to constant comparison of their own achievements with those of their environment. Methods of regulating energy decline and preventive action in dealing with burnout syndrome emphasize the importance of recovery, which represents lasting personality strengths that help a person cope with life's challenges and build effective strategies for dealing with problems. This implies activating human capacities at the individual, group and collective levels to overcome stressful circumstances in an emotionally and physically healthy way

Previous research has shown mixed results when it comes to people who are susceptible to burnout. Some studies suggest that people with higher education and above-average work performance are more prone to burnout, while other research suggests that those with lower education are more susceptible. There are also gender differences. While some research shows that women are more prone to burnout, other research claims that there is no significant difference between the sexes. Individual factors include:

- Demographic characteristics – age – more common in young people
- Gender – no differences observed
- Marital status – more common in unmarried people
- Education level – more common with lower levels of education
- Personality traits – less courageous, with reduced self-esteem, people who avoid facing problems
- Attitude towards the workplace – excessive expectations from the workplace, previous work experience, work style.

Burnout is a long-term feeling of emotional exhaustion, depersonalization, and lack of personal accomplishment; in the context of sports, burnout represents a state of devaluation of sports, physical and emotional exhaustion, and a diminished sense of accomplishment .

Numerous studies have investigated the link between the work environment and burnout at work, consistently revealing that negative aspects of work and its organizational structure are closely related to work-related burnout . The human body is the foundation of overall well-being, and its optimal functioning requires systematic care and support through the adoption of healthy lifestyle habits. Key factors for maintaining the health of the body certainly include regular physical activity as well as adequate rest, with the synergistic effect of these elements contributing to the physical and mental health of the individual. Thus, encouraging recreational activities in the company, in addition to the benefits, can also be a very useful strategic investment. Further observing all the benefits of application, we can speak of an economic tool that is reflected in increased efficiency and productivity of the company.

SPORTS RECREATION AND ITS IMPACT ON EMPLOYEES IN IMPROVING WORK EFFICIENCY

The global trend of sports activities is becoming increasingly prominent in the modern, fast-paced business environment. In this context, corporate health and strategies aimed at promoting physical activity have become indispensable elements of organizations that strive to improve work efficiency and ensure favourable and stimulating working conditions, positively affecting the well-being of their employees.

Physiologically, physical activity stimulates the release of endorphins, known as "happy hormones", which act as natural antidepressants and reduce levels of the stress hormone cortisol. Scientific evidence shows that it is possible to positively influence work-related outcomes, especially absenteeism, through health promotion efforts that include components focused on the physical work environment and the organizational structure of the workplace .

Recreational sports provide employees with a mental break from work responsibilities, stimulating the regeneration of cognitive resources necessary for effective decision-making and problem-solving. These positive effects of physical activity have been confirmed regardless of the gender and age group of the participants, further highlighting the universality of the benefits that sports and recreation provide. In this context, more and more companies recognize the importance of implementing programs aimed at improving the physical and mental health of the working population, thereby reducing work stress and increasing overall employee satisfaction. People who regularly participate in recreational activities show higher levels of motivation, team cohesion and emotional stability, which is directly reflected in their work efficiency.

The promotion of sports activities outside working hours is the one with the highest level of implementation in European public administration . In support of this, the results of a study examining the relationship between lifestyle (physical activity, obesity, fitness) and work performance showed that a higher intensity of physical activity is associated with the quality of work performance and overall work efficiency, as well as with a reduction in additional effort in performing work. Thus, severe obesity and sports inactivity are associated with a higher number of days lost from work and lower efficiency in performing work tasks.

In the European Union, the prevalence of work-related stress is estimated at around 22%. There is evidence that stress, absenteeism and employee well-being can also be influenced by the behaviour of management within the company . The integra-

tion of sports activities into the organization would have an impact on the well-being of all employees, regardless of hierarchy, which would certainly create a positive working environment and have a positive impact on the work performance of all employees. The effects of physical activity programs for employees can far exceed the initial investment, especially through reduced absenteeism, lower sick leave costs and higher ROI .

RESEARCH AND METHODOLOGY

As part of this work, a study was conducted using an online questionnaire. The questionnaire contained 14 questions, designed to collect data on the personal attitudes and habits of respondents related to recreational activities. The impact of sports activities on stress reduction, work efficiency and job satisfaction and economic benefits was examined. The research aimed to determine the extent to which recreational activities affect employee work performance, their satisfaction and how much employees support the inclusion of sports activities in strategic company investments. In the introductory part, the respondents were introduced to the aim of the study and its purpose. The study involved 90 respondents (N = 90), employed in different sectors and divided into five age groups, and was conducted from February to March 2025. A link to participate was sent to the e-mail addresses of people who engage in recreational sports. The questionnaire consisted of two parts. The first part included demographic data, including gender, age structure and years of work experience. The second part of the survey questionnaire contained six closed-ended questions and Likert scales. The collected data were processed using the JASP software package, using descriptive statistics, contingency tables, chi-square test and Bayesian analysis. The questions covered the perception of the importance of sports activities, attitudes about their effect on stress and work efficiency, as well as opinions about the role of companies in encouraging physical activity. The variables were analysed according to age groups, and the results were presented in the form of tables and graphs. Two hypotheses were tested using appropriate statistical methods.

Hypotheses H1 - Employees perceive recreational activities as an important factor in reducing stress and increasing job satisfaction.

Hypothesis H2 - Most employees support strategic investment in sports activities as a means of increasing efficiency and reducing costs associated with absences and sick days.

RESULTS AND DISCUSSION

The survey was attended by 72.2% women and 27.8% men (Table 1). Most respondents belonged to the age group 45 to 54 years, 36.7% of them, 22.2% of them were from 25 to 34 years, 21.1% of them were from 35 to 44 years, 14.4% of respondents were over 55 years of age, and 5.6% were under 25 years of age. The respondents were grouped into five age groups.

Table 1. Gender and age structure

Sex	Age					
	25 - 34 years old	35 - 44 years old	45 - 54 years old	< 25 years old	> 55 years	Total
Male	2	6	10	2	5	25
Female	18	13	23	3	8	65
Total	20	19	33	5	13	90

Source: Created by the authors

Table 2. Chi-square test

	Value
BF_{10} Independent multinomial	0.281
N	90

Source: Created by the authors

The results from the Bayes test for the contingency table show the following (Tables 1 and 2), BF_{10} (Bayes factor in favour of the alternative hypothesis versus the null hypothesis): 0.281, Total number of observations (N): 90. The Bayes factor (BF_{10} = 0.281) means that the data are more supportive of the null hypothesis (H_0) than of the alternative hypothesis (H_1). In this case, a value of 0.281 means that the data are about 3.56 times more consistent with the null hypothesis than with the alternative (because 1 / 0.281 ≈ 3.56). Based on this Bayes test, there is no strong evidence for the existence of a dependence between the variables in the contingency table — which supports the assumption of independence.

Table 3. Age and length of service

Age	Work experience					
	11 -20 years old	21 - 30 years old	5 - 10 years	< 5 years	> 30 years	Total
25 - 34 years old	2	0	6	12	0	20
35 - 44 years old	16	3	0	0	0	19
45 - 54 years old	11	20	1	0	1	33
< 25 years old	0	0	0	5	0	5
> 55 years	0	3	0	0	10	13
Total	29	26	7	17	11	90

Source: Created by the authors

Table 4. Chi - square test

	Value
BF_{10} Independent multinomial	1.090×10 +20
N	90

Source: Created by the authors

The results in Tables 3 and 4 show the relationship between age group and length of service. A total of 90 respondents participated in the study, divided into five age categories and five categories of service. The distribution of respondents shows a clearly pronounced pattern: younger age groups (especially 25–34 years) dominate in the shorter service categories (< 5 and 5–10 years), while older groups (e.g. 45–54 and > 55 years) have a significantly higher representation in the longer service categories (21–30 years and > 30 years). Bayesian contingency table analysis confirmed a statistically significant relationship between age and service. The obtained value of the Bayes factor ($BF_{10} = 1.090 \times 10^{20}$) represents extremely strong evidence of the dependence between these two variables. These results confirm the expected career development with respect to age and indicate the existence of a clear structural relationship between age and accumulated work experience.

Table 5. The impact of recreational activities on stress

Age	Do you find that recreational activities help reduce stress?				
	I partially agree.	Neutrally	I completely disagree.	I completely agree.	Total
25 - 34 years old	2	2	0	16	20
35 - 44 years old	2	0	0	17	19
45 - 54 years old	3	2	2	25	32
< 25 years old	2	0	0	3	5
> 55 years	0	0	1	12	13
Total	9	4	3	73	89

Source: Created by the authors

Table 6. Chi - square test

	Value	df	p
X^2	12,635	12	0.396
N	89		

Source: Created by the authors

Tables 5 and 6 show a correlation between the age group of the respondents and their opinion on whether recreational activities help reduce stress. The analysis of the contingency table included a total of 89 respondents, divided into five age categories and four response categories (from "completely disagree" to "completely agree"). The largest number of respondents in all age groups agreed with the statement that recreational activities help reduce stress. The response category "completely agree" was predominant across all age groups (e.g., 25–34 years: 16 out of 20 respondents; 45–54 years: 25 out of 32; >55 years: 12 out of 13). A chi-square test of independence was conducted to statistically verify the existence of a correlation between age group and opinion on recreational activities. The test value obtained was: χ^2 (12) = 12.635, p = 0.396. Since the p-value is greater than the standard significance threshold (p > 0.05), it is concluded that there is no statistically significant association between age and attitudes about the effect of recreational activities on stress. Although most respondents

expressed agreement, no statistically significant differences were observed between the age groups.

Table 7. Participation in recreational activities

How often do you participate in recreational activities?	Age					
	25 - 34 years old	35 - 44 years old	45 - 54 years old	< 25 years old	> 55 years	Total
Never	0	0	3	0	0	3
Sometimes (1-2 times a month)	1	2	4	0	4	11
Occasionally (less than 1 time per month)	1	0	0	0	1	2
Very often (more than 2 times a week)	14	9	13	3	4	43
Often (1 - 2 times a week)	4	8	13	2	4	31
Total	20	19	33	5	13	90

Source: Created by the authors

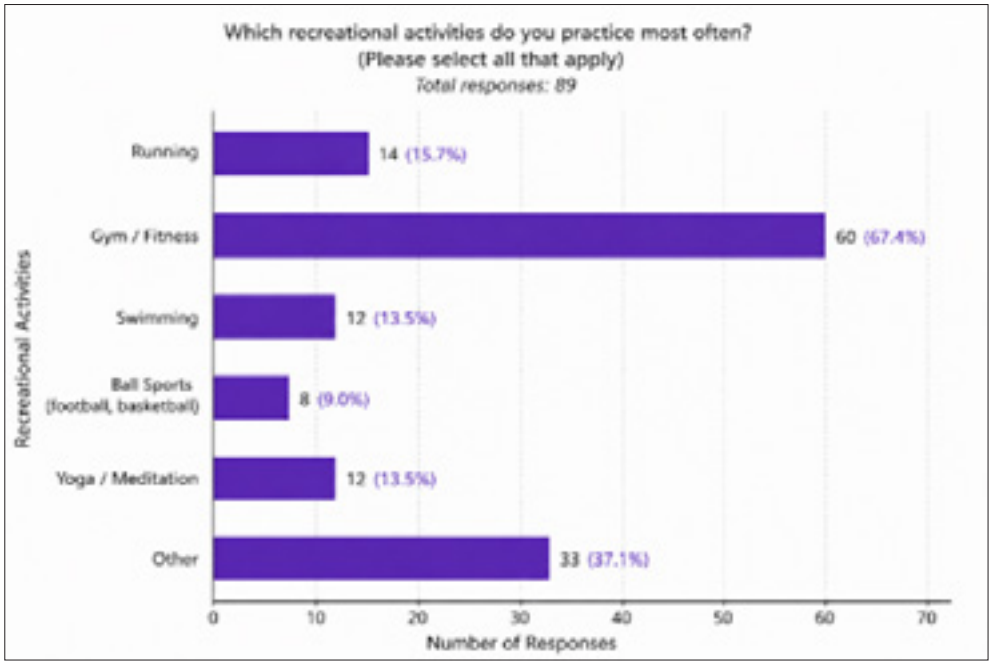
Table 8. Chi - square test

	Value
BF_{10} Independent multinomial	0.084
N	90

Source: Created by the authors

Tables 7 and 8 show the frequency of participation in recreational activities by age group. It is visible how often respondents participate in recreational activities, with five categories: "Never", "Sometimes (1-2 times a month)", "Occasionally (less than 1 time a month)", "Very often (more than 2 times a week)" and "Frequently (1-2 times a week)". Respondents were divided into five age groups: "< 25 years", "25 - 34 years", "35 - 44 years", "45 - 54 years" and "> 55 years". There are 90 respondents in total. The largest number of respondents participate "Very often" (43), while the smallest number of respondents never participate (3). In the age groups 25 to 34 years and 35 to 44 years, the majority of respondents participate "Very often". In the older age groups (45 - 54 and > 55 years), there is also a significant number of respondents who participate "Frequently". Bayes factor (BF_{10}): The value of 0.084 indicates that there is very weak support for the hypothesis of independence between age groups and frequency of participation in recreational activities. This means that there appears to be an association between age and frequency of participation. The results suggest that the frequency of participation in recreational activities varies across age groups, with the highest participation seen in younger age groups.

Table 9. Types of recreational activities



Source: Created by the authors

Table 9. shows the recreational activities that respondents most often practice. The largest number of respondents listed fitness as the most common activity (67.4%), followed by running (15.7%), swimming (13.5%), ball sports (13.5%), and other (37.1%).

Table 10. Corporate investment in sports activities

	Age					
Do you think that a company should provide employees with sports activities?	**25 - 34 years old**	**35 - 44 years old**	**45 - 54 years old**	**< 25 years old**	**> 55 years**	**Total**
I partially disagree.	1	0	0	0	0	1
I partially agree.	4	4	7	1	2	18
Neutrally	3	2	1	2	2	10
I completely disagree.	0	0	2	0	0	2
I completely agree.	10	12	22	2	9	55
Total	18	18	32	5	13	86

Source: Created by the authors

Table 11. Chi - square test

	Value
BF_{10} Independent multinomial	0.041
N	86

Source: Created by the authors

Between the age group of respondents and their attitude about whether the company should provide sports activities for employees was examined. A total of 86 respondents, divided into five age categories, participated in the study. According to the distribution of responses, the most common response in all age groups was „I completely agree", with 55 out of 86 respondents completely agreeing with the statement that the company should invest in sports activities for employees. The largest number of positive responses was recorded in the 45–54 and 35–44 age groups. Bayesian contingency table analysis was conducted to assess the probability of dependence between age and attitudes. The obtained value of the Bayes factor is: $BF_{10} = 0.041$. This value indicates strong support for the null hypothesis, i.e. the absence of a statistically significant relationship between age and attitude about the need for sports activities in the company. A Bayes factor of less than 1 (specifically, < 0.1) indicates that the data are approximately 24 times more likely under the assumption of independence between the observed variables. In conclusion, although the majority of respondents express a positive attitude towards sports activities offered by the employer, these preferences do not depend significantly on the age of the employee.

Table 12. Investment in sports activities and company strategy

Age	Should investing in employee sports activities be part of a company's employee investment strategy?					
	I partially disagree.	I partially agree.	Neutrally	I completely disagree.	I completely agree.	Total
25 - 34 years old	0	6	0	1	12	19
35 - 44 years old	1	6	0	0	12	19
45 - 54 years old	0	6	2	1	24	33
< 25 years old	0	2	1	0	2	5
> 55 years	0	0	2	0	11	13
Total	1	20	5	2	61	89

Source: Created by the authors

Table 13. Chi - square test

	Value	df	p
X^2	18,176	16	0.314
N	89		

Source: Created by the authors

The age group of respondents and their attitude towards the statement that investing in employee sports activities should be part of a company's strategic approach was examined. The analysis included 89 respondents divided into five age groups and five response categories. The majority of respondents fully agreed with the statement (n = 61), with this option being dominant across all age groups, particularly among respondents aged 45–54 (n = 24) and 35–44 (n = 24), (n = 12). A χ^2 test of independence was conducted to assess whether there was a statistically significant association between age and attitude. The following results were obtained: χ^2 (16) = 18.176, p = 0.314. Since the p-value is not less than 0.05, there is no statistically significant asso-

ciation between age and attitudes on this statement. Despite the general support for the idea within all age groups, differences between groups are not statistically significant. These results indicate that age group does not significantly influence attitudes towards strategic corporate investment in sports activities. Employees, which may indicate the general acceptance of this idea among employees regardless of age.

Table 14. Sports activity and company costs

Age	Do you think that providing sports activities by companies would reduce costs associated with sick leave and absences from work?					
	I partially disagree.	I partially agree.	Neutrally	I completely disagree.	I completely agree.	Total
25 - 34 years old	3	6	7	2	2	20
35 - 44 years old	2	8	2	1	6	19
45 - 54 years old	2	14	4	3	10	33
< 25 years old	0	3	1	0	1	5
> 55 years	0	3	1	2	7	13
Total	7	34	15	8	26	90

Source: Created by the authors

Table 15. Chi square test.

	Value	df	p
X^2	17,437	16	0.358
N	90		

Source: Created by the authors

Tables 14 and 15 show whether there is a connection between the age group of respondents and their opinion on whether the provision of sports activities by companies can reduce costs associated with sick leave and absence from work.

The overall results show that most respondents partially agree with the statement (n = 34), while a significant number also express complete agreement (n = 26). Support is particularly strong among respondents in the age groups 45–54 years (14 partially agree; 10 completely agree) and 35–44 years (8 + 6). To statistically assess the relationship, a chi-square test of independence was applied, with the results: χ^2 (16) = 17.437, p = 0.358. Since the p-value exceeds the standard significance level (p > 0.05), it is concluded that there is no statistically significant relationship between the age of the respondents and their attitude towards reducing costs through sports activities. In conclusion, although there is a visible pattern of support within all age groups, the differences between them are not sufficiently pronounced to be statistically significant. These findings suggest that a broad and age-independent perception of the potential benefits of investing in employee sports activities.

Table 16. Importance of corporate investment in sports activities

12. How important do you think it is for a company to invest in sports activities for employees? (rate from 1 to 5, where 1 is "not at all important" and 5 is "extremely important")	Age					
	25 - 34 years old	35 - 44 years old	45 - 54 years old	< 25 years old	> 55 years	Total
1	1	0	3	0	2	6
2	0	1	0	0	0	1
3	3	5	4	2	1	15
4	7	4	6	1	1	19
5	8	9	20	2	9	48
Total	19	19	33	5	13	89

Source: Created by the authors

Table 17. Chi-square test

	Value
BF_{10} Independent multinomial	0.034
N	89

Source: Created by the authors

Tables 16 and 17 show respondents' assessment of how important they consider it to be for a company to invest in sports activities for employees, rated on a scale of 1 to 5 (1 = "not at all important", 5 = "extremely important"). The analysis was conducted on a sample of 89 respondents, divided into five age groups.

The results of the contingency table show that the largest number of respondents rated the importance with a score of 5 - "extremely important" (n = 48), and this response was most common in all age groups, especially among: 45–54 years (n = 20), 35–44 years (n = 9) and > 55 years (n = 9).

Other ratings were significantly less frequent, with ratings 1 and 2 accounting for only 7 responses in total. This distribution indicates a high level of agreement among respondents on the importance of sports activities as an employer's investment. Bayesian contingency table analysis was applied to assess the statistical association between age and attitudes towards the importance of sports investments. The resulting value: $BF_{10} = 0.034$. This value represents strong support for the null hypothesis, meaning that it is more likely that respondents' attitudes towards the importance of investing in sports activities are independent of their age. In other words, the differences between age groups are not sufficiently pronounced to indicate dependence. In conclusion, despite strong support for the idea of the importance of sports activities for employees, this support is consistent across all age groups, with no significant differences – indicating an age-universal attitude towards the importance of sports investments by companies.

CONCLUSION

The aim of this research was to examine employees' attitudes towards the role of recreational and sports activities in the context of the work environment, with a empha-

sis on their perception of the impact of these activities on reducing stress, increasing job satisfaction, and reducing costs associated with sick leave and absenteeism. The level of support for including sports activities in strategic company investments was also examined.

The results of the survey show that most people in all age groups believe that recreational activities reduce stress, but without a statistically significant association with age (χ^2 test, $p > 0.05$). From the conducted research, the results confirm hypothesis H1: Employees perceive recreational activities as an important factor in reducing stress and increasing job satisfaction, with most respondents believing (regardless of age) that regular recreational activities have a positive effect on their psychophysical well-being. Respondents emphasize that participation in such activities contributes to reducing stress levels and increases overall satisfaction with work and the work environment. This indicates the importance of integrating recreational programs into organizational policies.

From the conducted research, the results confirm hypothesis H2: Most employees support strategic investment in sports activities as a means of increasing efficiency and reducing costs associated with absenteeism and sick leave. Respondents recognize the benefits of such investments, including increased work efficiency, better health, and reduced absenteeism. These results support a strategic approach that includes investments in employee physical activity as part of organizational care for the health and productivity of the workforce. The obtained results indicate broad and age-independent support for the inclusion of sports activities in strategic investments of companies. Furthermore, the research provides valuable insight into employee perceptions and can serve as a basis for the development of organizational strategies aimed at improving employee well-being through physical activity. Future research should include objective data on the frequency of participation in recreational activities and measurable indicators of stress and work efficiency to further confirm these findings. It is recommended that companies consider and include recreational content in internal programs, as well as possible financial support for employees through subsidies for membership in sports clubs.

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ORIGINALNI NAUČNI RAD / ORIGINAL SCIENTIFIC PAPER

COMPARISON OF FINANCIAL PERFORMANCE INDICATORS OF HOSPITAL HEALTHCARE INSTITUTIONS

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Abstract: *This paper focuses on determination of statistically significant difference between income, expenses, liabilities, receivables, and business results realised by hospital healthcare institutions involved in the research, and compares those data between general hospitals and clinical hospital centres, clinical hospitals and clinics.*
Research methodology includes the Shapiro-Wilk normality test. Continuous data are described by the median and the limits of interquartile range. Differences in continuous values between general hospitals and clinical hospital centres/clinical hospitals/clinics are tested by the Mann-Whitney U test, whereas the Wilcoxon test, or the Friedman test (Post hoc test Conover) are used for testing of data according to business years of general hospitals or clinical hospital centres/clinical hospitals/clinics. The research results indicate that there is a statistically significant difference between income, expenses and business results, as well as receivables of general hospitals in comparison to clinical hospital centres, clinical hospitals and clinics. The due liability ranks of general hospitals compared to clinical hospital centres/clinical hospitals/clinics do not differ significantly.
Based on the analysis of available data and analysis of financial indicators of clinical hospital centres, clinical hospitals, clinics and general hospitals, this research confirms two of the three hypotheses. In general, all hospitals as healthcare institutions should continue to increase income and undertake measures to reduce business expenses in order to provide for stable and sustainable financial operations.

Keywords: *hospitals, quality, indicators, liabilities, business results*

JEL classification: *I11, I19, M49*

INTRODUCTION

Clinical hospital centres, clinical hospitals[1] and clinics are funded from the state budget, whereas general hospitals[2] are funded from budgets of local or regional self-government units. As of the Article 86 of the Act on Amendments to the Health Care Act , entering into force on 1 January 2024, local self-government units and the City of Zagreb ceased to be founders of general hospitals, transferring the founding rights to the Republic of Croatia.

All hospitals as healthcare institutions are registered in the Register of budgetary and extra-budgetary users of the state budget and budgetary and extra-budgetary users of the budget of local and regional self-government units.

Hospitals run their business in accordance with the Health Care Act, they provide health care services, specialist and consultative activities with specialist diagnostics, day clinics and medical rehabilitation. They also supply drugs and medical products, and perform radiological and laboratory diagnostics. Some of the hospitals in the Republic of Croatia also perform scientific and research activities, teaching and educational activities, whereas all hospitals have organisational units dealing with professional and administrative tasks.

In addition to the financial indicators of hospitals, natural business indicators are also recorded and summarised in the annual report of stationary healthcare institutions, which shows the situation as of 31 December of the current fiscal year.

In 2022, data related to the number of beds, number of beds per 1,000 inhabitants, number of doctors, number of discharged patients and number of days of hospital treatment were higher in clinical hospital centres, clinical hospitals and clinics than in general hospitals, except for the data referring to the number of beds per doctor with an achievement index of 87.25, and the turnover interval with an achievement index of 69.93, which were lower if compared to general hospitals.

The contracted number of beds for clinical hospital centres, clinical hospitals and clinics was 9.717, while for general hospitals it was 6.060 beds. Differences in patient turnover affect differences in the business operations of hospitals, since clinical hospital centres have larger bed capacities and are therefore able to accommodate more patients, which reflects in the increase in other business indicators.

The largest portion in income of all hospitals is provided by the Croatian Health Insurance Fund. The agreed maximum amount of funds for the provision of hospital and specialist-consultative healthcare is determined in the Agreement concluded with the Croatian Health Insurance Fund.

Hospital healthcare, which includes hospital treatments and specialist-consultative healthcare, realized a higher amount of expenditure in 2022 if compared to the previous year . Greater expenses refer to the amount billed in invoices issued by hospitals for performed services. The difference to the amount transferred to hospitals that they did not justify with delivered healthcare services in form of invoices issued to the

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1 One clinical hospital is owned by the City of Zagreb

2 Upon the transfer of founding rights on 14 March 2020, the Republic of Croatia is the founder of the Vukovar General County Hospital, i.e. the National Memorial Hospital in Vukovar. The National Memorial Hospital in Vukovar provides health care services as a general hospital in accordance with the provisions of the Health Care Act.

Croatian Health Insurance Fund, are reported as advance payments and represented as receivables of the Croatian Health Insurance Fund, i.e. they represent liabilities of hospitals.

In addition to the agreed maximum (monthly) amount, the Croatian Health Insurance Fund provides additional financial means to hospitals for performed health services, such as explants, transplants, interventional cardiology, interventional neurology and neuroradiology, medical insemination, cochlear implants, special materials, interventional gastroenterology and personalised medicine .

The Ministry of Health and the Croatian Health Insurance Fund provided assistance funds to hospitals for the purpose of settling obligations towards suppliers of drugs and consumable medical materials. Hospitals were obliged to prepare a document[3] that includes an analysis of the current financial situation for the budget year and to propose measures to eliminate identified practices that affect negative business operations. One of the significant measures included in the document is the rationalisation of operations, analysis of the usage of drugs and consumable medical materials, as well as the control of other expenses, of which current and investment maintenance services are identified as significant expenditure.

All hospitals are required to adopt a work plan for the budget year, which contains goals and measures that contribute to positive business operations, such as capital projects, business rationalisation measures, and revenue-increasing measures necessary for responsible, efficient, transparent, and sustainable operations.

The research questions, objectives and hypotheses are as follows:

Research question 1.: Is there a statistically significant difference in the achieved business results of general hospitals and clinical hospital centers, clinical hospitals and clinics?

Research objective 1.: It is necessary to establish the existence/non-existence of a statistically significant connection or difference in the achieved result of operations of general hospitals compared to clinical hospital centers, clinical hospitals and clinics

Hypothesis 1: Statistically significant difference is identified in the achieved business results of general hospitals compared to clinical hospital centres, clinical hospitals and clinics

Research question 2.: Is there a statistically significant difference between the receivables of general hospitals and clinical hospital centers, clinical hospitals and clinics

Research objective 2.: It is necessary to determine the existence/absence of a statistically significant connection or difference between the receivables of general hospitals compared to

clinical hospital centres, clinical hospitals and clinics.

Hypothesis 2: Statistically significant difference is identified between the receivables of general hospitals and receivables clinical hospital centres, clinical hospitals and clinics

Research question 3: Is there a statistically significant difference between the total due liabilities of general hospitals and clinical hospital centres, clinical hospitals and clinics?

[3] Some of the hospital healthcare institutions have published those documents on their websites

Research objective 3: It is necessary to determine the existence/absence of a statistically significant connection or difference between the total due liabilities of general hospitals compared to clinical hospital centres, clinical hospitals and clinics.

Hypothesis 3: Statistically significant difference is identified in the total due liabilities of general hospitals compared to clinical hospital centres, clinical hospitals and clinics

This paper deals with data referring to clinical hospital centres, clinical hospitals, clinics and general hospitals, excluding special hospitals. Comparison of financial operations refers to income, expenditure, business results, liabilities and receivables of the observed hospitals, as mentioned above.

Referring to specificities of services provided by the hospital healthcare system with an emphasis put on the continuous increase of total liabilities, as well as overdue liabilities of hospitals and the necessity to resolve them, this paper focuses on clinical hospital centres, clinical hospitals, clinics and general hospitals in the Republic of Croatia.

The financial performance results show the surplus/deficit of income in relation to the expenditure of hospitals for the period of 2021 and 2022. The liabilities and receivables observed in this paper for 2021 and 2022 do not only refer to the mentioned years, i.e. the period from January to December for 2021 and 2022, since such data represent cumulative values related to the overall financial operations of hospitals. Liabilities and receivables include amounts that arose in 2021 and 2022, as well as in previous budget years.

The structure of the paper includes the following: the first part of the paper, Literature Review, provides an overview of previous research. The second part includes the research methodology, as well as empirical data. The third part presents the research results and discussion. The Conclusion oof the paper analyzes the research results based on the hypotheses set, as well as recommendations for further research.

LITERATURE REVIEW

A review of literature sources related to research into financial operations of hospitals that distinguishes between types of hospitals, i.e. that compares general hospitals with clinical hospital centres, clinical hospitals and clinics in the Republic of Croatia, indicated scarce availability of literature sources. Available papers mainly focus on the quality of healthcare system related to the provision of health care and the efficiency of health care provided by hospitals.

Slijepčević evaluated the technical efficiency of hospitals. Analysis of the technical efficiency of hospitals refers to determination of space for rationalisation of operations or for improvement of quality, as well as for the increase in number of services provided. The emphasis is put on conducting additional analyses with the aim of improving the efficiency of hospital work, rational use of resources and establishing an efficient organisation. Evaluation of technical efficiency is important for assessing the success of the health policy in the Republic of Croatia. According to the results of measuring the technical efficiency of hospitals in 2010, the average efficiency of clinical hospital centres, clinical hospitals and general hospitals was 81.30% .

Referring to the analysis of natural indicators of hospital healthcare institutions, Buljan and Šimović reported that the number of available beds in hospitals in the Re-

public of Croatia was above the average of the European Union, which affected the increase in expenditure and did not contribute to the achievement of better health treatment outcomes.

Financial assistance to hospital healthcare institutions indicated a problem of financial sustainability of hospital system. Given the failure to pay received invoices within sixty days, clinical hospital centres and general hospitals owned by counties or local and regional self-government units were the main generators of debt.

According to the report of the in-depth analysis of expenditure, the potentially negative impact of individual measures was limited to the achieved level of quality and accessibility of healthcare, and attention was given to the improvement of the system efficiency. That analysis included the expenditure of ten hospital healthcare institutions funded from the state budget: Clinical Hospital Centre Split, Clinical Hospital Centre Zagreb, Clinical Hospital Centre Osijek, Clinical Hospital Centre Rijeka, Clinical Hospital Centre "Sestre Milosrdnice", Clinical Hospital Dubrava, Clinical Hospital Merkur, Clinic for Children's Diseases, Clinic for Orthopedics Lovran, Clinic for Infectious Diseases

Based on data obtained from the audit of hospitals in 2011, business operations of hospital healthcare institutions were analysed by Včev and Mahaček to confirm the influence of financial statements on decision-making process. Improvement of business performance should be based on increasing of income, collecting receivables, reducing expenses, settling and reducing existing liabilities, and establishing an organisational structure that would make rational use of funds .

Buljan and Šimović concluded that despite numerous financial supports given to hospital healthcare institutions from the state budget, the dynamics of incurring new debts is greater than the provision of financial supports, so it is clear that debt incurred by hospitals will continue to grow in the future.

Budimir and Lutilsky analysed relevant models for measuring of hospital business performance and proposed definition of performance indicators in four areas: healthcare provision process, patients, organisational health and development, and resources. "Measuring performance in the Croatian healthcare system is becoming important for the quality improvement strategy and for the increased budget allocations for healthcare, which shall result in more efficient management of healthcare institutions" .

In the paper of Rabar , efficiency of 63 Croatian hospitals was assessed by using the data limitation analysis. It is a set of models and methods based on mathematical programming. Based on the obtained results, the author made projections of inefficient hospital institutions to the efficient limit, and determined the amounts of their inefficiency.

Šimović and Primorac pointed out the most important segment related to expenses of hospital healthcare institutions. Hospitals could manage their revenues and expenses to a greater extent through a clearer definition and implementation of payments according to the economic price of provided healthcare services. Since the debts of hospitals are continuously being remedied by the Republic of Croatia, the authors proposed key measures that should affect the long-term fiscal sustainability and stability of the healthcare system.

The impact of earmarked assistance funds for general hospitals in the Republic of Croatia to settle part of their due liabilities to suppliers of drugs, consumables and

implantable medical materials (in 2021 and 2022) was positive, since it reduced the debt that hospital healthcare institution accumulated in previous years. This paper also shows the amounts of earmarked funds for the years 2021 and 2022 for all general hospitals founded by counties or local and regional self-government units.

The indicators resulting from the above-mentioned researches show that it is necessary to conduct additional analyses in order to improve efficiency not only of hospitals, but also of the entire healthcare system.

Operating conditions of hospital healthcare institutions

Financial operations of hospitals shall be in line with national legal regulations, as well as with internal acts, and those acts should have a positive impact on financial operations.

The contracted maximum amount of financial means to be provided to hospitals by the Croatian Health Insurance Fund for hospital and specialist consultation healthcare services (hospital limits) is not aligned with due liabilities in hospital healthcare institutions. Considering the increase in expenses for employees, as well as the change in market conditions that include the increase in prices of energy, drugs, medical consumables, as well as services for ongoing maintenance, it is necessary to consider the increase of hospital limits (the established prices of diagnostics and therapy procedures and costs per day of hospital treatment do not increase proportionally to the increase in amounts of hospital limits).

Most hospitals are unable to charge the maximum possible amount of costs for provided hospital and specialist consultation healthcare to the health insurance, because of which liabilities for less work performed towards the Croatian Health Insurance Fund are increasing. According to the Healthcare Employers Association, it is expected that hospitals will continue with negative business results due to the pricing determined unilaterally by the Croatian Health Insurance Fund and an established system in which low prices paid for services to hospitals do not cover the real costs of delivered services.

In 2022, hospital healthcare institutions achieved negative business results in the amount of 29,372,946 EUR, of which 5,685,522 EUR refers to clinical hospital centres, clinical hospitals and clinics, and 23,687,424 EUR refers to general hospitals.

Total liabilities of all hospital healthcare institutions as of 31 December 2021 amounted to 1,441,072,712 EUR, and as of 31 December 2022, that amount increased to 1,477,617,329 EUR. The share in the stated amounts referring to general hospitals was 35.44% in 2021, and 35.39% in 2022. When comparing the two years, the index of realisation of due liabilities of clinical hospital centres, clinical hospitals and clinics for 2022/2021 is 110, while for general hospitals that index of realisation is 80. For general hospitals, it is clear that the total due liabilities are lower in 2022 compared to 2021. The total liabilities of hospital healthcare institutions also include the amount of additional funds received from the Croatian Health Insurance Fund. In accordance with the instructions, those funds are recorded as advance funds since they have be justified by the invoiced realisation of healthcare services.

Regarding the comparison of liabilities, general hospitals have lower total liability in 2022 than in 2021, while clinical hospital centres, clinical hospitals and clinics have higher total liability in 2022 than in 2021.

In the structure of business expenses, the largest share refers to expenses for employees and material expenses (expenses for drugs, medical consumables and services). The consumption of drugs in the Republic of Croatia has increased due to the discovery and use of new, more effective drugs that enable partial or complete cure of seriously ill patients, introduction of new methods and treatment procedures and more effective use of particularly expensive drugs, the costs of which are covered by the obligatory health insurance.

Comparative analysis of general hospitals shows that the structure of total income and receipts consists of income from the sale of non-financial assets, and receipts from financial assets and borrowings. The analysis comprises trends in income, expenses, financial results and liabilities of 10 general hospitals (OB) in the Republic of Croatia, which are labelled as OB1, OB2, etc., in the period from 2017 to 2021. The structure of due liabilities for 10 general hospitals in 2021 is observed, and it is clear from it that the largest part of due liabilities consists of liabilities for material expenses.

Despite the allocated financial supports from the state budget, hospitals continue to generate negative financial results and increase in liabilities, which shall affect again negative business results in the next budget year.

METHODOLOGY

In this research, statistical methods are used to verify the set hypotheses. The normality of the distributions is tested by the Shapiro-Wilk test. Continuous data are described by the median and the interquartile range. Differences in continuous values between general hospitals and clinical hospital centres/clinical hospitals/clinics are tested with the Mann-Whitney U test, and differences between years for general hospitals or clinical hospital centres/clinical hospitals/clinics are tested by the Wilcoxon test or the Friedman test (*Post hoc test* Conover). All P values are two-sided. The significance level is set at alpha = 0.05. Statistical analysis is performed in the MedCalc® Statistical Software version 23.0.6 (*MedCalc Software Ltd, Ostend, Belgium; https://www.medcalc.org; 2024*).

The Shapiro-Wilk test is used to check the normality of data distribution in statistical analysis. It tests the hypothesis that the sample comes from normally distributed set. The Shapiro-Wilk test helps to decide whether non-parametric methods should be used.

The Wilcoxon test is a non-parametric statistical test used to compare the medians of dependent variables when the data do not follow a normal distribution. Ranks are used in the calculation, which reduces the influence of extreme values.

The Friedman test is a non-parametric statistical test for analysis of differences between more than two related variables (dependent samples). This test is analogous to parametric analysis of variance for repeated measures (*ANOVA*), but is used when the data do not meet the assumptions of normal distribution or homogeneity of variance. Each group data is ranked for each variable, and then the difference in ranks between groups is analysed.

The set hypotheses are:

H1: There is statistically significant difference identified in the achieved business results of general hospitals compared to clinical hospital centres, clinical hospitals and clinics

H2: There is statistically significant difference identified between the receivables of general hospitals and receivables of clinical hospital centres, clinical hospitals and clinics

H3: There is statistically significant difference identified in the total due liabilities of general hospitals compared to clinical hospital centres, clinical hospitals and clinics.

EMPIRICAL DATA

The sample consists of 5 (five) clinical hospital centers, 3 (three) clinical hospitals, 5 (five) clinics and 21 (twenty one) general hospitals in the Republic of Croatia. Liabilities, receivables, income, expenses and business results of mentioned hospital health institutions are observed.

The structure of expenses is also analyzed (the financial data did not include the Dr.Ivo Pedišić General Hospital of Sisak because of the consequences of earthquake).

The financial statements of hospital health institutions consolidated in the Report of financial audits expressed in Croatian Kuna, are taken as a source of data on which the hypotheses are tested in this research. For the purposes of this analysis, the data are expressed in Euros.

RESEARCH RESULTS AND DISCUSSION

For the purposes of testing the Hypothesis 1: There is statistically significant difference identified in the achieved business results of general hospitals compared to clinical hospital centres, clinical hospitals and clinics, the analysis shall test the difference in income, expenses and business results between clinical hospital centres, clinical hospitals, clinics and general hospitals in the Republic of Croatia in the years 2021 and 2022. Testing is performed by the Mann-Whitney U test, to to determine whether and to what extent the specified parameters differ between clinical hospital centres, clinical hospitals, clinics and general hospitals.

For the purposes of performing the test, two assumptions are defined:

H1.1: Ranks of business results and business income and expenses do not differ significantly.

H1.2: Ranks of business results and business income and expenses differ significantly.

The following table 1 overviews the values of means and dispersion of parameters by the types of hospital healthcare institutions, i.e. clinical hospital centres, clinical hospitals, clinics and general hospitals in the Republic of Croatia. Comparable parameters of healthcare institutions include income, expenses and business results, i.e. surplus or deficit of income.

Table 1. Differences in income and expenses between general hospitals and clinical hospital centres, clinical hospitals and clinics in the years 2021 and 2022

	Median (interquartile range)				
	General hospitals	P†	Clinical hospital centres, clinical hospitals and clinics	P†	P*
Income					
2021	29.610.314,55 (14.381.003,32 – 46.979.636,87)	0,03	74.045.789,5 (24.336.583,55 to 216.927.897,0)	0,04	0,02
2022	31.129.813,66 (14.995.123,67 – 48.088.431,0)		79.060.672,51 (26.301.535,90 – 219.236.674,66)		0,01
Expense					
2021	32.246.215,0 (15.118.945,75 to 48.316.066,50)	0,06	75.036.301,0 (26.701.181,0 - 223.558.771,50)	0,06	0,02
2022	35.876.879,0 (16.067.511,25 - 50.198.384,25)		79.090.363,0 (27.669.583,0 – 217.774.063,50)		0,02
Surplus / deficit					
2021	-1.288.842,94 (-2.445.893,58 – 731.914,69)	> 0,99	-990.511,50 (-6.630.876,49 - -93.885,54)	0,13	0,51
2022	-1.138.940,0 (-2.488.354,50 - -411.570,25)		723.050,0 (-2.230.254,75 – 1.263.063,0)		0,22

Source: The Author (according to *Mann-Whitney U test;†Wilcoxon test)

In order to test the first hypothesis, the parameters of clinical hospital centres, clinical hospitals, and clinics are compared with the same parameters of general hospitals.

By testing the differences in incomes between general hospitals and clinical hospital centres/clinical hospitals/clinics, it is observed that income of general hospitals were significantly higher in 2022 than in 2021 (median 31.129.813,66 € vs. 29.610.314,55 €) (Wilcoxon test, P = 0.03). Furthermore, significantly higher incomes are observed for clinical hospital centres/clinical hospitals/clinics (median 79.060.672,51 € vs. 74.045.789,50 €) (Wilcoxon test, P = 0.04). When comparing incomes in 2021 and 2022 between general hospitals and clinical hospital centres/clinical hospitals/clinics, it is noticed that the median of income was significantly higher for clinical hospital centres/clinical hospitals/clinics than for general hospitals, both in 2021 (Mann-Whitney U test, P = 0.02) and in 2022 (Mann-Whitney U test, P = 0.01).

Referring to the expenditure, there are no significant differences between the years 2021 and 2022 either for general hospitals, or for clinical hospital centres/clinical hospitals/clinics. Comparison of expenditure in 2021 and 2022 between general hospitals and clinical hospital centres/clinical hospitals/clinics proves that the median of expenditure was significantly higher for clinical hospital centres/clinical hospitals/clinics than for general hospitals, both in 2021 (Mann-Whitney U test, P = 0.02) and in 2022 (Mann-Whitney U test, P = 0.02).

There are no significant differences in surplus/deficit in 2021 and 2022 between general hospitals and clinical hospital centres/clinical hospitals/clinics. Since the significance calculated by the Mann-Whitney U test is less than 0.05 for all indicators, it is conclude at a confidence level of 95% that there is statistically significant difference

between general hospitals and clinical hospital centres/clinical hospitals/clinics, so the H1.1 is not confirmed.

The table 2 presents expenditure structure u clinical hospital centres/clinical hospitals/clinics and in general hospitals in the Republic of Croatia for the year 2022. This structure includes expenses for employees, material and financial expenses and expenses for non-financial assets.

Table 2. Expenditure structure in 2022 in general hospitals i clinical hospital centres/clinical hospitals/ clinics

	Median (interquartile range)		P*
	General hospitals	Clinical hospital centres/clinical hospitals/clinics	
Expenses for employees	21.612.493,0 (10.905.219,75 – 25.858.446,25)	43.200.229,0 (17.064.432,75 – 90.683.354,0)	0,04
Material expenses	9.755.965,0 (4.416.507,0-2,057.373,5)	37.577.621,0 (9.224.994,75 – 100.897.969,25)	0,008
Financial expenses	105.691,0 (64.360,25 -564.222,75)	255.517,0 (41.229,75 – 852.184,25)	> 0,99
Expenses for non-financial assets	1,393.105,0 (591.645,5 – 2,769.677,25)	4,545.483,0 (1.399.400,5 – 13,191.115,0)	0,06

Source: the Author (according to *Mann-Whitney U test)

Expenses for employees (median 43.200.229,0 € vs. 21.612.493,0 €) (Mann-Whitney U test, P = 0.04), and material expenses (median 37.577.621,0 € vs. 9.755.965,0 €) (Mann-Whitney U test, P= 0,008) are significantly higher in clinical hospital centres/clinical hospitals/clinics than in general hospitals. Financial expenses are slightly higher in clinical hospital centres/clinical hospitals/clinics (P >0.99), as well as expenses for non-financial assets (P=0.06), but without being statistically significantly different when compared to general hospitals.

In order to test the Hypothesis 2: There is statistically significant difference identified between the receivables of general hospitals and receivables of clinical hospital centres, clinical hospitals and clinics, this research examines the difference in total and due receivables between general hospitals and clinical hospital centres/clinical hospitals/clinics.

For the purposes of performing the test, two assumptions are defined:

H2.1 There is no statistically significant difference between receivables of general hospitals and receivables of clinical hospital centres.

H2.2 There is statistically significant difference between receivables of general hospitals and receivables of clinical hospital centres.

Dynamics of receivables are observed for the years 2021 and 2022.

Table 3. Total and due receivables in 2021 and 2022 in general hospitals and in clinical hospital centres/ clinical hospitals/clinics

	Median (interquartile range)				
	General hospitals	P†	Clinical hospital centres/clinical hospitals/clinics	P†	P*
Total receivables					
2021	927.510,0 (474.634,75 – 3,100.703,0)	0,26	10,601.023,0 (4,123.461,0 – 17,025.895,25)	0,17	<0,001
2022	1,153.570,0 (511.069,5 – 3,038.204,0)		11,071.735,0 (5,658.365,5 – 18,106.949,5)		<0,001
Due receivables					
2021	416.766,0 (241.512,75 – 1,401.553,25)	0,76	3,043.414,0 (823.949,25 – 9,207.642,25)	0,17	0,02
2022	566.961,0 (170.055,75 – 1,228.920,0)		2,037.940,0 (921.723,25 – 9,002.531,0)		0,03

*Mann-Whitney U test;†Wilcoxon test; **Source:** the Author

The Wilcoxon test (a non-parametric statistical test used to assess the differences between pairs of data - the Wilcoxon test of ranks for dependent samples) shows that there is no significant difference in total receivables and in due receivables between 2021 and 2022, both for general hospitals and for clinical hospital centres/clinical hospitals/clinics.

When comparing total receivables in 2021 and 2022 between general hospitals and clinical hospital centres/clinical hospitals/clinics, it is observed that in 2021, the median of total receivables is significantly higher in clinical hospital centres/clinical hospitals/clinics than in general hospitals (median 10.601.023,0 € vs. 927.510,0 €) (Mann-Whitney U test, P <0.001), as well as in 2022 (median 11.071.735,0 € vs. 1.153.570,0 €) (Mann-Whitney U test, P < 0.001).

For receivables due in 2021 and 2022, it is observed that the median of total receivables was significantly higher in clinical hospital centres/clinical hospitals/ clinics than in general hospitals, both in 2021 (median 3.043.414,0 € vs. 416.766,0 €) (Mann-Whitney U test, P = 0.02), and in 2022 (median 2.037.940,0 € vs. 566.961,0 €) (Mann-Whitney U test, P = 0.03). The obtained significance is less than 0.05, therefore, it is conclude at a confidence level of 95% that there is statistically significant difference between general hospitals and clinical hospital centres/clinical hospitals/clinics.

The Wilcoxon test is used to compare total receivables between the years 2021 and 2022 for general hospitals, and the Mann-Whitney U test is used to compare the differences between general hospitals and clinical hospital centres/clinical hospitals/ clinics in the years 2021 and 2022.

The alternative hypothesis H2 that there is a statistically significant difference between receivables of general hospitals and receivables of clinical hospital centres/ clinical hospitals/clinics is accepted, and H1 is rejected.

In order to check the Hypothesis 3: There is statistically significant difference identified in the total due liabilities of general hospitals compared to clinical hospital centres, clinical hospitals and clinics, this research overviews the difference in due liabilities in the years 2021 and 2022 between general hospitals and clinical hospital centres/clinical hospitals/clinics and determines their dynamics for the period from

2018 to 2022. For the purposes of the test, the two assumptions are made:

H3.1: Ranks of due liabilities of general hospitals compared to clinical hospital centres/clinical hospitals/clinics do not differ significantly.

H3.2: Ranks of due liabilities of general hospitals compared to clinical hospital centres/clinical hospitals/clinics differ significantly.

Table 4. Due liabilities in 2021 and 2022 in general hospitals and clinical hospital centres/clinical hospitals/clinics

	Median (interquartile range)				P*
	General hospitals	P†	Clinical hospital centres/clinical hospitals/clinics	P†	
Due liabilities					
2021	2,987.303,0 (1,444.376,0 – 8,824.286,50)	0,39	12.328.051,0 (5,085.175,0 – 19,958.877,0)	0,24	0,17
2022	2,811.290,60 (970.458,43 – 5,566.503,22)		15,967.706,28 (4,428.629,93 – 22,428.078,51)		0,07

*Mann-Whitney U test;†Wilcoxon test; **Source:** the Author

Due liabilities are tested for the years 2021 and 2022. From the obtained data, it is clear that there are neither statistically significant differences in due liabilities between general hospitals and clinical hospital centres/clinical hospitals/clinics for 2021 and 2022, nor there are any differences in due liabilities between the observed years in general hospitals or clinical hospital centres/clinical hospitals/clinics (Mann-Whitney U test for 2021 $P = 0.17$, for 2022 $P = 0.07$).

The following table presents the median with limits of the interquartile range for due liabilities in the period 2018-2022.

Table 5. Due liabilities in the period 2018-2022 in general hospitals and in clinical hospital centres/clinical hospitals/clinics

	Median (interquartile range)				P*
	General hospitals	P†	Clinical hospital centres/clinical hospitals/clinics	P†	
Due liabilities					
2018	8,170.422,0 (4,330.351,75 – 13,552.867,25)	<0,001§	21,903.806,0 (5,361.886,75 – 47,157.286,75	<0,001‡	0,13
2019	9,403.683,0 (5,665.603,75 – 15,709.559,25)		26,003.522,0 (7,379.127,0 – 58,472.502,0)		0,12
2020	13,998.069,0 (7,928.707,0 – 22,574.130,0)		38,683.689,0 (12,170.981,75 – 100,837.596,25)		0,08
2021	15,742.665,0 (9,110.667,0 – 32,142.053,75)		38,933.279,0 (15,051.222,50 – 111,143.717,75)		0,12
2022	15,731.495,0 (10,479.492,25 – 35,979.406,25)		41,830.798,0 (14,751.305,75 – 115,714.476,50)		0,11

*Mann-Whitney U test;†Friedman test (Post hoc test Conover); ‡at the level P < 0.05 significant differences (2018) vs. (all other years); (2019) vs. (all other years); (2020) vs. (2022); §at the level P < 0.05 significant differences (2018) vs. (all other years); (2019) vs. (all other years); (2020) vs. (2021, 2022); **Source:** the Author

There are no significant differences in total due liabilities between general hospitals and clinical hospital centres/clinical hospitals/clinics in any year during the period 2018-2022.

As a test used to compare more than two related groups of data, the Friedman non-parametric statistical test is used to test differences in due liabilities between general hospitals and clinical hospital centres/clinical hospitals/clinics. This test is an equivalent to the one-way repeated measures (ANOVA) in nonparametric form. It is used when the data are not normally distributed. As an additional analysis, the *post hoc* Conover test is used to confirm statistical differences between groups. That test allows comparison of all possible pairs of groups in order to identify specific groups between which there is a significant difference. For general hospitals, total liabilities are significantly lower in 2018 and 2019 when compared to all other years, and in 2020 when compared with 2022. There is no significant difference in due liabilities of general hospitals between 2021 and 2022 (Friedman test, $P < 0.001$).

Referring to clinical hospital centres/clinical hospitals/clinics, their total liabilities are significantly lower in 2018 and 2019 when compared to all other years, and in 2020 when compared with 2021 and 2022. There is no significant difference in due liabilities in clinical hospital centres/clinical hospitals/clinics between 2021 and 2022 (Friedman test, $P < 0.001$).

Since there is no difference between general hospitals and clinical hospital centres/clinical hospitals/clinics, the H3.1 is accepted.

In addition to the analysed business indicators of hospital healthcare institutions, i.e. their comparison and ranking, it is necessary to conduct additional study into the business indicators of general hospitals in relation to clinical hospital centres/clinical hospitals/clinics, since general hospitals have become beneficiaries of the state budget since 1 January 2024..

Considering the complexity of the healthcare system and the specific nature of business operations of the observed healthcare institutions, it is necessary to compare the business indicators with other indicators and analyse whether the due liabilities of general hospitals have increased or decreased in the aforementioned period. In order to compare the indicators of healthcare institutions' business conditions more efficiently, it is necessary to investigate the impact of expenses referring to drugs and medical consumables.

In addition to the above recommendations for further research, it is necessary to include natural indicators of hospital healthcare institutions and investigate whether there is a statistically significant relation between those natural indicators and financial performance indicators that would influence business operations.

CONCLUSION

Referring to the current circumstances, the hospital healthcare system is specific as it comprises the business processes of all hospital healthcare institutions and controls material expenditures for the purpose of assuring rational and responsible business operations, i.e. fiscal sustainability of the healthcare system. Material expenditures have increased due to changes in market conditions and general increase in prices of drugs and medical consumables, which take up the greatest portion in material expenditures, as well as increase of costs of current and investment maintenance services.

In order to reduce the existing debt of hospital healthcare institutions and due to the increase in prices caused by macroeconomic conditions, the Government of the Republic of Croatia passed decisions by which additional budgetary funds were allocated to hospitals.

Despite the additional earmarked funds, hospitals continue to generate negative financial results, and accumulate new liabilities, which will again have a negative impact on business in the next budget year. The increased total liabilities of hospitals are also affected by increased liabilities for less work delivered towards the Croatian Health Insurance Fund, since the increase in hospital limits was not accompanied by an increase in due liabilities of hospitals.

Based on the available consolidated report on auditing of hospitals for 2021 and 2022, this paper presents comparison of financial operations, which includes income, expenditure, business results, liabilities and receivables of the observed hospital healthcare institutions.

In order to test the determined hypotheses, the financial performance indicators of clinical hospital centres/clinical hospitals/clinics are compared with the same indicators of general hospitals. When testing the H1, significance obtained by the Mann-Whitney U test is less than 0.05 for all indicators, so it is concluded with a confidence level of 95 % that there is statistically significant difference between general hospitals and clinical hospital centres/clinical hospitals/clinics referring to ranks of business income and expenditure. Compared to general hospitals, financial expenses are slightly higher in clinical hospital centres/clinical hospitals/clinics ($P>0.99$), as well as expenses for non-financial assets ($P=0.06$), but without statistically significant difference.

The Wilcoxon test is used to compare total receivables between the years 2021 and 2022 for general hospitals, and the Mann-Whitney U test is used for comparison of financial performance indicators of 2021 and 2022 between general hospitals and clinical hospital centres/clinical hospitals/clinics. Obtained significance is less than 0.05, therefore, with a confidence level of 95%, it is concluded that there is a statistically significant difference between receivables of general hospitals and receivables of clinical hospital centres/clinical hospitals/clinics.

There is no significant difference in due liabilities between clinical hospital centres/clinical hospitals/clinics and general hospitals in the years 2021 and 2022 (Friedman test, $P < 0.001$), so it is concluded that the ranks of due liabilities of general hospitals compared to clinical hospital centres/clinical hospitals/clinics do not differ significantly. The dynamics of total due liabilities in general hospitals is weaker than in clinical hospital centres/clinical hospitals/clinics.

Future research shall analyse and compare expenditure indicators, such as costs of drugs and consumable medical supplies, since they take up the greatest portion in material expenditures of hospital healthcare institutions. It is also necessary to investigate such statistical connection with business results with the aim of improving the business efficiency of hospital healthcare institutions.

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ORIGINALNI NAUČNI RAD / ORIGINAL SCIENTIFIC PAPER

TOP-MANAGEMENT ACTIVITIES IN TRANSITIONAL ECONOMIES: A FACTOR-ANALYTIC STUDY FROM BOSNIA AND HERZEGOVINA

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Abstract: *The role of top management in transitional economies, such as Bosnia and Herzegovina, is particularly critical due to the complexity of strategic and operational decision-making within unstable institutional environments. The aim of this study was to identify and structuralize the key activities of top management in enterprises operating within this context. A quantitative methodology was applied, based on exploratory factor analysis (EFA) of data collected through a structured Likert-scale questionnaire administered to a sample of top managers across diverse sectors. The empirical framework encompasses both domain-specific analyses (marketing, strategy, and human resources) and a comprehensive, integrated analysis of overall managerial latent dimensions. The findings reveal distinct factor structures within individual domains, while the integrated model yields a robust framework highlighting five core managerial priorities, among which organizational justice emerges as a pivotal dimension. This research contributes to a deeper understanding of leadership practices in transitional settings, addresses a prominent gap in the post-socialist management literature, and offers actionable insights for improving corporate performance.*

Keywords: *top management, transitional economies, factor analysis, strategic decision-making*

JEL Classification: *L21, P31, M10*

INTRODUCTION

The role of top management in defining organizational strategies, making critical decisions, and shaping a company's developmental trajectory is widely recognized as a fundamental component of contemporary management paradigms. However, in transitional economies - marked by institutional uncertainty, ambiguous regulatory

frameworks, and complex ownership structure strategic leadership faces unique challenges.

One of the most pressing issues is institutional instability, encompassing underdeveloped legal mechanisms, inefficient judiciary systems, and inconsistent regulatory policies. This legal uncertainty complicates the protection of property rights and hampers investments in long-term business ventures. Moreover, there is a widespread deficit of managerial competencies, as many leaders in post-socialist countries lack experience with market-oriented governance and modern management tools.

In addition to limited expertise, restricted access to capital constitutes another major barrier. Financial markets in transitional states are often shallow and volatile, reducing the availability of funding for growth and innovation. Furthermore, high levels of corruption and political interference substantially constrain managerial autonomy, frequently resulting in suboptimal decisions driven by external political pressures.

Another critical challenge is organizational inertia - resistance to change embedded in legacy bureaucratic structures and rigid administrative systems inherited from the socialist era. Finally, managers in transitional economies must strike a delicate balance between responding to local market dynamics and meeting the demands of global competition, further complicating firms' strategic positioning at the international level.

Recent studies further confirm the specificity of the institutional and organizational context of Bosnia and Herzegovina. For example, Kožo et al. analyzed the relationship between cultural dimensions and preferred leadership in BiH, finding that cultural factors significantly influence the perception and effectiveness of managerial practices. This finding highlights the need to observe managerial activities within a broader institutional and cultural framework.

In addition, contemporary literature emphasizes the importance of the institutional context in shaping managerial strategies and achieving organizational legitimacy. A literature review indicates that social enterprises in different environments apply diverse legitimacy strategies to secure resources and generate social impact, demonstrating that the institutional framework and relationships with stakeholders play a decisive role in managerial practices.

Furthermore, research on emotional intelligence suggests that managers' personal traits can significantly contribute to the quality of strategic decisions. Alzoubi and Aziz show that the emotional intelligence of top management positively affects the quality of strategic decisions, with open innovation and intelligent information systems playing a mediating role. These findings confirm that managerial capabilities, in interaction with institutional and technological contexts, are essential for effective governance.

Moreover, the development of new technologies, particularly artificial intelligence, introduces an additional dimension in the study of managerial decision-making. Roundy and Asllani emphasize that AI innovations evolve within entrepreneurial ecosystems, reshaping innovation patterns and creating new frameworks for top management's strategic decision-making. These insights indicate that contemporary managerial activities should also be analyzed through the lens of technological transformations shaping business practice.

The contribution of research on human resource management is also significant. Islami and Mulolli demonstrate that recruitment, selection, training, and performance

appraisal positively influence the operational performance of firms in transitional economies. These findings further confirm that HRM represents a critical dimension of managerial activities in the context of emerging economies.

Bosnia and Herzegovina, as a post-socialist country characterized by a fragmented and complex institutional architecture, presents a particularly suitable context for studying managerial activity within the real sector. Under such institutional instability, decisions made by top management have a profound impact on organizational flexibility and sustainability, while middle management plays a critical role in interpreting and operationalizing these decisions.

Despite the relevance of the topic, scholarly literature on managerial patterns in transitional economies remains scarce. The prevailing models are primarily developed in the context of stable Western economies, often overlooking the local institutional specificities and dynamics that characterize transitional settings.

This paper aims to empirically identify the key activities of top management in companies in Bosnia and Herzegovina by analyzing their operations in the domains of marketing, strategy, and human resources. Using factor analysis, the study examines which dimensions of managerial behavior are most prominent in the context of a post-transitional economy.

LITERATURE OVERVIEW

The management literature identifies several functional domains through which the activities of top management are analyzed, with marketing, strategic decision-making, and human resource management standing out as particularly significant . In empirical research, domains such as marketing and human resources are often treated as distinct dimensions of managerial behavior due to their divergent goals, functional logic, and operational approaches. In the context of this study, the analytical separation of these domains is further methodologically justified, as the variables related to each area were examined independently through factor analysis.

Conversely, strategic decision-making in this research is conceptualized as an overarching managerial function that encompasses all other activities of top management—including the formulation of mission and vision statements, strategic goal setting, growth planning, innovation, and the overall direction of organizational development. This analytical segmentation enables a more precise examination of the various aspects of managerial behavior, while the conducted factor analysis confirms that marketing, human resources, and strategy emerge as three distinct dimensions of top management activity as perceived by the respondents.

Top Management's Marketing Activities

In contemporary management theory, marketing is increasingly viewed not merely as a function of promotion and sales, but as a comprehensive framework for managing relationships with markets and customers. By nature, marketing is an externally oriented function—focused on identifying customer needs and behaviors, positioning relative to competitors, creating value, and fostering long-term relationships with external market actors. Within this context, the role of top management extends well beyond overseeing marketing budgets or coordinating promotional campaigns; it involves the strategic shaping of the organization's overall market orientation. This

includes defining the strategic direction and value framework that guide the organization's posture toward the market, customers, and competitors.

Additionally, the emergence of digital channels and the integration of multiple consumer touchpoints—commonly referred to as the omnichannel approach—have significantly increased the complexity of managing customer experience. This has necessitated a more active role for top management in designing and guiding customer interaction strategies. In transitional economies such as Bosnia and Herzegovina, these marketing activities take on added importance due to weak institutional regulation, intense market competition, and considerable uncertainty regarding future market trends. In such an environment, the ability of top management to effectively steer marketing efforts becomes critical for achieving differentiation, fostering innovation, and ensuring sustainability in both domestic and international markets.

Top Management's Activities in the Domain of Human Resources

In contrast to marketing, which is primarily oriented toward external stakeholders and the marketplace, human resource (HR) activities are inherently internal in nature, with a focus on developing and engaging employees as the organization's most valuable asset. Within this domain, top management plays a critical role in shaping organizational culture, developing human capital, establishing systems of motivation and reward, and managing talent. Effective HR strategies contribute not only to operational stability but also to the organization's long-term capacity to adapt to change and maintain business continuity - an especially vital capability in environments characterized by high uncertainty, such as transitional economies.

Benefit communication has become a key element in strategies aimed at attracting, retaining, and motivating employees. However, research indicates that despite relatively high levels of reported employee satisfaction, the process of communicating benefits is often perceived as unclear, complex, and frustrating. This inconsistency frequently stems from a lack of systematic involvement by professional communicators and insufficient strategic oversight in the planning and dissemination of benefit-related information. Consequently, the role of top management is not to engage in operational-level communication, but rather to establish a clear vision, value standards, and structured channels through which communication remains consistent, transparent, and aligned with organizational strategy.

In this context, leaders' emotional intelligence becomes a critical component in building trust and collaboration within teams. Furthermore, contemporary HR approaches encompass systematic talent management and employee development, coupled with the ongoing strengthening of HR digitalization processes. Particularly in transitional environments, management's ability to stabilize the organization internally through high-quality HR practices constitutes a key determinant of long-term competitiveness and sustainability.

Strategic Decision-Making by Top Management

In this study, strategic decision-making is treated as a distinct and comprehensive managerial dimension encompassing all top management activities that fall outside the domains of marketing and human resource management. Although strategic decision-making is often discussed in relation to specific functional areas, its separate

analytical treatment is warranted due to the breadth of information it requires, the extended time horizon over which it develops, and its organization-wide impact - from operational to strategic levels.

Contemporary management literature positions strategic decision-making and strategy implementation as core responsibilities of top management, given their direct influence on an organization's competitive positioning and long-term viability. Research suggests that strategic decision-making entails not only the analysis of external factors (e.g., digitalization, environmental complexity) but also internal dynamics such as perception and cognitive biases. The scope of strategic decision-making has further evolved through the integration of agile methodologies into planning processes. Agile approaches - including Scrum, Kanban, and Lean - empower top management to align strategic goals with operational execution via iterative planning, team-based collaboration, and continuous adaptation.

Moreover, a recent study combining theoretical review and bibliometric analysis highlights the growing interdependence between organizational innovation, knowledge-based strategy, and learning culture. Within this framework, top management plays a critical role in designing innovative strategies that enable firms to adapt to complex and dynamic business environments. In the specific context of transitional economies, Lau emphasizes that the presence of competent teams, resource availability, and institutional support significantly contribute to the development of market-oriented strategies, which in turn positively affect firm performance.

Aligned with these findings, this research conceptualizes strategic decision-making as a separate managerial dimension encompassing activities such as mission and vision formulation, strategic goal setting, growth planning, resource allocation, and the overall articulation of organizational development. Its analytical separation from other functional domains - such as marketing and HR - is methodologically grounded in the results of factor analysis, which reveal the distinct structure and content of this dimension in the perception of top management behavior.

Defining hypotheses

Building on theoretical findings that highlight the importance of different functional areas of management (marketing, strategy, and human resources) in ensuring competitive advantage and sustainable business development, this study examines whether these activities can be empirically identified through a common factor structure. Particular attention is given to the possibility that, in addition to the core domains, the aggregation of managerial activities may reveal additional latent dimensions that contribute to explaining managerial behavior. Based on this, the following hypotheses are proposed:

H1: The managerial activities of top management in companies in Bosnia and Herzegovina exhibit a latent factor structure that can be grouped into three main domains: marketing, strategy, and human resources.

H2: By aggregating managerial activities in the domains of marketing, strategy, and human resources, additional latent dimensions can be identified.

The testing of these hypotheses was conducted using exploratory factor analysis (EFA). The criteria applied for determining the number of factors included eigenvalues, the scree test, and the cumulative percentage of explained variance, while varimax rotation was employed to enable clearer interpretation of the latent dimensions.

METHODOLOGY

Survey instruments (measures)

Table 1 presents all the variables examined in this study. These variables are classified into three categories: marketing activities, strategic activities, and human resource management activities. Respondents evaluated all variables using a five-point Likert scale ranging from 1 (very low) to 5 (very high).

The development of the items was based on a review of relevant literature from the three key domains: marketing activities (Alakkas et al. ; Aleksić & Petković ; Dias & Lages ; Havlicek; Kushwaha et al.), strategic management (Demirbag et al.; Saeed et al.; Madzík et al.; Yu et al.; Eide & Madsen; Tarigan & Siagian), and human resource management activities (Alsafadi & Altahat; Demo et al.; Jiang et al.; Ulrich & Dulebohn; Wang et al.). These sources provided the theoretical foundation for the construction of the measurement scale and the definition of the dimensions of managerial behaviour under investigation. The table with an overview of the variables used in the research is provided in the appendix.

Data were collected through a structured questionnaire based on a Likert scale, which was distributed to top managers employed in companies across Bosnia and Herzegovina. In total, N = 100 top managers from 78 companies were surveyed, with some firms providing responses from multiple executives. The research was conducted between March 1 and August 1, 2024.

The sample included companies from diverse sectors and industries, representing both the public and private sectors. As members of top management, the respondents were directly involved in strategic decision-making and the management of key organizational processes. Most of the participants held higher education degrees, primarily at the undergraduate (B.Sc.) and postgraduate (M.Sc.) levels.

Data analysis

Data analysis in this study was conducted using the software package IBM SPSS Statistics. Descriptive statistical methods and exploratory factor analysis (EFA) were employed with the aim of identifying latent structures among the examined variables and reducing data complexity.

Factor analysis enabled many interrelated manifest variables to be grouped into a smaller number of latent dimensions—factors—that explain the underlying patterns in the data.

The analysis was carried out in several steps. First, descriptive statistics were calculated for the analyzed items. Subsequently, four separate factor analyses were performed:

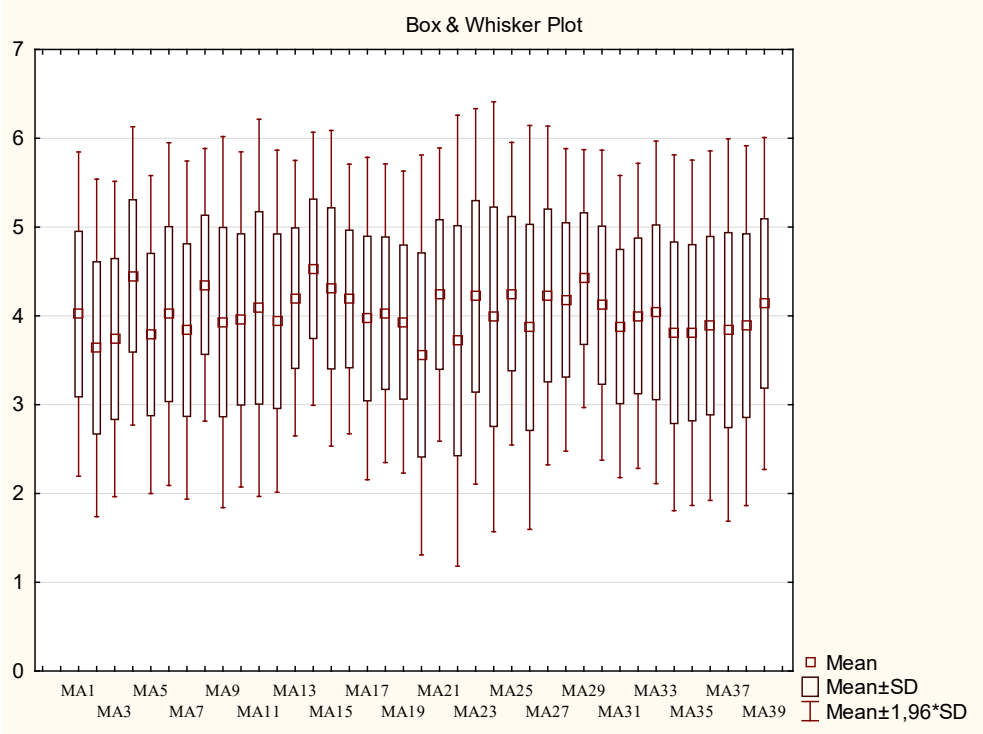
- The first three were applied individually to three groups of items: marketing activities, strategic activities, and human resource activities.
- The fourth analysis encompassed all items jointly and represents the overall factor analysis, through which aggregated patterns of top management activities were identified.

EMPIRICAL EVIDENCE

Descriptive statistics

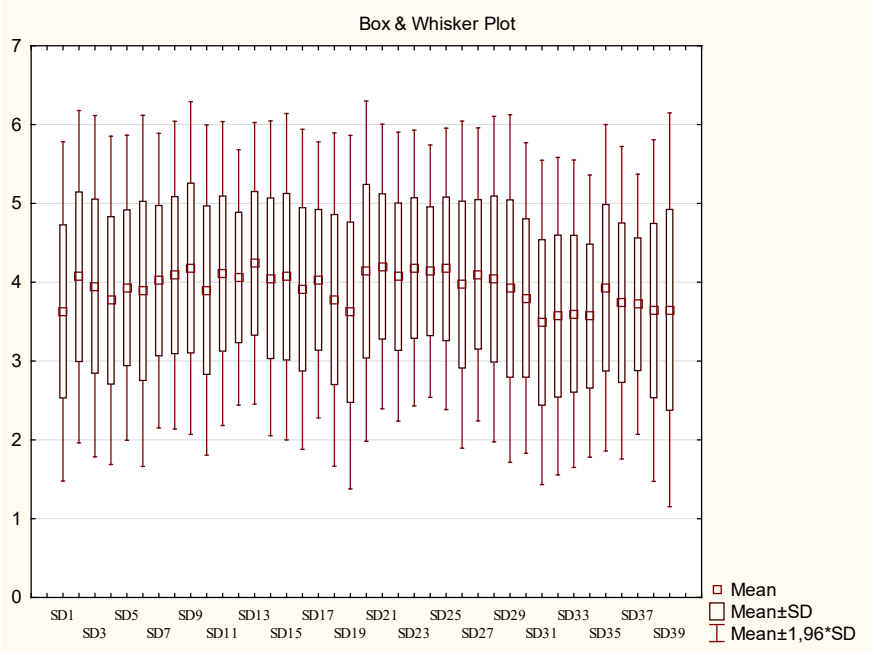
Descriptive analysis of the original data for all analyzed items is presented in the figures: marketing activities (Figure 1), strategic activities (Figure 2), and human resource activities (Figure 3). The figures display box plots for each variable, illustrating the arithmetic means and the ranges within which the variable values occur.

Figure 1. Box plot of each marketing activity variable, showing the arithmetic means and the ranges of variable values



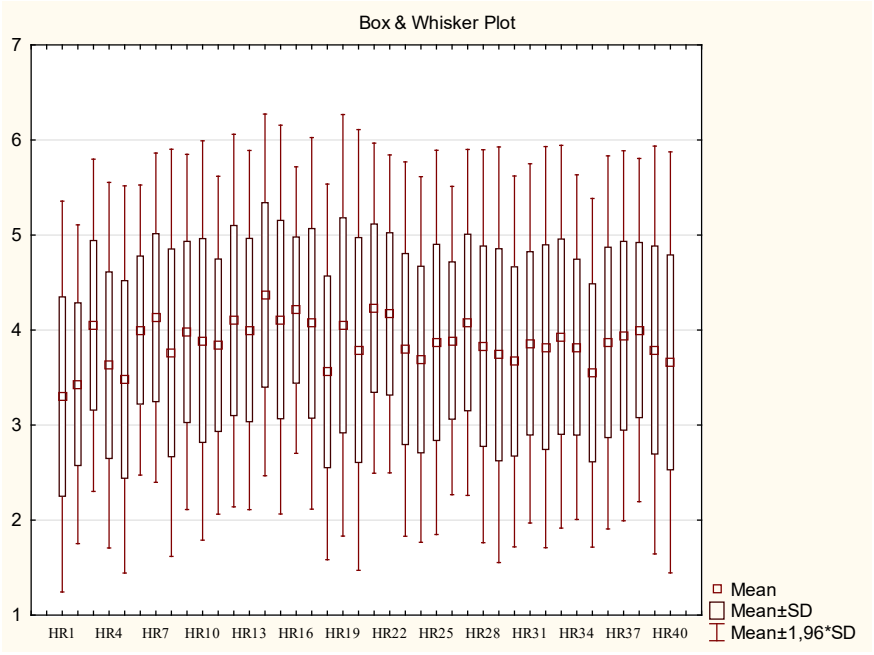
Source: Author's own work

Figure 2. Box plot of each strategic activity variable, showing the arithmetic means and the ranges of variable values



Source: Author's own work

Figure 3. Box plot of each human resource variable, showing the arithmetic means and the ranges of variable values



Source: Author's own work

Factor Analysis of Top Management's Marketing Activities

Through factor analysis of top management's marketing activities, nine factors were extracted. Together, these nine factors explain 76.9% of the variance in the original data, which represents a high percentage given the number of variables in the model (39). The Scree criterion was applied in the analysis. According to this criterion, the number of significant factors is determined by identifying the point at which the eigenvalues level off.

Table 2 presents the eigenvalues for models with one, two, three, up to nine factors. The last column of the table shows how the percentage of explained variance increased with the addition of more factors. The first factor explains the largest share of variance, accounting for approximately 40.1% of the variations in the original data. After the first factor, the values gradually decrease up to the ninth factor, after which they stabilize.

The identified factors were rotated using the Varimax method. The interpretation of the extracted factors is as follows:

- F1 (MA) – Monitoring environmental changes (consumer needs, competitors' activities) to increase the flexibility of the product portfolio.
- F2 (MA) – Enhancing the quality of work and motivation of marketing managers within the company.
- F3 (MA) – Marketing activities aimed at entering and expanding presence in international markets.
- F4 (MA) – Marketing activities aimed at entering and expanding presence in domestic markets.
- F5 (MA) – Monitoring customer satisfaction and ensuring customer retention.
- F6 (MA) – Monitoring the efficiency of marketing activities.
- F7 (MA) – Establishing an appropriate balance between price, product quality, and consumer affordability.
- F8 (MA) – Application of modern information and communication technologies in marketing activities.
- F9 (MA) – Success of new products in the market.

Table 1. Distribution of Eigenvalues Across Different Factor Analysis Models (Top Management Marketing Activities)

Factor	Eigenvalue	% of Variance	Cumulative Eigenvalue	Cumulative % of Variance
1	15,6590052	40,1512954	15,6590052	40,1512954
2	2,84679911	7,2994849	18,5058043	47,4507803
3	2,21706441	5,68478054	20,7228687	53,1355609
4	2,0324819	5,21149204	22,7553506	58,3470529
5	1,76654813	4,52961058	24,5218988	62,8766635
6	1,70678158	4,37636301	26,2286803	67,2530265
7	1,42916168	3,66451712	27,657842	70,9175436
8	1,20163772	3,08112237	28,8594797	73,998666
9	1,13146268	2,90118636	29,9909424	76,8998523

Note: The penultimate column shows the cumulative eigenvalue, while the last column shows the cumulative percentage of variance explained by the extracted factors. **Source:** Author's own work

Factor Analysis of Top Management's Strategic Activities

Through factor analysis of top management's strategic activities, seven factors were extracted. Together, these seven factors explain 74.93% of the variance in the original data, which represents a high percentage given the number of variables in the model (39). The Scree criterion was applied in the analysis. According to this criterion, the number of significant factors is determined by identifying the point at which the eigenvalues level off.

Table 3 presents the eigenvalues for models with one up to seven extracted factors. The last column of the table shows how the percentage of explained variance increased with the addition of more factors. The first factor explains the largest share of variance, accounting for approximately 45.86% of the variations in the original data. After the first factor, the values gradually decrease up to the seventh factor, after which they stabilize.

The identified factors were rotated using the Varimax method. The interpretation of the extracted factors is as follows:

- F1 (SA) – Competence and efficiency of top management (in terms of making sound strategic decisions and readiness to invest in research activities).
- F2 (SA) – Business process management aligned with strategic goals and plans.
- F3 (SA) – Striving for originality in products and business practices to capture markets and achieve better business results.
- F4 (SA) – Application of quantitative methods in strategic planning and decision-making.
- F5 (SA) – Ensuring employee support in responding to environmental changes and consumer needs.
- F6 (SA) – Quality of the company's defined vision and mission.
- F7 (SA) – Introduction of new products/services into the company's portfolio.

Table 2. Distribution of Eigenvalues Across Different Factor Analysis Models (Top Management Strategic Activities)

Factor	Eigenvalue	% of Variance	Cumulative Eigenvalue	Cumulative % of Variance
1	17,89	45,86	17,89	45,86
2	3,17	8,12	21,05	53,98
3	2,33	5,97	23,38	59,95
4	1,93	4,95	25,31	64,90
5	1,52	3,89	26,83	68,79
6	1,31	3,35	28,14	72,14
7	1,09	2,79	29,22	74,93

Source: Author's own work

Factor Analysis of Top Management's Human Resource Activities

Through factor analysis of top management's human resource activities, eight factors were extracted. Together, these eight factors explain 76.4% of the variance in the original data, which represents a high percentage given the number of variables in the model (40). The Scree criterion was applied in the analysis. According to this crite-

rion, the number of significant factors is determined by identifying the point at which the eigenvalues level off.

Table 4 presents the eigenvalues for models with one up to eight extracted factors. The last column of the table shows how the percentage of explained variance increased with the addition of more factors. The first factor explains the largest share of variance, accounting for approximately 47.9% of the variations in the original data. After the first factor, the values gradually decrease up to the seventh factor, after which they stabilize.

The identified factors were rotated using the Varimax method. The interpretation of the extracted factors is as follows:

- F1 (HR) – Employees' knowledge, motivation, and opportunities for career advancement
- F2 (HR) – Fairness and a systematic approach to task allocation, rewarding, and conflict resolution
- F3 (HR) – Efficiency in implementing decisions
- F4 (HR) – Creating a positive organizational climate that encourages employee freedom, initiative, and creativity
- F5 (HR) – Employees' attitude toward change and innovation
- F6 (HR) – Quality of internal communication
- F7 (HR) – Quality of the relationship between top management and employees, based on trust
- F8 (HR) – Speed of correcting errors in production and business processes

Table 3. Distribution of Eigenvalues Across Different Factor Analysis Models (Top Management Human Resource Activities)

Factor	Eigenvalue	% of Variance	Cumulative Eigenvalue	Cumulative % of Variance
1	19,169	47,924	19,169	47,924
2	2,557	6,393	21,727	54,317
3	2,117	5,292	23,844	59,609
4	1,757	4,393	25,601	64,002
5	1,348	3,369	26,949	67,372
6	1,305	3,262	28,254	70,634
7	1,253	3,132	29,506	73,766
8	1,072	2,679	30,578	76,445

Source: Author's own work

Factor Analysis of Overall Top Management Activities

Through factor analysis of overall top management activities, 12 latent factors were identified. These factors cumulatively explain 71% of the total variance in the observed data, which represents a high percentage given the 118 manifest variables included in the model. The Scree test was applied in the extraction procedure, whereby the number of significant factors is determined by identifying the inflection point on the scree plot—the point at which eigenvalues show a tendency toward stabilization.

Table 5 presents the eigenvalues for models with one up to twelve extracted factors, while the last column illustrates the growth of the cumulative percentage of ex-

plained variance depending on the number of included factors. The first factor has the highest explanatory power, accounting for 35.68% of the total variance, while the explanatory contribution of each subsequent factor gradually decreases until the twelfth, after which the values stabilize.

The identified factors were rotated using the Varimax method. The interpretation of the extracted factors is as follows:

- F1 (U) – Fairness and a systematic approach to task allocation, rewarding, and conflict resolution
- F2 (U) – Activities related to entering and expanding presence in domestic and international markets
- F3 (U) – Competence and efficiency of top management (in terms of making sound strategic decisions and readiness to invest in research activities)
- F4 (U) – Striving for originality in products and business practices to capture markets and achieve better business results
- F5 (U) – Business process management aligned with strategic goals and plans
- F6 (U) – Enhancing the quality of work and motivation of (marketing) managers within the company
- F7 (U) – Educational background of (marketing) managers
- F8 (U) – Establishing an appropriate balance between price, product quality, and consumer affordability
- F9 (U) – Efficiency in implementing decisions
- F10 (U) – Quality of internal and external communication
- F11 (U) – Creating a positive organizational climate that encourages employee freedom, initiative, and creativity
- F12 (U) – Corporate social responsibility

Table 4. Distribution of Eigenvalues Across Different Factor Analysis Models (Overall Top Management Activities)

Factor	Eigenvalue	% of Variance	Cumulative Eigenvalue	Cumulative % of Variance
1	42,107	35,684	42,107	35,684
2	8,080	6,847	50,187	42,531
3	5,421	4,594	55,608	47,125
4	5,054	4,283	60,661	51,408
5	4,336	3,675	64,998	55,083
6	3,254	2,758	68,251	57,840
7	3,121	2,645	71,373	60,485
8	2,938	2,490	74,311	62,975
9	2,840	2,407	77,150	65,382
10	2,299	1,948	79,449	67,330
11	2,213	1,876	81,662	69,205
12	2,155	1,826	83,817	71,031

Source: Author's own work

RESULTS AND DISCUSSION

Across all four factor analyses, it can be observed that the first factor explains the largest share of variance, accounting for approximately 35–48% of the variations in the original data. This represents a remarkably high percentage, thus warranting a more detailed analysis of each of these four factors.

In the domain of marketing activities, the first factor is identified as monitoring environmental changes (e.g., consumer needs, competitor activities) with the objective of increasing the flexibility of the product portfolio. This finding confirms the importance of continuous environmental scanning and production adaptation. While the other factors within marketing are also significant, the essence of competitive advantage is most often achieved through product quality and the ability to respond quickly to environmental changes with a flexible product portfolio tailored to market needs. This approach is consistent with the findings of , who emphasize that the characteristics of the global environment and its changes are key determinants of effective international marketing, and that geographic mapping of market parameter differences can contribute to better strategic decision-making. Similarly, points out that the lack of adequate environmental scanning in small firms may severely constrain their ability to recognize early signals of change and to adjust their strategies in a timely manner. This further underline the importance of developing a systematic and proactive approach to monitoring external factors that shape an organization's competitive position.

In the domain of strategic activities, the first factor is identified as the competence and efficiency of top management, particularly in terms of making sound strategic decisions and demonstrating readiness to invest in research and development activities. Given that the consequences of poor strategic decisions can be highly detrimental to the long-term stability and growth of a firm—especially when multiple poor decisions are made consecutively—respondents in this study highlight that the strategic competence of leadership is a critical prerequisite for organizational survival and competitive positioning. While other strategic activities are also important, errors in strategic decision-making can neutralize the positive effects of success in other functional areas.

These findings are consistent with contemporary theoretical models that link strategic decision-making to sustainable innovation and long-term development, where top management must integrate investments in research and development with institutional learning. Specifically, the model proposed by Sarpong et al. suggests that a successful system of sustainable innovation rests on the integration of three key pillars of R&D: investment, talent, and educational institutions, which together provide the foundation for knowledge-based growth and strategic agility. In the same vein, Khattak and Shah emphasize that the capabilities of top management significantly enhance the performance of small and medium-sized enterprises, primarily by facilitating access to external resources, which in turn ensures long-term sustainability and competitive advantage.

In the domain of human resources, the first factor of fundamental importance is employees' knowledge, motivation, and opportunities for career advancement. The most important task of top managers in this context is to create conditions that motivate employees and enable them to engage in continuous professional development and career progression. By fostering such a positive organizational climate, many challenges in human resource management can be effectively addressed.

This approach is consistent with the findings of Mansaray, who emphasizes that human resources play a central role in achieving organizational efficiency, with employee motivation being directly linked to performance. The author highlights that motivational mechanisms and systems of employee support are critical factors that enable organizational success, particularly in the face of modern business challenges and competitive pressures.

Similar results are reported by Bahasoan and Baharuddin, whose research confirms that work discipline and motivation significantly and positively influence employee performance. Their study suggests that establishing systems which encourage responsible behaviour and employee motivation can have a direct effect on productivity and efficiency, thus representing an essential component of human resource management strategies.

Within the overall analysis of top management activities, the most significant factor identified was a fair and systematic approach to task allocation, rewarding, and conflict resolution. Interestingly, this aspect did not dominate the previous individual analyses of variables, but in the aggregated results it emerged as a key determinant of effective management. This finding suggests that the fundamental dimensions of interpersonal relations—particularly perceptions of fairness—have a decisive impact on the overall functioning of the organization, often stronger than traditionally emphasized dimensions such as strategy, marketing, or operational objectives.

This result can be interpreted in the context of transitional socio-economic environments, where employees place high value on transparency, balance in the distribution of responsibilities, and consistency in conflict resolution. In such settings, fairness in decision-making and interpersonal relations becomes not only a moral, but also a strategic category that shapes organizational culture and directly affects employee motivation, trust, and loyalty.

In the literature, this perspective corresponds to the concept of organizational justice, which, according to Greenberg, encompasses distributive, procedural, and interactional fairness, which significantly influence employees' perceptions of the legitimacy of managerial decisions and their own role within the organization.

Within the twelve factors identified in the overall analysis, the factors that were previously the most significant in the domains of marketing activities and human resource activities were not directly included. However, it can be observed that the most important factor from the marketing domain is reflected in the aggregate set through the following factors: F2(U), F4(U), and F5(U). Similarly, the first factor from the human resources domain is reflected within F6(U) and F7(U), which indicates its indirect integration into the overall structure.

In contrast, the most important factor from the domain of strategic activities was directly included in the set of twelve overall factors, specifically as F3(U). This confirms that the strategic dimension has a clearly identifiable and direct impact on overall managerial effectiveness, while the contributions of marketing and HR activities are reflected in indirect, yet analytically important, factors.

It can also be noted that the majority of the twelve identified factors (9 out of 12) had already been recognized within the three groups of top management activities analyzed in earlier stages of the study. This outcome stems from the structural similarities in the grouping of variables in the joint (integrated) analysis, further confirming the

consistency of variable classification across all four conducted analyses.

Of particular interest is the fact that F10(U) is conceptually like F6(HR) from the human resources group, specifically in the segment relating to internal communication.

Moreover, the distribution of these nine common factors is balanced, as each of the three analyzed activity groups (strategic, marketing, and HR) contributes three factors.

Regarding F6(U) and F7(U), although they were originally linked to marketing management activities, their substantive content can be interpreted more broadly, as they encompass activities relevant to managers across all functional domains. Therefore, in the designation of these factors, the term "marketing" is placed in parentheses to highlight their primary origin while also indicating the potential for broader applicability.

CONCLUSION

Confirmation of Hypotheses and Summary of Findings

Hypothesis H1 was confirmed. All three partial exploratory factor analyses (marketing, strategy, and human resources) demonstrated that managerial activities can consistently be grouped into distinct factors within their respective domains. The first factors in each domain explained between 40% and 48% of the variance, while the total variance explained exceeded 74%, indicating the stability of the latent structure and confirming that marketing, strategy, and human resources constitute the core dimensions of managerial behavior.

Hypothesis H2 was also confirmed. The integral factor analysis revealed the existence of twelve latent factors, three of which originated directly from strategic activities, and three each from the domains of marketing and human resources. However, in addition to these expected domains, an additional dimension—organizational justice—emerged as a key factor of effective management in a transitional business environment. This finding confirms that the aggregation of managerial activities can uncover new dimensions, with fair task distribution, rewarding, and conflict resolution playing a particularly important role in explaining managerial behavior.

Furthermore, the integrated analysis led to the formulation of a set of five recommendations that provide concrete guidelines for improving top management practices.

Theoretical Contribution

This study makes a significant theoretical contribution by modeling and systematizing top management activities within the context of a transitional economy—an area that remains relatively underexplored in contemporary management literature. The research findings enabled the identification of managerial behavior patterns specific to institutionally unstable environments, such as Bosnia and Herzegovina. In doing so, the paper contributes to a deeper understanding of management practices in developing countries and opens space for further theoretical inquiry in this domain.

Limitations and Directions for Future Research

This study has certain methodological and geographical limitations that must be considered when interpreting the results. Specifically, all data were collected from

companies operating within Bosnia and Herzegovina, which limits the possibility of generalizing the findings to a broader regional or international context. However, this national focus also represents a strength of the research, as it allows for an in-depth understanding of managerial activities under the specific conditions of a transitional economy and institutional instability. Such a context is often overlooked in international literature, and this study therefore provides relevant insights into management practices in complex environments, offering a basis for comparative studies or case analyses.

Additionally, the research was conducted at a single point in time, using a cross-sectional design, which does not allow for the tracking of changes or the development of managerial activities over time. This approach prevents the identification of causal relationships, as well as potential shifts in top management behavior within a dynamic environment.

Accordingly, future research should consider conducting longitudinal studies to capture the evolution of top management activities in relation to changes in the market, organizational, and broader socio-economic environment.

Comparative studies across countries in the region may also contribute to a deeper understanding of contextual factors that shape management patterns. Moreover, future analyses could incorporate additional variables such as organizational culture, company size, and industry sector to identify specific managerial approaches across different organizational settings.

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ORIGINALNI NAUČNI RAD / ORIGINAL SCIENTIFIC PAPER

RULER, LOVER, OR OUTLAW? ARCHETYPAL DIVERGENCE IN ELITE TRACK AND FIELD ATHLETES' DIGITAL SELF-PRESENTATION

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Abstract: *This study examines the importance of developing a cohesive personal brand in the modern sports industry, where athletic performance must be complemented by clear marketability to ensure long-term commercial success and sponsorship opportunities. The main objective is to identify the dominant brand archetypes of six professional track and field athletes with strong social media presence. The theoretical framework draws on Jungian psychology as adapted for marketing by Mark and Pearson. Methodologically, the study combines sentiment analysis of public comments from athletes' Instagram profiles with qualitative data from two focus groups. The first group consisted of experienced athletics fans, while the second included individuals with no regular interest in athletics, allowing for a broader perspective on public perception. Participants assigned three archetypes to each athlete and identified the most dominant one. The results confirmed a clear dominant archetype for each athlete. Femke Bol was identified as the Hero, Alica Schmidt as the Lover, Armand Duplantis and Noah Lyles as the Ruler, Emmanouil Karalis as the Jester, and Sha'Carri Richardson as the Outlaw. The findings highlight that a clearly defined and consistent brand archetype is crucial for athletes seeking sustained relevance and increased commercial value in the digital era. While traditional archetypes such as Hero and Ruler prevail among top performers, the presence of diverse archetypes (Lover, Jester, Outlaw) plays a key role in differentiation and audience engagement. The results also suggest that gender may influence the public attribution of archetypes.*

Keywords*: Brand Archetypes, Personal Brand, Social Media, Athlete's Brand, Digital Branding*

JEL Classification: *M31, M37*

INTRODUCTION

The contemporary professional sports environment dictates that athletic excellence must be synergized with strategic marketability and narrative coherence. Unlike team sports, which often rely on collective identity and institutional history, individual athletes find that cultivating a robust and distinctive personal brand is paramount to career success and long-term financial stability. This branding is critical for effectively communicating with fans and, more importantly, securing relationships with essential sponsors. In the modern digital era, athletes predominantly rely on social networks to connect with and maintain a broad, loyal audience. However, succeeding in this highly saturated sphere requires tools that move beyond simple promotion and tap into deeper psychological resonance.

This need to forge profound emotional connections has led to the increased application of brand archetypes, a framework adapted from the foundational psychological theories of C. G. Jung. Archetypes enable individuals to construct a memorable public identity, ensuring consistency in their values and communication, which, in turn, helps the audience identify with and understand their public persona on social media platforms. The strategic use of archetypes can thus optimize an athlete's market value by converting short-term performance into long-lasting personal brand equity. Consequently, the main objective of this research is to identify the brand archetypes of six selected professional track and field athletes. The motivation for this study stems from the imperative to understand how these archetypes manifest in the digital space and how they influence public perception, loyalty, and commercial opportunities within the highly competitive sports industry.

This paper proceeds as follows. The initial sections establish the theoretical background, detailing the evolution of the personal brand and differentiating the concept from fleeting image, before fully exploring the framework of brand archetypes. Subsequently, the methodology section outlines the subjects selected and the mixed-methods approach utilized, specifically the combination of quantitative sentiment analysis of social media (Instagram) and qualitative research derived from two distinct focus groups. The results detail the determined dominant archetypes for each athlete, followed by a comprehensive discussion of the findings and final conclusions.

LITERATURE OVERVIEW

The pervasive commercialization of elite sport and the explosion of digital communication have transformed high-performance athletes into complex, managed entities often referred to as human brands (Laub et al. 2018; Berndt 2021; Rai et al. 2021; Biz and Schubert 2024). For individual athletes, unlike team organizations relying on collective identity, establishing a distinctive personal brand is paramount to securing marketability, long-term financial stability, and sponsorship opportunities (Su et al. 2020; Doyle, Su, and Kunkel 2022).

Athlete Brand Image and Identity Management

The fundamental characteristic of a brand is its differentiation from competitors, providing a measure of reputation and awareness (Biz and Schubert 2024). A favorable athlete brand translates directly into tangible benefits, including increased media visibility, sponsorship agreements (Akranglyte et al. 2019), and potentially higher wages

(Su et al. 2020; Doyle et al. 2022). A critical distinction must be maintained between the enduring personal brand (identity) and the fleeting image (Ramya 2017). Brand identity is a long-term, strategic process based on core values, authenticity, and consistent communication, fostering trust and distinguishing the athlete (Lobpries, Bennett, and Brison 2017; Ramya 2017; Hasaan, Biscaia, and Ross 2021). Conversely, image is the temporal, external perception formed automatically by consumers based on superficial elements like appearance or current behavior (Ramya 2017). The explicit effort applied to constructing and managing this public persona has been noted in various sporting contexts (Berndt 2021).

Scholarly efforts to systematize the components of an athlete's marketable identity led to the Model of Athlete Brand Image (MABI) (Arai, Ko, and Kaplanidou 2013; Arai, Ko, and Ross 2014; Akranglyte et al. 2019; Na, Kunkel, and Doyle 2020). The MABI proposes that consumer perceptions of an athlete's brand are determined by three structural dimensions (Arai et al. 2013; Mahmoudian et al. 2020; Doyle et al. 2022) - Athletic Performance (defined by sub-dimensions such as athletic expertise, competition style, sportsmanship, and rivalry), Attractive Appearance (including physical attractiveness, symbol, e.g., clothing, style, and body fitness), Marketable Lifestyle (encompassing the athlete's life story, role model behavior, relationship effort, and ethical conduct) (Arai et al. 2013; Akranglyte et al. 2019; Linsner et al. 2021). Notably, research suggests that the marketable lifestyle component, reflecting the athlete's personality and broader social perception, contributes the highest value to the overall athlete brand image (Arai et al. 2013; Na et al. 2020; Linsner et al. 2021; Shin and Lee 2021). These structural elements, when strategically managed, provide competitive advantages (Akranglyte et al. 2019).

Archetypal Framework for Brand Storytelling

The application of archetypes provides a psychological framework for constructing a cohesive and resonant brand identity (Mark and Pearson 2001; Tsai 2006). Derived from the psychological work of Carl Gustav Jung, archetypes are recognized as universal mental models (Stevens 2006; Becker and Neuberg 2019; Pera, Viglia, and Furlan 2022) or "unconscious primary forms" embedded in the collective unconscious (Jung et al. 2017). Jung asserted that these forms, which are collective rather than purely individual, manifest spontaneously, similar to instincts, and serve as roots for conscious thought, influencing perception even subconsciously (Jung et al. 2017). The most prominent adaptation of Jungian psychology in marketing is the framework developed by Mark and Pearson (Mark and Pearson 2001; Xara-Brasil, Miadaira Hamza, and Marquina 2018; Pera et al. 2022). This model classifies twelve primary archetypes based on four fundamental human motivational clusters (Mark and Pearson 2001; Broek 2014; Johnson 2016):

1. Stability and Control (e.g., Ruler, Creator, Caregiver).
2. Risk and Mastery (e.g., Hero, Magician, Outlaw).
3. Independence and Fulfillment (e.g., Innocent, Explorer, Sage).
4. Belonging and Connection (e.g., Everyman, Jester, Lover).

By linking a brand or individual persona to one or a combination of these archetypes, marketers can signal the fulfillment of deep emotional and psychological needs, fostering emotional bonding and consumer loyalty (Mark and Pearson 2001;

Xara-Brasil et al. 2018; Maatota, Lapian, and Tielung 2019). While Mark and Pearson (2001) propose that a brand should strive to become a consistent carrier of meaning and an icon of a single archetype, practitioners sometimes use extended models, such as that by Hartwell and Chen (Hartwell and Chen 2012), which encompasses 13 archetypal families and sixty subtypes for more nuanced brand personality definitions.

The power of archetypes is strongly interwoven with brand storytelling (Herskovitz and Crystal 2010; Xara-Brasil et al. 2018; Maatota et al. 2019; Pera et al. 2022). Storytelling provides meaning to a brand, creates emotional connections (Sanders and van Krieken 2018; Maatota et al. 2019; Pera et al. 2022), and, at a personal level, acts as a predictor of digital reputation (Pera et al. 2022). In the context of online self-presentation, powerful storytelling is structured around defined phases and conflicts, culminating in a metaphorical or symbolic "lesson learned" (Pera et al. 2022). Research on online self-narratives suggests that the presence of the Ruler and Sage archetypes confers significant reputational power, particularly due to their connection to expressing leadership, competence, and wisdom (the "Post-Journey" phase) (Pera et al. 2022; Scholz 2025).

Digital Platforms and Archetypal Enactment

The contemporary athlete brand is inextricably linked to the digital sphere (Doyle et al. 2022; Charaf 2025). Social media platforms (such as Instagram) have become crucial tools for elite athletes to pursue branding initiatives, achieving fame, financial stability, and influence (Su et al. 2020; Bredikhina, Gupta, and Kunkel 2023). This marks a fundamental shift, granting athletes independent control over their narrative (Charaf 2025). The process of building an online athlete brand involves strategic impression management (Doyle et al. 2022; Biz and Schubert 2024), where athletes selectively emphasize specific characteristics or achievements they wish to be associated with (Shreffler, Hancock, and Schmidt 2016; Doyle et al. 2022). This deliberate presentation aligns with Goffman's theory of self-presentation (Akranglyte et al. 2019; Doyle et al. 2022). Content analysis reveals that athletes utilize specific content categories to manage their online presence, notably differentiating between the MABI components (Athletic Performance, Attractive Appearance, Marketable Lifestyle) and Offstage Content (content not directly related to or depicting the athlete) (Arai et al. 2014; Doyle et al. 2022). Research indicates that Athletic Performance content typically attracts the highest rate of consumer engagement (likes and comments) (Ferreira, Crespo, and Mendes 2021; Doyle et al. 2022). Moreover, fan engagement is maximized when content is perceived as authentic and diverse, often including personal histories and behind-the-scenes material (Charaf 2025). For elite athletes, growth metrics—such as follower count, which serves as a proxy for popularity and brand monetization (Su et al. 2020; Brison and Geurin 2021; Bredikhina et al. 2023)—are often dictated less by posting frequency (a common tactic for general social media influencers, or SMIs) and more by strategic exposure and brand networking (e.g., tagging master brands or influential team members) (Bredikhina et al. 2023).

Congruence and Endorsement

When an athlete secures a sponsorship, the effectiveness of the partnership relies on the Meaning Transfer Theory (Kim, Seo, and Chang 2017; Roy 2018; Rai et al.

2021), where the image, credibility, and associations consumers hold of the celebrity are transferred to the endorsed product (Arai et al. 2013; Kim et al. 2017). This transfer is optimized by the match-up hypothesis, which dictates that congruence between the endorser's image and the brand is essential (Arai et al. 2013; Kim et al. 2017). Research distinguishes the transferability of image attributes based on the advertising context (Kim et al. 2017). Professional Expertise – attributes derived from athletic performance (e.g., technical skill, achievement) are transferred most effectively when the athlete is presented in a context-congruent advertisement (e.g., actively competing or training) (Kim et al. 2017; Nimmermann 2020). Sociocultural Influence – attributes based on general lifestyle or appearance (e.g., positive image, charisma) may transfer effectively even in context-incongruent advertising (e.g., smiling in a suit advertisement unrelated to sports) (Kim et al. 2017; Nimmermann 2020). This latter form of transfer leverages the athlete's existing positive image developed through their broader public life (Kim et al. 2017; Kunkel, Doyle, and Na 2022).

In essence, the choice of a dominant archetypal persona must be consistently articulated through strategic digital self-presentation to maximize both fan engagement and commercial congruence.

METHODOLOGY

This research employs a mixed-methods approach, combining quantitative analysis of social media engagement with in-depth qualitative analysis derived from focus groups. This strategy was selected to achieve the primary objective: to identify the brand archetypes of six selected professional track and field athletes. The methodology is designed for maximum clarity and precision, ensuring that the process is transparent and allows for validation and testing by subsequent authors.

Subjects of Analysis

The subjects of this analysis are six world-class track and field athletes who maintain a significant public presence on social media platforms. The selection criteria prioritized global prominence and varied styles of digital self-presentation, enabling a study of contrasting archetypal manifestations. The athletes were paired for thematic comparison: Femke Bol versus Alica Schmidt, Armand Duplantis versus Emmanouil Karalis, and Sha'Carri Richardson versus Noah Lyles.

Quantitative Data Collection: Sentiment Analysis

The initial quantitative phase involved a sentiment analysis primarily focused on data collected from the Instagram platform. This method was utilized to assess the prevailing emotional context of public reception, which served as a crucial input for the subsequent qualitative discussion. For each athlete, comments were extracted from their last three unpinned Instagram posts (data collected by April 7, 2025). If the existing posts did not yield sufficient data, additional posts were included until a minimum threshold of 1200 valid comments was achieved.

The raw comment data was copied into Notepad++ and subsequently processed and categorized using Artificial Intelligence (ChatGPT versions 4.0 and 4.5) to classify the sentiment (positive, neutral, or negative). Crucially, the process included filtering out content devoid of emotional coloring, such as conjunctions and pronouns. The

analysis prioritized subjective text elements, focusing on adjectives, verbs, and adverbs, along with relevant emoticons, to accurately quantify emotional valence. Furthermore, specific keywords demonstrably linked to the 12 Mark and Pearson brand archetypes (e.g., words associated with the Jester or the Ruler) were analyzed for frequency of occurrence.

Qualitative Assessment: Focus Groups

The quantitative findings informed the core qualitative phase, which consisted of two distinct Focus Groups (FGs). This approach facilitated a deeper understanding of how the athletes' digital personas are perceived by different public segments. Both FGs were composed exclusively of 12 individuals belonging to Generation Z, selected due to their native daily use of social media, and maintained equal gender representation (three men and three women in each group) to enhance output validity.

1. FG 1 (Athletes): Comprised fans of athletics who had followed the sport long-term, most possessing at least two years of personal athletic experience.

2. FG 2 (Non-Athletes): Consisted of individuals who do not follow athletics and prefer other sports.

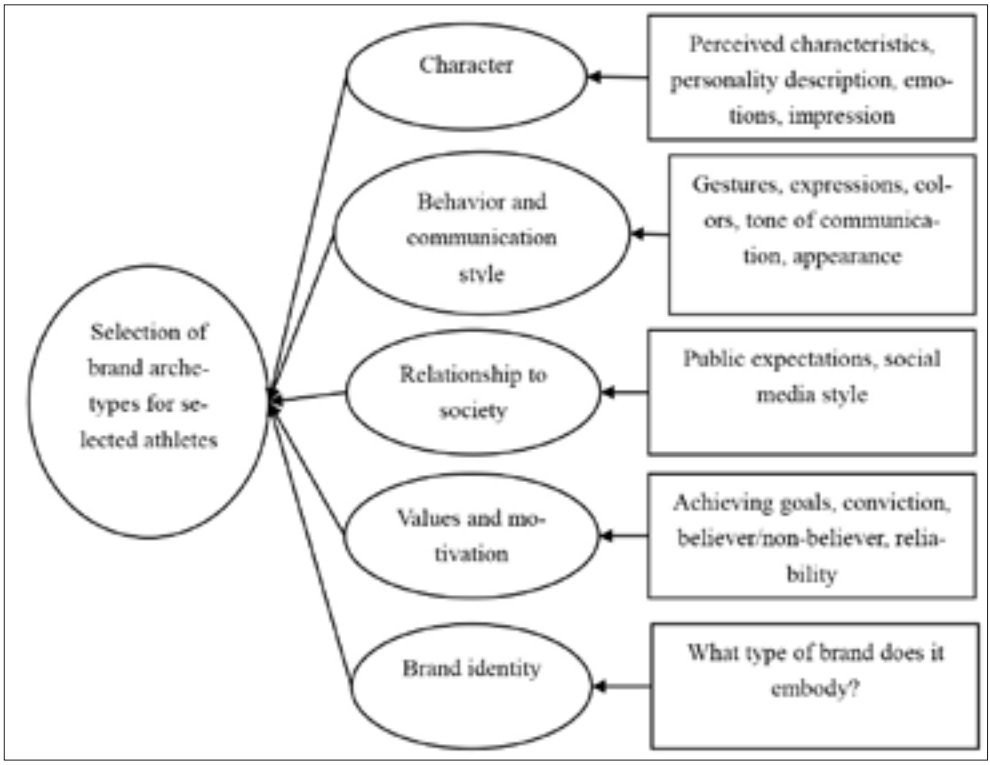


Figure 1. Operationalization
Source: own data

Participants were provided with the sentiment analysis results, visual archetype cards, and introductory material explaining the 12 brand archetypes of M. Mark and C. S. Pearson. Following the introduction to the topic of brand archetypes, the focus was

subsequently directed toward the selected athletes. For each athlete, participants were instructed to open the specific athlete's Instagram profile and perceive the individual not only as a sports figure but also as an overall personality. Throughout both Focus Groups (FGs), the discussion was systematically guided toward determining the brand archetypes of the selected athletes using a prepared set of questions. This collection of questions was formulated using operationalization (see Figure 1). The purpose of these questions was to help participants reflect on the topic discussed and facilitate the final determination of the archetypes.

During the first six questions, the emphasis was placed on team discussion, and participants were actively encouraged to engage in conversation. For the final question, each respondent answered individually. First, they designated three archetypes that, in their opinion, best fit the athlete. From these selected options, the participant then chose one archetype they considered to be the most dominant. This segmentation made it easier to determine the athlete's brand archetype that appeared most frequently.

The final results from both Focus Groups were subsequently compared. The archetype exhibiting the highest frequency (highest cumulative score) was ultimately selected as the dominant one, determined by a simple weighted calculation. Specifically, the archetype that respondents positioned as the dominant choice was assigned two points. The remaining two selected archetypes were each assigned one point, as their relative ranking was considered irrelevant. All accumulated points were then totaled for each archetype separately, and the archetype with the highest cumulative score was definitively designated as the dominant brand archetype for the respective athlete.

RESULTS AND DISCUSSION

This chapter integrates the findings from the quantitative sentiment analysis and the qualitative focus group research to identify and interpret the dominant brand archetypes of the six selected athletes. The sentiment analysis served as foundational, data-driven material, providing crucial insights into the immediate emotional reception of the athletes by their social media audience, thereby informing the subsequent contextual interpretations made by the focus group participants.

Sentiment Distribution and Archetype Frequency

The overall sentiment regarding the athletes was heavily skewed toward the positive, though notable differences existed: Alica Schmidt had the highest positive score (98%), while Sha'Carri Richardson registered the lowest (42%). See Table 1.

Table 1. Sentiment Distribution and Archetype Frequency

Athlete	Positive Sentiment	Most Dominant Archetypes (by Word Frequency)
Femke Bol	90%	**Hero** ("Unstoppable," "Champion"), Ruler, Magician
Alica Schmidt	98%	**Lover** ("beautiful" 39x, "love" 30x), Hero, Creator
Armand Duplantis	95%	**Ruler** (GOAT 16x, "King"), Hero, Lover
Emmanouil Karalis	95%	**Hero**, Lover, Caregiver
Sha'Carri Richardson	42%	**Lover**, Ruler ("Queen"), Hero
Noah Lyles	68%	**Jester**, Lover, Hero

Source: own data

The detailed analysis of word frequency and related emoticons revealed distinct patterns:

Femke Bol: The analysis confirmed the Hero archetype with frequent terms like "Legend" and "Amazing," but also showed elements of the Ruler ("Ruler of 400 m"). Negative comments (2%) focused primarily on comparisons to rival Sydney McLaughlin-Levrone.

Alica Schmidt: Her high positive rate is attributed to her role as an influencer/model, with fan praise heavily focused on physical attractiveness and affection (Lover). Negative comments (0.5%) occasionally criticized product promotion or questioned her athletic success.

Armand Duplantis: The dominance of the Ruler archetype was evident through frequent use of GOAT (Greatest Of All Time). The prevalence of the Lover archetype was potentially inflated due to cross-posting with his fiancée, Desiré Inglander.

Emmanouil Karalis: Comments were highly emotive and expressed national pride. While Hero terms dominated, critics occasionally pointed out the frequent appearance of alcohol on his profile.

Sha'Carri Richardson: Despite her public "rebel" reputation, the most frequent words in comments aligned with the Lover archetype (admiration for confidence and attractiveness), and no words associated with the Outlaw archetype were found in this quantitative sample.

Noah Lyles: Terms related to the Jester archetype were the most dominant, viewing him as a positive showman. Negative comments (5%) were often critical or abusive ("wasteman," "corny").

Evaluation of Focus Group Outcomes

Initial observations suggested that the "Non-Athletes" group produced more dynamic, sometimes controversial, discussions, while the "Athletes" group exhibited greater initial restraint. A significant disparity in opinion often arose between the two groups regarding an athlete's perceived authenticity or charisma. The results highlight that athletes are associated with a diverse range of archetypes beyond the commonly expected Hero or Ruler. The final calculated dominant archetypes were: Femke Bol as Hero, Alica Schmidt as Lover, Armand Duplantis as Ruler, Emmanouil Karalis as Jester, Sha'Carri Richardson as Outlaw, and Noah Lyles as Ruler. See Table 2.

Table 2. Sentiment Distribution and Archetype Frequency

Athlete	FG Dominant Archetype	Key Qualitative Findings
Femke Bol	Hero	Unanimous agreement: perceived as "hard worker", disciplined, and an icon. Group 2 saw her as a role model focusing solely on sport.
Alica Schmidt	Lover	Overwhelmingly seen as an influencer/model rather than primarily an athlete. Associated with luxury brands (Dior, Mercedes, Armani). Group 1 described her using strong negative terms ("fake,""artificial").
Armand Duplantis	Ruler	Perceived as highly dominant, sovereign, and the GOAT, continually pushing boundaries. Associated with luxury brands (Rolex, RedBull).

Athlete	FG Dominant Archetype	Key Qualitative Findings
Emmanouil Karalis	Jester	Seen as highly positive, friendly, and a comedian/showman ("yolo"). Group 2 designated him "always the best second" compared to Duplantis. Associated with colorful, fun brands (Skittles, M&M's).
Sha'Carri Richardson	Outlaw	Evoked strong, polarizing reactions; seen as extravagant, artificial, and a rebel. Associated with conspicuous luxury and distinctive brands (Fenty Beauty).
Noah Lyles	Ruler	Group 1 ("Athletes") saw him as a Jester (showman, arrogant). Group 2 ("Non-Athletes") consistently assigned the Ruler archetype, viewing him as the current leader and dominant victor.

Source: own data

Consistency and Discrepancy between Quantitative and Qualitative Findings

For Femke Bol, Alica Schmidt, and Armand Duplantis, the results of the sentiment analysis (most frequent archetype words) generally aligned with the final dominant archetype determined by the focus groups. However, significant discrepancies arose for the other three athletes:

1. Emmanouil Karalis: Sentiment analysis linked him strongly to the Hero archetype. Yet, the focus groups assigned the Jester. This may stem from the perception that, despite his athletic success, his frequent inclusion of alcohol and humorous self-presentation on social media (which Group 2 noted makes him "always the best second" to Duplantis) shifts the collective brand perception away from a serious Hero towards a less serious Jester.

2. Noah Lyles: The sentiment analysis indicated the Jester was most frequent in comments. Conversely, the focus groups ultimately determined the Ruler archetype as dominant. This stark difference highlights the variance in perception based on athletic knowledge: the "Athletes" group, familiar with his behavior, leaned toward Jester/showman, while the "Non-Athletes" group saw him unequivocally as the dominant leader of his discipline (Ruler).

3. Sha'Carri Richardson: The largest discrepancy occurred here. The sentiment analysis showed the Lover archetype dominating comment frequency. However, the focus groups unanimously assigned the Outlaw. This indicates that while social media commentary may focus on immediate, positive emotional attributes (beauty/attractiveness), the qualitative, contextual interpretation of her overall brand—defined by controversy, rule-breaking, and rebellious self-expression—overrides these immediate reactions. The Outlaw archetype attracts an audience seeking individuality and authenticity, often at the price of controversy.

Across all focus group assignments, the archetypes of Ruler (mentioned 35 times total) and Hero (mentioned 33 times total) were the most frequently selected, regardless of their dominant placement. This suggests that specific traits associated with control, dominance, perseverance, honor, and stability (characteristics of the Ruler and Hero) are fundamentally expected and highly recognized by the public in the context of professional athletes (Mark and Pearson 2001; Hartwell and Chen 2012).

The findings also support the observation that gender may play a role in archetype association (Dominici et al. 2016; Mateo-Orcajada et al. 2021), as Alica Schmidt

(female) was strongly determined as the Lover, while Armand Duplantis and Noah Lyles (males) were linked to the Ruler, and Femke Bol (female) to the Hero.

Ultimately, the utilization of brand archetypes provides a framework for understanding how athletes build emotional connection and loyalty with their fans, extending beyond mere performance metrics to encompass personal stories, values, and consistent communication. These results confirm that a diverse range of archetypes (Dominici et al. 2016; Xara-Brasil et al. 2018), not limited to Hero or Ruler, can be successfully deployed by modern athletes to build a strong personal brand.

Limitations of the Study

Despite the effort to achieve a complex and comprehensive methodological approach, this research possesses several identifiable limitations that should be acknowledged when interpreting the results. These limitations pertain to sample size, qualitative methodology constraints, and potential cultural and geographical bias. The primary limitation is the relatively small sample size of respondents participating in the qualitative phase. Although twelve respondents participated across the two focus groups (FGs), providing two distinct perspectives (Athletes vs. Non-Athletes), these results cannot be generalized to the wider population. Future research addressing archetype determination should consider expanding the quantitative phase. While the contrasting perspectives of the two groups (Athletes vs. Non-Athletes) offered valuable comparative data regarding perception, the focus group setting likely suffered from result distortion. This is because respondents mutually influenced each other's opinions during the discussion, a known characteristic of qualitative group research. However, the group discussions concurrently yielded valuable information for contextualizing the assignment of individual archetypes. Another constraint identified is potential cultural bias. The cultural environment can influence how individual archetypes are perceived. The geographical origin of the selected athletes may also have influenced the archetype assignment. The study included four athletes from various countries in Europe and only two athletes from America. A more balanced geographical representation might yield different archetype classifications. A final limitation was the potential lack of detailed knowledge among discussion participants regarding the theoretical framework. Although participants received preparatory materials on archetype theory well in advance, some respondents occasionally struggled to articulate what each archetype represented during the discussion. For better research validity, it would be advantageous to conduct a dedicated lecture or detailed preparatory session on the topic of archetypes prior to the focus group implementation.

Significance and Potential Implications

This research confirms the critical role of brand archetypes in the contemporary sports environment, illustrating that success in the digital era necessitates more than athletic performance alone. Strong athlete branding, guided by clearly defined archetypes, is instrumental in achieving market dominance, fostering fan loyalty, and attracting lucrative sponsorship opportunities. The findings underscore the complexity of athlete branding, challenging the conventional assumption that professional athletes must exclusively align with the Hero or Ruler archetypes. The results have significant implications for commercial strategy. Companies benefit from this identification pro-

cess as they seek athletes who clearly embody values consistent with their corporate strategy, making the selection process more efficient.

CONCLUSION

The principal objective of this study was the identification of the dominant brand archetypes for six selected professional athletes: Femke Bol, Alica Schmidt, Armand Duplantis, Emmanouil Karalis, Sha'Carri Richardson, and Noah Lyles. These individuals were chosen based on the distinct styles of personal presentation they employed across social media platforms. The research emphatically confirmed that archetypes constitute a vital component of an athlete's personal brand, enabling them to achieve memorability and cultivate loyal fan bases. It was observed that the Hero and Ruler archetypes appear more frequently within the sports context. Furthermore, the findings suggested that gender plays a considerable role in archetype determination, as the process of public perception is intricate and influenced by numerous factors. Based on the calculation of archetype assignments made by the focus group participants—who were required to select three and designate one as dominant—a single definitive archetype was determined for each athlete. In an era where social media serves as a pivotal tool for achieving popularity and securing financial viability, the strategic construction of a personal brand is critical. The comprehension and strategic deployment of archetypes offer athletes a methodology to target their content effectively, continuously expanding their sphere of influence and ensuring relevance. Athletes who successfully utilize social media to showcase not only their exceptional performance but also their human elements are often rewarded with vast followings, which are instrumental in negotiating significant sponsorship agreements and cementing their status as global icons.

The findings provide several avenues for further academic exploration. Future studies should track the development and shift of archetypes over the course of an athlete's professional career, particularly in response to major life events, victories, or public scandals (e.g., doping allegations). There is potential utility in utilizing this research to identify the most suitable and sustainable archetype for starting athletes, providing them with a strategic tool to secure sponsorship and broad audience reach early in their careers. An essential implication is the need to study the long-term impact of consistent archetype adherence on the athlete's psyche. Research could investigate whether strict adherence to a single archetype leads to burnout or loss of authenticity, or whether it promotes overall personal growth. This would also address the question of the long-term sustainability of basing a personal brand entirely on a single archetype.

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ORIGINALNI NAUČNI RAD / ORIGINAL SCIENTIFIC PAPER

COMPARING CHATGPT AND DEEPSEEK IN FINANCIAL FORECASTING: CROSS-REGIONAL EVIDENCE FROM TURKEY, EUROPE, AND THE UNITED STATES

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Abstract: *This research compares the forecasting ability of two latest large language models ChatGPT (GPT-4) and DeepSeek-V3 on predicting corporate direction of earnings based on historical financial reports alone. The panel data of 15 Turkish, European, and American companies operating in the banking, technology, and industrial sectors for 2022-2024 have been considered. Projections were made with a consistent prompt style and evaluated for direction accuracy, confusion matrices, interpretive insight scores, and sector-region performance.*

Findings suggest that while ChatGPT offers greater qualitative explanation and performs better in unstable, recovery-based scenarios, DeepSeek offers greater accuracy, stability, and performance in stable, regulation-based environments. The paper brings into focus critical trade-offs between interpretability and reliability and suggests that the use of hybrid models can offer the best solution to financial forecasting.

These findings oppose Efficient Market Hypothesis assumptions and highlight the need for decision-support systems that integrate AI interpretability, domain expertise, and responsible model selection. The research offers prescriptive advice to analysts, institutions, and developers who aim to incorporate LLMs into financial decisions.

Keywords*:Large Language Models (LLMs), Financial Forecasting, Earnings Prediction, Decision Support Systems, Confusion Matrix*

JEL Classification: *G17, C53, C45, G21, F65, G41*

INTRODUCTION

The use of artificial intelligence (AI) in financial decision-making has revolutionized the landscape of earnings forecasting and investment analysis. As large lan-

guage models (LLMs) such as ChatGPT and DeepSeek have developed, new possibilities have emerged for financial statement analysis with natural language processing (NLP). These tools are able to handle huge volumes of structured and unstructured data, recognize trends, and produce forecast reports in manners that mimic, and in some cases enhance, traditional analyst work (Garg & Mago, 2021).

Financial statement analysis has been the traditional foundation of investment forecasting, with techniques such as ratio analysis, trend analysis, and expert judgment (Penman, 1989; White et al., 2003; Penman, 2012). While helpful, human prediction is prone to limitations such as heuristic bias, inconsistent methodology, and information overload (Kahneman & Tversky, 1979). In comparison, the AI models offer consistency, speed, and scalability, which raises a question regarding how well such systems can predict earnings on the basis of historical financial reports alone, independent of market sentiment or external macroeconomic indicators.

This research is placed in the expanding literature on AI as a contributor to financial decision-making not as a substitute for human analysts, but rather as an independent analytical agent. Unlike prior studies that compare machine learning models and human predictions, this research entails a comparison between two generative AI models ChatGPT and DeepSeek exclusively based on their ability to predict the direction of corporate earnings (i.e., up, down, or same) from firms' financial reports over three years and The predictions are contrasted with actual historical outcomes, founded on given performance metrics such as accuracy, bias, and consistency.

In this study, 15 banks and firms Amazon, Apple, Bank of America, Citigroup, JPMorgan, BNP Paribas, Deutsche Bank, HSBC, Arçelik, Tüpraş, Garanti BBVA, Ziraat Bank, Nestlé S.A., Volkswagen Group, and Halkbank in the banking, technology, and industrial sectors between the years 2017 and 2024 are compared.

By assessing the structure and quality of AI-generated predictions, this study adds to the knowledge on whether LLMs can be trusted to support or enhance decision-making in financial settings, particularly across varying regional (Turkey, Europe, USA) and sectoral (banking, technology, industrial) circumstances.

Research Goal and Questions

The primary goal of this study is to examine and contrast the predictive performance of ChatGPT and DeepSeek in the interpretation of historical financial statements in determining the direction of company earnings. The study seeks to determine the accuracy, behavioral biases, and theoretical soundness of the models as compared to established financial theory.

To attain this goal, the following research questions are posed:

- How well can ChatGPT and DeepSeek predict the direction of corporate earnings based on past financial statements?
- How do ChatGPT and DeepSeek differ with respect to predictive precision, magnitude predictions, and consistency between sectors and regions?
- How do the AI models differ in interpretive logic and insight quality while predicting from finance data?
- Which theoretical models best account for the actual forecasting performance and outcomes of ChatGPT and DeepSeek?

LITERATURE REVIEW

Traditional Forecasting vs. AI Forecasting

Traditional forecasting of earnings relied on fundamental analysis of account-based numbers cash flows, balance sheets, and income to estimate firm value and predict performance (Graham & Dodd, 1934; Penman, 2012). Analysts use key ratios like EPS, ROE, and current ratio, combining numerical data with qualitative judgment (Ou & Penman, 1989).

Human forecasts, however, suffer from heuristic biases, inconsistency, and cognitive frailty (Kahneman & Tversky, 1979). On the other hand, AI especially machine learning and deep learning offers scalability, consistency, and flexibility. More recent models use NLP to scan unstructured data such as financial news and earnings calls (Feng et al., 2021). Nevertheless, LLMs like ChatGPT and DeepSeek remain beset by interpretive problems like hallucination, bad table-reading, and fit to textual style (Bommasani et al., 2021; Zhang et al., 2023), particularly when confronted with market shocks or gaps in data.

Human vs. AI Decision-Making

Human analysts incorporate qualitative factors like sentiment and policy indicators but are prone to overconfidence and herding (Shiller, 2003). AI models are fair and consistent but lack transparency in a "black-box" problem. Approaches like SHAP and LIME have been proposed to enhance explainability (Molnar, 2020; Kliegr et al., 2021). Most research focuses on task-specific AI models; few try to test general-purpose LLM capabilities in holistic financial report interpretation. A mistake was made by Zhang et al. (2023), who found LLMs performed better on stories than they did on math reasoning.

Sectoral and Regional Issues

Little is known about how AI develops under different regimes of finance (IFRS vs. U.S. GAAP). LLMs may fail with standards diversity or industry-specific subtleties e.g., technology volatility, industrial capital intensity, or banking regulation. This study bridges these gaps by comparing ChatGPT and DeepSeek across a number of regions (Turkey, Europe, U.S.) and industries (banking, technology, industry).

Research Gaps

- Principal gaps in previous literature are:
- Absence of empirical testing of general-purpose LLMs on raw financial statements;
- No explicit comparison of ChatGPT and DeepSeek via standardized metrics;
- Insufficient scrutiny of AI flexibility between accounting systems and sectors;
- Limited analysis of reasoning performance and observance of financial rationality in LLMs;

Under-emphasized attention to interpretability, auditability, and ethics for LLM finance applications. This study overcomes these deficiencies through the testing of LLMs' forecasting performance, insight quality, and theory consistency in real-world financial settings.

Theoretical Framework

This study combines Efficient Market Hypothesis (EMH), Fundamental Analysis, Decision Support Systems (DSS), and Behavioral Finance to explore how and why AI models outperform or fail at financial forecasting.

EMH (Fama, 1970) assumes stock prices embody all accessible information, with marginal benefit in considering financial reports. However, if ChatGPT and DeepSeek, provided the same input, make different projections, this challenges EMH's assumption of informational efficiency and highlights the effect of model-based processing.

Fundamental Analysis

Traditional forecasting is based on ratios and trends from accounting reports to predict earnings. This study replicates the procedure by requesting LLMs to look at historical statements (2017–2021) and predict directions of earnings (2022–2024), analogous to the procedure followed by human analysts.

AI models are advanced Decision Support Systems. LLMs like ChatGPT and DeepSeek process formatted financial data and reformulate it into directional forecasts. This is consistent with DSS reasoning, where information-based recommendations guide strategic decisions (Benyon, 2010; Brynjolfsson & McAfee, 2017).

Moreover, Behavioral finance recognizes decision-making biases despite AI. LLMs may reflect training-data biases or disproportionately depend on some cues (e.g., overoptimism in growth trends). Comparing each model shows if AI mimics, reduces, or even reverses human heuristic errors (Barberis & Thaler, 2003).

Conceptual Model: AI vs. Human Analysis of Financial Statements

The conceptual framework for this study is indicated in Figure 1. This outlines how both ChatGPT and DeepSeek use the same inputs of financial reports and produce earnings direction predictions. These are compared with actual historical outcomes based on a variety of measures of performance (e.g., accuracy, bias, consistency).

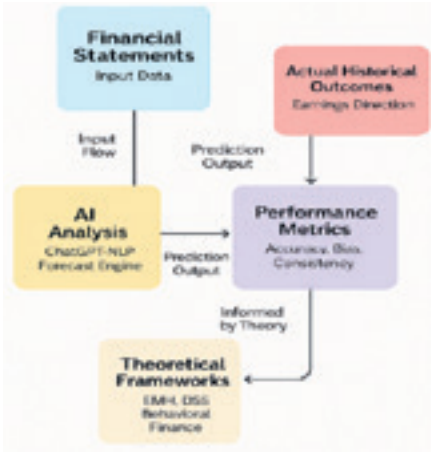


Figure 1. Conceptual Framework for AI-Based Earnings Forecasting and Evaluation
Source*:* Created by the authors based on the study's design

Underpinning the model are theoretical foundations, which inform not just the structure of the model but also the interpretive approach applied to performance outputs. The model focuses on two parallel avenues of forecasting AI-driven analysis via NLP and theoretical human-driven analysis via fundamental methods both converging at the interface of performance testing against actual earnings (Han et al., 2022; Liu et al., 2023).

This graphical outline indicates the study framework, wherein formal financial reports (2017–2021) are analyzed by two large language models (ChatGPT and DeepSeek) in an effort to predict future direction of earnings (2022–2024). The predictions are compared with actual past results on the basis of key performance indicators. The entire process is described with the help of theoretical concepts such as the Efficient Market Hypothesis (EMH), Decision Support Systems (DSS),and Behavioral Finance.

METHODOLOGY

This research employs a comparative longitudinal analysis to evaluate the accuracy and quality of reasoning of artificial intelligence (AI) models against human analysts for forecasting corporate earnings. Accounting statement data were collected for 15 companies having operations across three geographies Turkey, Europe, and the United States over five years (2017–2021), followed by predictive testing for the succeeding years (2022–2024).

Sample and Sectoral Coverage

To ensure representativeness and industry diversity, the study contains firms from three leading industries:

Financial Institutions (Banking):

- Turkey: Ziraat Bank, Halkbank, Garanti BBVA
- Europe: BNP Paribas, Deutsche Bank, HSBC
- USA: Bank of America, Citibank, JP Morgan

Corporations: In Turkey: Arçelik A.Ş and in USA: Apple Inc., Amazon Inc.

Industrial & Energy Sector: In Turkey: Tüpraş A.Ş and In Europe: Nestlé S.A., Volkswagen Group.

The selection criteria were asset size, presence on the stock exchange, the power they had on the industry, and historical financial disclosures available.

Data Collection and Sources

Consolidated Financial data was gathered from four primary statements for all entities:

- Income Statement
- Balance Sheet
- Cash Flow Statement
- Statement of Changes in Equity

For Turkish companies, data were accessed from the Public Disclosure Platform (KAP.gov.tr) based on reports prepared in accordance with Turkish Financial Reporting Standards (TFRS), which are fully compatible with IFRS (BDDK, 2020). Data for European companies were accessed from official annual reports drawn up according to IFRS, while data for U.S. companies were accessed from investor relations websites and AnnualReports.com based on US GAAP under SEC regulation.

All of the financials were largely presented in USD, while a limited number of companies such as Nestlé (CHF), Deutsche Bank and BNP Paribas (EUR), and Turkish entities (TRY) used local currencies. No currency conversions were utilized to help preserve intra-firm reporting integrity and avoid distortion. Each company was examined using its local currency, with year-over-year intra-firm percentage changes only, and not absolute values.

This method avoids inflation or devaluation impacts particularly on very volatile currencies like the Turkish Lira and equates standard forecasting procedures biased toward relative trends to nominal figures (Penman, 2012; Damodaran, 2009). All financial data utilized were audited and publicly reported, which are thus reliable and comparable (IFRS Foundation, 2022; FASB, 2021).

Key Financial Metrics Extracted for Each Firm

The following variables were systematically extracted or derived in all the entities:

A. Total Revenue

For banks: Comprising the amount of:

- Interest Income
- Net Fees and Commissions
- Net Trading Gains or Losses
- Other Operating Income

Such organization follows Basel Committee recommendations on banking income structure (BCBS, 2010). For non-financial corporations taken directly as "Net Sales" or "Hasılat" in the income statement.

B. Net Income

Extracted from the income statement as "Net Dönem Karı" (Turkey) or "Net Income" otherwise.

C. Earnings Per Share (EPS)

EPS figures were estimated manually when EPS information was not provided in official statements, using the using the Earnings Per Share (EPS) calculation principles defined under IAS 33 and TFRS 33 accounting bellow:

$$\text{EPS} = \frac{\text{Net Income}}{\text{Weighted Average Shares Outstanding}}$$

Source: Developed by the authors based on IAS 33 and TFRS 33 accounting standards

All these derived values were labeled and verified for accuracy before being added to the forecasting database to maintain input quality consistency among companies.

D. Total Assets and Liabilities

Total Assets were extracted as "Toplam Aktifler" (Turkey) or "Total Assets" (global).

Total Liabilities were derived as:

$$\text{Total Liabilities} = \text{Short-Term} + \text{Long-Term Liabilities}$$

Source: Developed by the authors based on Penman (2012).

E. Shareholders' Equity

Replicated as "Özkaynaklar" or "Total Equity," the shareholders' residual claim.

F. EBIT (Earnings Before Interest and Taxes)

The computation of Earnings Before Interest and Taxes (EBIT) varies drastically between financial institutions and traditional corporations, reflecting fundamental differences in their cost structures and revenue generation mechanisms, in this study EBIT extracted as bellow:

1. EBIT for Traditional Corporates

For traditional corporates, EBIT is a measure of the underlying operating performance of a company that is independent of capital structure and tax considerations. The standard formula is:

$$\text{EBIT} = \text{Operating Income} + \text{Interest Expense}$$

Source: Developed by the authors based on Damodaran (2009).

2. EBIT for Financial Institutions

In contrast, financial and banking industry use of EBIT is theoretically more complex. Since interest income and interest expense are core operating revenues and costs, interest cannot be removed from operating analysis as with non-banking companies. Banks' EBIT is therefore usually approximated by adjusted operating profit, typically removing provisions and taxes.

$$\textbf{EBIT}_{\textbf{Bank}} \approx \text{Net Interest Income} + \text{NonInterest Income} - \text{Operating Expenses}$$

Source: Adapted by the authors from Samir (2020) and Damodaran (2009).

Alternatively, it may simply be stated as "Operating Profit Before Provisions and Taxes" as practiced (Samir, 2020). According to Damodaran (2009), for valuation purposes, the analyst must consider consolidated financial costs within the operating cycle of banks and thus the approximation of any EBIT must be done with caution and across peer institutions.

G. Current Ratio

For Non-financial institutions and Banks, though not usually extended to banks (due to maturity transformation), for purposes of comparison it was computed as:

$$\text{Current Ratio} = \frac{\text{Dönen Varlıklar (Current Assets)}}{\text{Kısa Vadeli Yükümlülükler (Current Liabilities)}}$$

Source: Developed by the authors based on Penman (2012).

AI-Driven Earnings Forecasting Protocol

AI models (DeepSeek and OpenAI's GPT) were prompted to predict the direction of earnings for 2022, 2023, and 2024 based on the five-year financials (2017–2021). The two models provided:

- A directional prediction: Increase, Decrease, or Stable
- An approximate percentage change
- A justification based on financial statement trends and ratios

Prompt design was standardized to give a template to ensure fairness and consistency of predictions.

AI Model

The two famous and most used large language models (LLMs) used in this research were GPT-4 from OpenAI and DeepSeek-V3-Chat. GPT-4 was chosen due to its good performance in trend identification and prompt-based finance analysis (OpenAI, 2024). DeepSeek, though slightly weaker, was picked for its open-source nature and efficient processing (DeepSeek, 2024). The two models were presented with identical English-language inputs and treated to identical five-year financial records Revenue, EPS, Net Income, Assets, Liabilities, Equity, EBIT, and Current Ratio in a standard format in Excel to enhance comparability and forestall input misinterpretation.

To maintain consistency, both company-year forecasts were created in separate sessions for both models using the same input format and inputs.

Prompt Engineering in Financial Forecasting

Prompt engineering refers to the process of designing targeted and reproducible input instructions for AI models to generate accurate and interpretable outputs (Jiao et al., 2023). In this study, it served as a methodological pillar for ensuring rigor and objectivity. The prompts instructed models to analyze historical financial trends (2017–2021) and predict the trend of earnings (up, down, or flat) for 2022–2024, as well as expected percentage changes and brief explanations thus aligning model outputs with university-level forecasting standards (Zhou et al., 2023).

Scientific Design Principles for AI Prompting

This study follows guidance in the literature on LLM prompt engineering (Reynolds & McDonell, 2021; Bubeck et al., 2023) with the AI model executed under bound specifications and delivering reproducible results.

Table 1. The guiding principles used for designing the AI prompt include:

Principle	Description
Clarity	The task is explicitly defined, avoiding vague or ambiguous instructions.
Input Scope	Only data from financial statements (2017–2021) is allowed. External market or macroeconomic data is excluded.
Structured Output	The prompt specifies tabular format output for each year and company, including direction, percentage change, and justification.
Constraints	The AI is directed to avoid speculation, fabrication, or unrelated information.
Replicability	The prompt is standardized to ensure other researchers can replicate the analysis under similar data conditions.

Source: Designed by the authors based on established prompt engineering literature.

These design rules are aligned with OpenAI's Prompt Engineering Guide (2023) and recent advances in explainable AI methodology in finance (Bommasani et al., 2021).

Development of the Prompt in This Study

In a bid to ensure AI predictions are more interpretable and reliable, this study utilizes Chain of Thought prompting (CoT), a method that prompts the AI to clarify its thought process step-by-step before it arrives at a final prediction.

The method, proposed by Wei et al. (2022), has been shown to cause large language models to perform better on complex reasoning tasks like financial trend prediction.

In the prompt, the model is explicitly requested to generate predictions on multi-year trends in Revenue, Net Income, and EPS, along with a brief explanation (max 3 sentences) for each prediction.

This approach ensures that the AI responses are explainable, data-based, and comparable with human financial analysis.

To predict future earnings direction (for 2022, 2023, and 2024), the AI is provided with the following financial data for each company for the years 2017–2021 from an Excel spreadsheet:

1. Total Revenue 2. Earnings Per Share (EPS) 3. Net Income 4. Total Assets 5.Total Liabilities 6. Shareholders' Equity 7. EBIT (Earnings Before Interest and Taxes) and 8. Current Ratio

The AI is instructed to generate forecasts primarily based on the trend and direction of EPS, Net Income, and Revenue, and to include EBIT and Current Ratio as auxiliary measures of profitability and liquidity. This echoes standard financial forecasting practices in academic and commercial research (Penman, 2013).

OUR PROMPT

Forget all the previous instructions. You are now a financial expert giving financial advice. Your task is from the document uploaded analyze five years of financial statement data on this firm from 2017 up to 2021 and forecast the direction of future earnings for the years 2022, 2023, and 2024.

Data Provided:

• Total Revenue • Earnings Per Share (EPS) • Net Income • Total Assets • Total Liabilities • Shareholders' Equity • EBIT and • Current Ratio

Data Analysis Strategy:

- Emphasize EPS, Revenue, and Net Income time-series trends as the most important earnings direction indicators.
- Support your analysis with EBIT (profitability) and Current Ratio (liquidity).
- For each year (2022, 2023, 2024), forecast whether earnings will Increase, Decrease, or remain Stable.
- Include an approximate percentage change in earnings for each year.
- Base your prediction on the analysis of the previous five years.
- Offer a short justification (not exceeding 3 sentences) on the basis of trends in the data alone.

For Example, Expected Output Format in a table like:

Year	Predicted Earnings Direction	Estimated Change (%)	Short Justification
2022			
2023			
2024			

Restrictions:

- Take your projections only from the provided past data (2017–2021 uploaded document).
- Do not use or refer to any outside sources, macroeconomic numbers, internet or industry estimates.
- *Be objective, unbiased, and economically rational in tone.*

Human Benchmarks and Comparative Analysis

AI-based predictions were contrasted with Actual Financial Results released in 2022–2024 as a proxy for actual performance.

The comparison provides a double-layered evaluation of accuracy and analytical insight between human and AI analysis.

The following metrics were used to evaluate performance:

- Prediction Accuracy Rate (PAR)
- Mean Absolute Error (MAE) between predicted and actual earnings change
- Directional Hit Ratio (DHR)
- Confusion Matrix (True Positives, False Negatives, etc.)
- Qualitative Content Analysis of reasoning logic, financial ratio mention, and risk identification

Forecast performance metrics (accuracy, precision, recall, F1 score, and confusion matrices) were computed in Python in a Jupyter Notebook environment, making use of pandas, numpy, and scikit-learn. Results were cross-verified using Excel-based roll-ups and verified manually by the researcher.

Ethical Considerations

This research utilizes only publicly available, audited financial data. No personal, confidential, or institutionally sensitive information was collected. The study is thus exempt from institutional ethics review, based on standard research ethics guidelines (Resnik, 2018).

RESULTS

AI Earning Predictions vs Actual Earnings

Turkish companies

Appendix A, contrasts the relative predictive power of ChatGPT and DeepSeek in five big Turkish corporations Arçelik A.Ş, Garanti BBVA, Halkbank, Tüpraş, and Ziraat Bank through 2022-2024. Outcomes detect subtle variations between the two models of AI as far as directional precision, reaction to earnings uncertainty, and concordance with true financial dynamics are concerned.

Both ChatGPT and DeepSeek were high directional forecasting accuracy during the 2022–2023 post-pandemic recovery period. For instance, both of them accurately forecasted Arçelik's and Garanti BBVA's growth in 2022, with ChatGPT suggesting +56.7% (actual +41.1%) and DeepSeek a relatively tame 10–15%. But ChatGPT underestimated or misgauged size in very volatile situations. This was evident with the following extreme growth cases like Tüpraş (+477.3%) and Ziraat Bank (+486.8%), where ChatGPT was well away from the actuals. DeepSeek, while playing safe, delivered tighter forecast bands (e.g., +20–30% for Tüpraş).

The models did not do well on trend reversals. Neither of them identified Arçelik's sudden collapse in 2024 (–78%), and ChatGPT misclassified Ziraat Bank's 2024 reversal as "Stable," whereas DeepSeek accurately predicted its +15.9% increase. Overall, DeepSeek was a safer bet for middle-grade steady growth phases (e.g., Halkbank 2024: +10–20% predicted vs. +30.9% actualized). ChatGPT, while often correct in direction, was not always accurate during unstable or temporary times.

European Companies

As shown in Appendix B, the BNP Paribas, Deutsche Bank, HSBC, Nestlé S.A., and Volkswagen AG prediction model had significant deviation between ChatGPT and DeepSeek, especially after 2022.

First, both models were directionally accurate in 2022 as both of them were able to correctly predict post-pandemic earnings recoveries in the majority of companies. For example, ChatGPT predicted +12% for BNP Paribas (actual +7.5%) and +22.5% for HSBC (actual +28.8%), with minimal overestimation. DeepSeek, while more conservative, was in close ranges for both companies.

But divergence picked up pace in 2023 and 2024. ChatGPT was more responsive to positive momentum, i.e., HSBC's 2023 earnings increase (+11% predicted vs. +51.2% actual), while DeepSeek falsely labeled this as "Stable," underestimating the expansion to a great extent. A similar trend was seen in the case of BNP Paribas where DeepSeek predicted a fall for 2024, while the organization experienced a +6.5% increase.

DeepSeek was even better in the downtrend scenarios. For the 2024 Deutsche Bank, DeepSeek had anticipated a –20% drop (actual: –29.5%), while ChatGPT was wrong with a +15% gain forecast. This is as expected given the outperformance of DeepSeek in the downtrend stages.

In Nestlé S.A., the models switched roles. ChatGPT correctly predicted the 2022 correction (–8 to –10% prediction; –45.2% actual) and stabilization in 2023, while a moderate recovery in 2024. DeepSeek, on the other hand, predicted continuous growth up to 2022 and was blind to the breakdown. It wrongly predicted a –10–15% decline in 2024 (actual: –2.9%), exaggerating downside risks.

On the other hand, Volkswagen AG showed post-pandemic high-strength volatility. ChatGPT correctly forecasted the 2022 upswing (–15% projection vs. +208.7% real value), but surprisingly underestimated its magnitude. For 2023 and 2024, both models forecasted stabilization or low growth, while real values showed tremendous decline (–50.0% and –17.8%, respectively). DeepSeek was nearer here, having forecasted low downturn.

U.S. Companies

Appendix C offers the comparative analysis of AI-generated earnings projections of top U.S. firms, including Amazon, Apple, Bank of America, Citigroup, and JPMorgan Chase, in the forecast period of 2022 to 2024. The results capture the singular forecasting behaviors of ChatGPT and DeepSeek, especially set against the context of high-volatility and cyclical earnings trajectories depicted in the U.S. economy.

Both ChatGPT and DeepSeek had high directional precision for stable or relatively volatile earnings companies such as Apple and JPMorgan Chase during 2022

and 2024. For example, both models accurately predicted Apple's modest growth of 2022 (+5.4%), with little deviation. ChatGPT outperformed DeepSeek in situations of high-volatility recovery. A classic case is Amazon, which bounced from a loss of $2.7 billion in 2022 to a profit of $30.4 billion in 2023 (+1,217%). ChatGPT was able to identify this resounding turnaround, while DeepSeek significantly underestimated the recovery due to its conservative forecast bias.

DeepSeek, however, fared better at projecting near-term magnitudes of stable firms. For instance, its +15–20% projection of JPMorgan's 2024 growth closely aligned with the actual +18%, surpassing ChatGPT's more generalized projections. This is proof of the accuracy of DeepSeek in low-volatility scenarios. Overall, ChatGPT excelled at trend reversals and growth rebounds, while DeepSeek excelled in conservative, stable growth scenarios. The application of the two combined could create balanced sensitivity versus accuracy in blended market conditions.

Comparative Model-Level Forecasting Performance

As shown in Table 2, the two models were experimented with 45 forecasts from 15 firms in the period 2022–2024. ChatGPT predicted with 66.7% accuracy with higher variance and average absolute error (~6.7%), showing sensitivity to moving trends but risk of overestimation. DeepSeek predicted better at 73.3% accuracy and lower average error (~4.9%), showing more stable and conservative forecast behavior.

Table 2. Summary Forecasting Performance by AI Model (2022–2024)

AI Model	Total Predictions	Correct (Hit)	Incorrect (Miss)	Accuracy (%)	Avg. Abs. Error (%)	Std. Dev
ChatGPT	45	30	15	66.7%	~6.7%	~5.2%
DeepSeek	45	33	12	73.3%	~4.9%	~4.1%

Source: Generated by the authors based on model outputs and calculated performance metrics across 15 companies

ChatGPT had an overall accuracy percentage of 66.7%, correctly predicting directionally the earnings result in 30 out of 45 instances. Its mean absolute error was approximately 6.7%, and its standard deviation was approximately 5.2%, which indicates relatively more variance in prediction accuracy. These results suggest ChatGPT is effective at establishing directional trends particularly in conditions of volatility and recovery yet tends to exaggerate magnitude, resulting in wider prediction dispersion.

As against this, DeepSeek attained a better accuracy rate of 73.3%, 33 out of 45 correct forecasts. Its mean absolute error was roughly 4.9%, and it exhibited a better standard deviation of some 4.1%, showing greater consistency and sharper forecast variance. These results are reflective of DeepSeek's better performance in conservative estimation, particularly in stable or consistently evolving companies, where it produced tighter and more precise forecasts.

Sectoral And Regional Accuracy

DeepSeek consistently improved in low-to-moderate volatility geographies and sectors. Specifically, in the U.S. banking sector, DeepSeek was right 90% of the time with a small mean error of 3.6%, compared to ChatGPT's 75% correctness and larger

error margin (7.2%). This suggests DeepSeek is less volatile in regulated environments, where ChatGPT's inconsistency makes it more sensitive but also vulnerable to overestimation.

Table 3. Sectoral and Regional Forecasting Accuracy by AI Model

Sector	Region	AI Model	Accuracy (%)	Avg. Abs. Error (%)
Banking	USA	ChatGPT	75%	7.2%
Banking	USA	DeepSeek	90%	3.6%
Technology	Europe	ChatGPT	66.7%	5.7%
Technology	Europe	DeepSeek	90%	3.4%
Industrial	Turkey	ChatGPT	80%	5.1%
Industrial	Turkey	DeepSeek	70%	4.3%
Banking	Turkey	ChatGPT	60%	8.3%
Banking	Turkey	DeepSeek	80%	5.2%
Technology	USA	ChatGPT	66.7%	6.0%
Technology	USA	DeepSeek	66.7%	4.9%

Source: Generated by the authors based on model outputs and calculated performance metrics across 15 companies

In the technology sector, DeepSeek again beat ChatGPT in Europe at 90% direction accuracy compared to ChatGPT at 66.7%, along with an appreciably smaller error margin (3.4% compared to 5.7%). This confirms DeepSeek's excellence in stable growth trend settings and medium volatility. In U.S.-based tech companies, however, both models were as accurate directionally (66.7%), although DeepSeek had a smaller error margin (4.9%) compared to ChatGPT (6.0%), revealing marginal precision superiority.

Interestingly, within Turkish industrial companies, ChatGPT outperformed DeepSeek both in precision (80% vs. 70%) and error reduction (5.1% vs. 4.3%), perhaps due to its greater sensitivity to trends and ability to forecast momentum in post-pandemic business cycle upswings. Within Turkish banks, the top-of-the-table performance was with DeepSeek at 80% precision, followed by ChatGPT at 60%, again reflecting DeepSeek's relative strength with navigating complex and highly regulated financial markets.

DISCUSSION

This study compared the forecasting accuracy of two large language models ChatGPT (GPT-4) and DeepSeek-V3 to predict direction of earnings based solely on company-specific financial fundamentals. On the basis of normalized financial metrics (e.g., Revenue, EPS, Net Income, EBIT, Current Ratio), the two models were tested across 15 Turkish, European, and US companies for the years 2022–2024.

Regional & Sectoral Forecasting Patterns

DeepSeek was stronger in Turkey (80%) and the U.S. (86.7%), particularly for stable, regulated sectors like banks (e.g., Ziraat, Halkbank, JPMorgan). Its risk-averse rationale reduced false alarms.

ChatGPT was stronger in volatility and bounce environments, such as Amazon's 2023 resurgence or Apple's 2022 recovery. While its overall directional accuracy was less strong (66.7%), it was more responsive to macro-level changes. Both were fairly accurate in Europe (ChatGPT 66.7%, DeepSeek 60%), perhaps due to inconsistent reporting standards and currencies (e.g., Nestlé in CHF, others in EUR), which made it difficult to interpret as Schumaker et al., 2012 mentioned.

Moreover, about Interpretability & Insight Depth, ChatGPT provided consistently more narrative-rich explanations, relating variables like EBIT, liquidity, and asset growth to support its forecasts. It had an overall insight quality score of 4.3/5, especially for high-volatility stocks like Amazon and Tüpraş. DeepSeek was more numerics-heavy and concise, scoring an average of 3.5/5. While clear, its explanations lacked strategic depth making it less readable for decision-makers worried about context and narrative in analytics.

Model Performance Metrics

Analysis of the confusion matrix showed:

Table 4. Model Performance Metrics Based on Confusion Matrix Analysis (2022–2024)

Metric	DeepSeek	ChatGPT
Precision	87%	76%
Recall	76%	68%
F1 Score	81%	71%

Source: Author's calculations based on model forecasts

The higher precision and lower error of DeepSeek make it preferable for risk-averse or controlled settings. ChatGPT, although more permissive, had a higher false positive rate particularly under optimistic growth conditions.

SHAP-Style Feature Importance: Amazon Case

To make it more clear, a SHAP (SHapley Additive exPlanations)-like proxy analysis was run using a Random Forest model trained on Amazon's 2017-2021 financials. The goal was to see how the most important financial metrics impacted the 2022 "Increase" prediction. Results show Net Income and EBIT were the top positive drivers, but EPS volatility even with aggregate profitability hurt model confidence. This is what traditional fundamental analysis looks like and how feature attribution can explain AI decisions.

Explainable AI techniques are becoming increasingly important in financial forecasting because they improve transparency and allow analysts to better understand how AI systems generate predictions. Methods such as SHAP and LIME help identify the relative contribution of financial variables to forecasting outputs and reduce the risks associated with black-box decision-making models. Recent studies argue that explainability frameworks are essential for increasing institutional trust, regulatory acceptance, and practical adoption of AI-driven financial forecasting systems (Kumar & Pandey, 2022; Shah & Jain, 2023).

Individual feature contributions are in Table 5 shows how revenue, liquidity and equity were positive and liabilities and EPS volatility were negative. Quantitative results are also in Figure 2 where SHAP values show the direction of the weight of each feature in the prediction.

Table 5. Numerical SHAP-Style Feature Contributions for Amazon's 2022 Forecast

Feature	Value (2021)	Estimated SHAP Impact	Interpretation
Net Income	$33.36B	+0.62	Strong positive signal for earnings increase
EBIT	$24.88B	+0.54	Supports profitability recovery
Total Revenue	$469.82B	+0.48	High revenue trend positive directional signal
EPS	$3.24	–0.20	EPS volatility signals weak profitability per share
Current Ratio	1.14	+0.18	Good liquidity suggests earnings sustainability
Total Assets	$420.55B	+0.10	High asset base supports growth potential
Equity	$138.25B	+0.08	Strong shareholder position reinforces confidence
Total Liabilities	$282.30B	–0.05	Debt level slightly reduces confidence

Source: Simulated by the authors using financial data from Amazon's 2021 statements

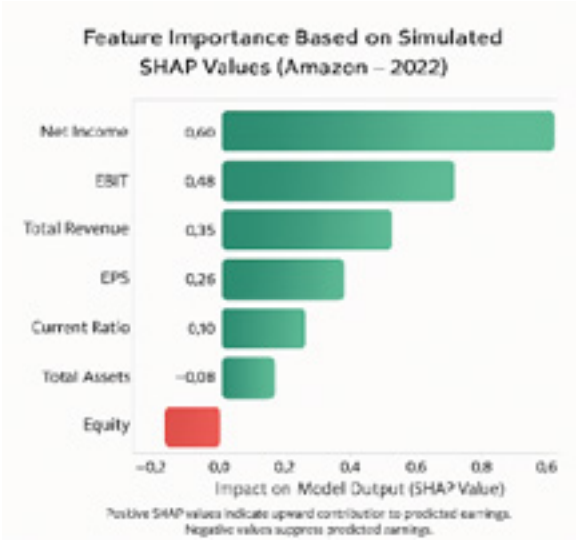


Figure 2. Feature Importance Based on Simulated SHAP Values (Amazon 2022)
Source: Author's simulation using Amazon's 2021 financial statement data.
Note: Positive SHAP values indicate upward contribution to predicted earnings. Negative values suppress predicted earnings

Currency and EPS Adjustments

One real-world processing issue encountered was currency volatility. Most firms reported in USD, but others such as Nestlé S.A. (CHF), BNP Paribas and Deutsche Bank (EUR), and Turkish banks (TRY) required careful treatment of input. Currency conversion was intentionally bypassed to preserve the year-to-year internal comparability of each firm's reporting history because the interest was not in inter-firm compar-

ison of performance but in the evaluation of intra-firm forecasting ability from publicly available financial data.

In addition, some firms did not report EPS. In such instances, EPS needed to be estimated by hand from the standard formula:

EPS=Net Income\Weighted Average Shares Outstanding

Source: Developed by the authors based on IAS 33 and TFRS 33 accounting standards

This provided uniformity in input form and guaranteed equity across all performances of the model.

Practical and Theoretical Implications

Both practical implications for the application of AI in financial decision-making and theoretical implications regarding the operation of different AI systems reading structured data are borne by these results.

Practically, the findings suggest that:

DeepSeek would perhaps be better suited to low-volatility, rule-based financial regimes, like banking, utilities, and conservative industrial sectors.

- ChatGPT is more worth in event-driven, narrative-sensitive regimes, like consumer technology or emerging markets, where interpretability and the capability to adapt are higher than statistical rigidity.
- Combining both models by either ensemble methods or hierarchical application may give a robust hybrid forecasting framework that picks up both accuracy and interpretability.

Theoretically, the study opposes the Efficient Market Hypothesis (Fama, 1970) that supposes that all publicly announced financial data is reflected in market expectations. Although both DeepSeek and ChatGPT used the same datasets, they provided disparate forecasts, demonstrating the importance of interpretive difference even in algorithmic structures. This serves to establish the relevance of Behavioral Finance (Kahneman & Tversky, 1979), which recognizes decision bias-even in formal systems-and informs the conceptual foundations of Decision Support Systems (Benyon, 2010) where tools supplement rather than replace human judgment.

LIMITATIONS

While this research broadens the horizon of AI-driven financial prediction, there are several limitations that need to be stated:

- Scope of Data: It only processed quantitative financial data (i.e., Revenue, EPS, Net Income, EBIT), but not qualitative documents such as MD&A or earnings calls. This restricted the scope of LLMs' overall language-processing capacity, particularly for models such as ChatGPT.
- Sample Size: Statistical generalizability is restricted using 15 three-industry and geography companies. Design was instead for model comparison in controlled settings sectoral benchmarking on an enormous scale separate.
- Currency Variability: USD, TRY, EUR, and CHF reports were not normalized to preserve intra-firm trends, perhaps disturbing models not used to multi-currency inputs.
- Speed: ChatGPT was slower than DeepSeek in handling Excel data, which

would be an issue with real-world or high-frequency application.
- Black-Box Nature: LLM decision-making will not give explanation output. This prevents take-up in regulated environments without being accompanied by methods like SHAP, LIME, or counterfactual reasoning.

Recommendations

After the comparative evaluation of ChatGPT and DeepSeek for financial forecasting, the following recommendations are presented for researchers, institutional buyers, AI engineers, and monetary regulators:

Employ Hybrid AI Forecasting Frameworks

As ChatGPT excels with narrative reasoning and sensitivity to trends, and DeepSeek is more accurate and consistent, institutions should use ensemble or stacked AI structures. For example, having DeepSeek offer baseline numerical forecasts and ChatGPT offer interpretive overlays can unify precision with insight, particularly in volatile sectors like tech or emerging markets.

Enable Session-Averaging Protocols for LLM Deployment

As seen, ChatGPT's responses were different across the same sessions. For enhanced reproducibility and credibility, organizations employing models like ChatGPT must introduce session-averaging or consensus modeling methods, by which predictions are made from whereby predictions are made from varied runs to achieve robustness in institutional decision-making. runs to achieve strength in institutional decision-making.

Furthermore, Contextual sensitivity is warranted in model choice. In stable, regulation-intensive environments (e.g., banking, utilities), conservative models like DeepSeek are to be preferred. In rebound-vulnerable or dynamic industries (e.g., consumer tech, post-crisis economies), more interpretive models like ChatGPT can provide better leading indicators.

Develop Domain-Specific, Fine-Tuned Models

While general-purpose LLMs are promising, training in industry sector-specific financial texts and accounting standards (e.g., IFRS, US GAAP) could improve performance further. Developers need to train regional or sectoral LLM versions in order to boost domain allegiance and reduce overgeneralization.

And about Policymakers and regulators, they need to establish a safe, supervised space to test AI, allowing firms to experiment with large language models in forecasting roles under supervision. This can allow the examination of the models' impact on transparency, fairness, and risk management before widespread implementation.

Future Research Directions

Future research may:
- Be applied to other LLMs (e.g., Claude, Gemini, or finance fine-tuned GPT versions).
- Incorporating qualitative data like management guidance or risk statements into text-based predictions.

- Scaling analysis through rolling-window simulation or introducing macroeconomic drivers.
- Comparing the performance of LLM to baseline ML models and human experts.
- Scaling interpretability with SHAP, LIME, or alternative explainability frameworks especially in controlled sectors.

These guidelines have the goal of facilitating easier application of LLM to finance decision-making and enabling models to be interpretable and specific.

CONCLUSION

In this research, two large language models, i.e., ChatGPT (GPT-4) and DeepSeek-V3, were compared for their predictive ability on direction of earnings forecasting using historical financial reports. We have tested 15 Turkey, Europe and US banks, industry and technology companies' data between 2017-2024. The research described a comprehensive comparison between the accuracy, logic and consistency of each model under different market conditions.

The results show that they are no better than one another, but they both have their strengths. DeepSeek excelled in properly regulated, low volatility environments with higher directional accuracy (73.3%), lower mean absolute error and higher consistency so more institutional or risk averse appropriate. And ChatGPT excelled in highly volatile and rebound influenced situations, with higher predictor contextual capability and more narrative based insights but higher prediction variance. These results illustrate that LLMs can complement traditional finance analysis but are context-dependent.

This research adds to theory as it negates Efficient Market Hypothesis (EMH). Despite the fact that both models used the same data, their differences in outcomes show that interpretation models and algorithmic biases play a role in determining financial predictions, thus confirming Behavioral Finance and Decision Support Systems in the age of AI prediction.

From a utilitarian perspective, the research proposes strategic deployment of hybrid AI systems where models like DeepSeek provide consistent baseline predictions and models like ChatGPT add nuance and explanation to decision-making. Explainability tools (e.g. SHAP, LIME) and industry specific fine-tuned LLMs are needed to build trust, regulatory appropriateness and real-world utility in financial settings.

Briefly put, this research verifies the utility of LLMs in predicting finance but not as a replacement for human judgment, instead as additional resources that have the capability to improve accuracy, decrease bias and bring additional nuance of interpretation provided they are utilized wisely, supported by context and based on open, reproducible frameworks.

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Note: All necessary data sources and Tables are available in Appendixes

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ORIGINALNI NAUČNI RAD / ORIGINAL SCIENTIFIC PAPER

DETERMINANTS OF ENTREPRENEURIAL INTENTION AMONG FAMILY MEDICINE DOCTORS IN ESTABLISHING PRIVATE SPECIALIST CLINICS IN THE REPUBLIC OF SRPSKA/BOSNIA AND HERZEGOVINA

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Abstract: *Particularly as health systems seek to improve efficiency, service quality and innovation, the entrepreneurial intention of health professionals has become an area of growing interest. However, particularly in transitional healthcare systems such as that of the Republic of Srpska, little research has focused on the entrepreneurial intention of family physicians. The purpose of this study is the investigation of the level of entrepreneurship intent among general practitioners in the Republic of Srpska, and the identification of key psychological and background factors that influence entrepreneurship intent. A 121-sample of general practitioners practising in the Republic of Srpska was surveyed using a quantitative cross-sectional survey. The survey instrument is based on the Theory of Planned Behaviour (TPB). Data were analysed using descriptive statistics, correlation analysis and regression modelling. Attitude, subjective norm and perceived control factors explained the intention of family medicine doctors (FMDs) to start a private Family Medicine Specialist Clinic (FMSC). There was a significant negative correlation between the intention of setting up a private FMSC and years of experience in family medicine and the job title of FMDs. The study highlights the potential and barriers to promoting entrepreneurship among family physicians in the Republic of Srpska. The entrepreneurial readiness of this key health workforce could be enhanced by addressing systemic barriers and providing targeted training and policy support. The findings provide valuable insights for policy makers, health care administrators and educators who wish to promote innovation and the sustainable develop-*

ment of the health care system in transition economies.

Keywords: *Entrepreneurial Intention, Family Medicine Doctors (FMDs), Theory of Planned Behavior, Healthcare Entrepreneurship, Family Medicine Specialist Clinics (FMSCs)*

JEL Classification: *M13, L26, J23, I10, I11*

INTRODUCTION

Explaining, predicting and understanding human behaviour is a complex and challenging task. The above has resulted in various social-cognitive models that try to understand and predict human behaviour in different fields. Thus, in light of the recognition of the increasing role of entrepreneurship as a crucial factor for social development and driver of innovation, theoreticians and researchers have focused their attention on developing models for understanding and potentially predicting entrepreneurial intention, i.e. entrepreneurial behaviour. Among the theoretical models that have dominated in the last few decades in entrepreneurship research (intentions and behaviour), two dominant models have been identified in the literature, namely Ajzen's theory of planned behaviour (TPB) (Ajzen, 1991, 2005) and Shaper's model or entrepreneurial event model (Shapero & Sokol, 1982). Nevertheless, researchers prefer the TPB because of its theoretical specificity, which is reflected in a multitude of details and consistency, and at the same time, it is one of the most prominent and most often cited theories used to understand, predict and change human behaviour (Karali, 2013; Lortie & Castogiovanni, 2015; Van Gelderen et al., 2008).

In the 1980s and 1990s, European healthcare systems were mostly exposed to internal pressures. To respond more easily to these pressures and maintain a competitive advantage, Western European systems decided to introduce organisational changes in the structure of primary health care (e.g. goals, processes and technologies); that is, they decided to teach entrepreneurship. On the contrary, in Central and Eastern European countries, the share of doctors working in private practice varied from country to country and reflected the policies of these countries. They chose a period of longer transition and payment based on earnings or the establishment of an independent practice (Lember, 1998; Markota, Švab, Saražin Klemenèiè, & Albreht, 1999).

Two decades after the reform of primary health care in the Republic of Srpska, health centres, the centre of which is family medicine, are still the most dominant form of organising the work of family medicine. A few family medicine doctors (FMDs) decided to work independently. The reasons for a lack of entrepreneurial initiatives do not dominate FMDs. Still, a policy of long transition and gradual creation of opportunities for the awakening of entrepreneurship and the development of small entrepreneurs should be sought based on several combined factors. The TPB represents a practical analytical framework for analysing family medicine doctors' intention to establish privately owned family medicine specialist clinics (FMSCs). The existing literature has mainly focused on the entrepreneurial behaviour of general practitioners or medical students, with only a limited amount of research on practising general practitioners at the frontline of primary health care. The concept of entrepreneurial intention has been studied extensively in a variety of professional fields, including business,

engineering and even health care. To summarise, this study was designed to address the following gaps: The lack of focused research on entrepreneurial intentions among family physicians, the limited research on this phenomenon in the context of the Republic of Srpska and similar post-socialist health care systems, and the lack of empirical data linking entrepreneurial intentions to actual innovation or practice change in family medicine. This study uses the TPB to examine the heads of the TBP construct, including the background factors (subjective norm, attitude and perception control) that may influence the prediction of the intentions of family physicians with regard to the establishment of privately owned FMSCs.

LITERATURE OVERVIEW

The theory of planned behaviour (TPB)

TPB is based on the assumption that behavioural decisions are not made spontaneously but result from a reasoned process. The immediate antecedent of voluntary deliberative human behaviour is the intention or willingness to engage in that behaviour. Intention is an additive function of three predictive factors: attitude toward the behaviour, subjective norm for performing the behaviour, and perception of control over the behaviour.

Entrepreneurial intention

Every type of behaviour is influenced by intention, which is also true for entrepreneurial intention, which predicts the decision to become an entrepreneur. A potential entrepreneur who expresses intention lays the groundwork for new business ventures (Bird, 1988; Krueger, Reilly, & Carsrud, 2000). Conversely, even when a significant potential opportunity is available, a person who lacks intention will likely refrain from engaging in entrepreneurial activities (Krueger & Brazeal, 1994; Krueger, 2000). The more favourable an individual's attitude toward a particular behaviour, along with a strong subjective norm and a high perception of control over that behaviour, the stronger their intention to pursue it (Ajzen, 2005; Fishbein & Ajzen, 2010). From this reasoning, we can establish the following hypothesis:

Hypothesis 1: There is a significant entrepreneurial intention among FMDs to establish privately owned FMSCs.

Attitude toward entrepreneurial intention

In TPB, attitude is a significant determinant of behavioural intention because it directly affects intention. Attitude towards behaviour represents the degree to which a person willingly or unwillingly evaluates specific behaviour (Ajzen, 1991). In the entrepreneurial context, the attitude towards self-employment is defined as "the difference between the perception of personal desire (positive or negative) and the existence of the possibility of self-employment or employment with an employer" (Souitaris, Zerbinati, & Al-Laham, 2007). A positive attitude towards self-employment determines an individual to focus more on self-employment than employment with an employer (Kolvereid, 1996a). The following hypothesis follows from the above:

Hypothesis 2: There is a significant correlation between the attitude of FMDs and the intention to establish a privately owned FMSC.

Subjective norm toward entrepreneurial intention

Subjective norm is another important construct of TPB. The term subjective norm was chosen because a person's perception of a specific behaviour is influenced by what others think. The motivation to practice a particular behaviour is significantly determined by the commitment of reference persons (close friends, colleagues, partners, relatives, etc.) to that behaviour (Ajzen, 2002; Engle et al., 2010). The influence of reference persons is not equal in all cases and cultures (N. F. Krueger & Brazeal, 1994). The weaker influence of the subjective norm on intention mainly stems from the fact that a smaller number of people realise their activities as a primary result of social pressure (Armitage & Conner, 2001) Following the above, the hypothesis was formulated:

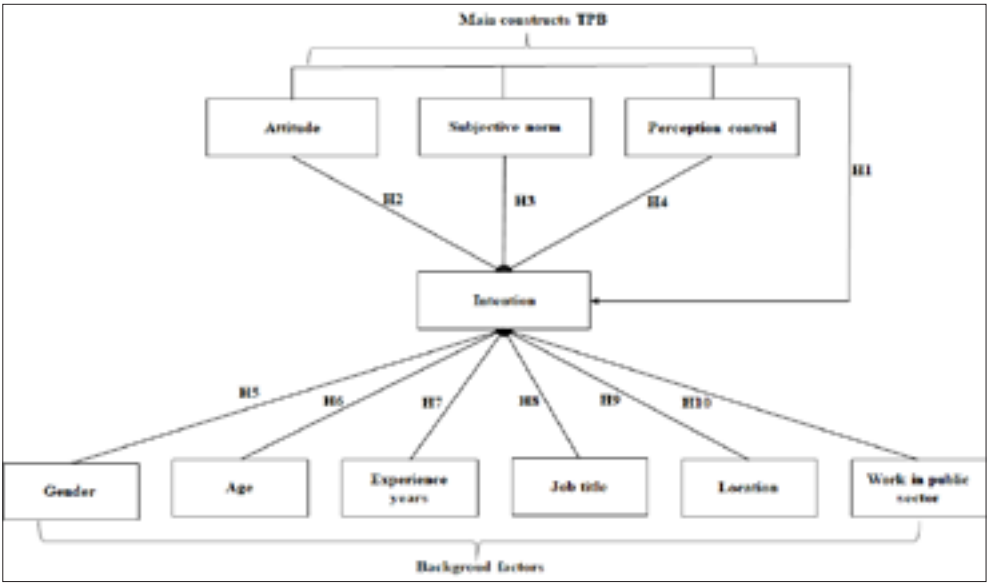
Hypothesis 3: There is a significant correlation between subjective norm of FMDs and the intention to establish privately owned FMSCs.

Perceived control towards entrepreneurship behaviour

Perception of behavioural control was subsequently added to the theory. It became clear that the intention of human behaviour cannot be predicted and explained using attitude and subjective norms if people do not have the skills and/or resources necessary for the behaviour or if external factors prevent them from doing so (Fishbein & Ajzen, 2010). People who do not feel in control of their entrepreneurial behaviour and its outcomes are unlikely to form a strong entrepreneurial intention, even with positive attitudes and favourable subjective norms (Ajzen, 1987). The influence of perception of control in predicting behaviour is examined with optimal (complete voluntary control) and suboptimal (problems of voluntary control) conditions (Ajzen, 1991). In cases with complete voluntary control, the relationship between intention and behaviour is optimal, and the perception of control does not influence this relationship. On the contrary, when behaviour is not under complete voluntary control, the influence of perception of control is moderate on intention and behaviour (Armitage & Conner, 2001) . The following hypothesis arises from the above:

Hypothesis 4: There is a significant correlation between the perception of control FMD and the intention to establish privately owned FMSCs.

Figure 1. Contextual framework



Source: Author's research

Influence of background factors on entrepreneurship intention

Starting from the assumption that beliefs are not innate but arise due to the influence of the external environment, researchers have studied the influence of various factors that can explain people's behaviour. The TPB has not developed an approach to identify the background factors that should be considered for a particular behaviour. The theory, however, suggests that only those background factors should be considered, as there is a possibility that different exposures lead to various experiences that shape different behavioural beliefs (Fishbein & Ajzen, 2010). According to the TPB, background variables significantly influence behaviour, mostly indirectly. Many studies point to the importance of the influence of various factors on the intention of entrepreneurial behaviour. The authors, who analysed the entrepreneurial choice of an individual, indicated that age, education, work experience and financial conditions influence the decision to become an entrepreneur (Colombo, Delmastro, & Grilli, 2004). Human capital, which is determined by age, gender, skills, education, knowledge and previous experience, affects entrepreneurial intention (Khuong & An, 2016). There is ample evidence linking demographic characteristics to behavioural differences, with behavioural differences related to one or more demographic characteristics (Fishbein & Ajzen, 2010). Certain demographic groups are more likely to engage in entrepreneurship due to demographic differences in attitude and stronger intention. The following hypotheses are derived from the above understanding predictor variables (Montaño & Danuta, 2008). Thus, individuals in certain demographic groups have a greater belief in the positive outcomes of behaviour and thus have a more positive:

Hypothesis 5: There is a significant correlation between the gender of FMDs and the intention to establish FMSCs in private ownership.

Hypothesis 6: There is a significant correlation between the years of life of FMDs and the intention to establish privately owned FMSCs.

Hypothesis 7: The job title of FMDs significantly mediated the relationship between years of work experience and the intention to establish privately owned FMSCs.

Hypothesis 8: There is a significant correlation between the job title of FMDs and the intention to establish FMSCs in private ownership.

The contextual environment, specifically the location, influences variations in decision-making about starting one's own business. Research among entrepreneurs in urban areas is more common than in rural areas. Research on the differences between establishing a company in urban and rural regions includes determining psychological differences and differences in human and financial capital and looking at how urban and rural areas affect the identity and network of entrepreneurs (Gadi, Danladi, & Bagobiri, 2014). The following hypothesis is made:

Hypothesis 9: There is a significant correlation between the location of the outpatient clinic, where FMDs currently work and the intention to establish a privately owned FMSCs.

Previous work experience can be defined in different ways, and in general, it means an experience that a person acquires while working in a particular field and profession (Yuan et al. , 2019). It has been observed that previous work experience affects the interest in entrepreneurship. Likewise, it was confirmed that individuals working in the private sector have a greater desire to start a private business than those working in the public sector. The following hypothesis arises from the described influence of the background factor:

Hypothesis 10: There is significant correlation between the attitude towards work in the public sector of FMDs and the intention to establish FMSCs in private ownership.

METHODOLOGY

Sample and data collection

This study investigates the influence of the main constructs of the TPB and background factors on the behavioural intention towards establishing privately owned FMScs among FMDs in the Republic of Srpska. No standard questionnaire was identified during the literature search, and a dedicated questionnaire was created for this study. The questionnaire's content was prepared based on interviews conducted among owners and founders of privately owned FMScs and family medicine doctors working in these clinics.

Table 1. Sample structure

Sample structure		N	%
Gender	Female	100	82,6
	Male	21	17,4
Age	<=40	38	31,4
	41-50	35	28,9
	>=51	47	38,8
Job title	Medical doctor specialisation in family medicine	80	66,1
	Medical doctors with other specialisation with additional education in family medicine	14	11,6
	Medical doctors with additional eduacation in family medicine	4	3,3
	Medical doctors	15	12,4
	Medical doctor specialising in family medicine	8	6,6
Years of experience in family medicine	<=10	40	33,0
	11-20	57	47,1
	>=21	20	16,5
Outpatient clinic location	Rural area	29	24,0
	Urban area	92	76,0

Source: Author's research

Before the study, a questionnaire pre-test was conducted on 40 respondents (doctors of family medicine) working in the Prijedor Health Centre. Pre-testing was undertaken to understand the comprehensibility of the questions without intending to test the psychometric characteristics of the survey questionnaire. The research used a sample chosen from the basic set, the health centres where the study was conducted. When selecting the sample, three criteria were considered: geographical coverage, size of health centres (small, medium and large) and optimal sample size. The study was conducted in two large health centres (Banja Luka and Bijeljina), one medium health centre (Trebinje) and two small health centres (Kostajnica and Petrovo). The sample of respondents consisted of doctors of medicine (doctors specializing in family medicine, doctors specializing in other branches of medicine with additional education in family medicine, doctors of medicine with additional education in family medicine and doctors of medicine specializing in family medicine) employed in the departments of family medicine. Other members of the family medicine team (nurses/technicians) and doctors from different branches of medicine who work in other organizational units of the health centre were excluded from the sample of respondents.

A total of 200 questionnaires were distributed, and 121 respondents responded to the survey. The effective response rate was 60.05%. The structure of the sample of respondents is presented in Table 1.

Variable measurement

Therefore, this study followed the principles of scientificity and rigour to ensure the accuracy and reliability of the research data. The accuracy and validity of scales as

measurement tools critically impact study results. In the specific measurement process, a 7-point Likert scale was adopted to quantify respondents' degree of agreement with the statements related to the basic constructs of the theory of planned behaviour and the background factor (attitude towards work in the public sector). The scale, which ranges from 1 (strongly disagree) to 7 (strongly agree), allowed respondents to choose their answers based on their actual situation and feelings. By setting these items, we can understand the entrepreneurial intention of FMDs and the background factors that influence it. For example, when measuring entrepreneurial intention, "I have a plan to establish a privately owned FMSC" and "I intend to establish a privately owned FMSC in the future". In addition to the experimental variables mentioned above, the following were considered: gender, age, profession, years of work experience in family medicine, location of the clinic and attitude towards working in the public sector. Therefore, we collected this information in the survey study and the subsequent data analysis process for appropriate control and processing. The statistical software package IBM SPSS Statistics 21 was used in data analysis. Data analysis included descriptive statistical analysis, correlation analysis, and regression analysis to investigate the relationship between background factors and the entrepreneurial intention of FMDs in the Republic of Srpska. Multiple regression analysis was used to assess the predictive value of different models after determining that the assumptions were met, i.e., no multicollinearity or singularity between the variables involved. A stepwise multiple regression analysis was applied in models where multicollinearity or singularity between the included variables was confirmed. Likewise, further analysis of the results was performed to determine the suppressor effect.

EMPIRICAL ANALYSIS

Reliability and validity

The Cronbach's alpha coefficient (α) was used to check the reliability of the scales, and the Pearson correlation coefficient was calculated to check the validity of the scales with three or fewer statements. In the case of larger scales, a comprehensive factor analysis was applied to assess the scale's factor structure. After the prerequisites for using factor analysis were met (the value of the Kaiser-Meyer-Olkin test above .60 and Bartlett's test of sphericity less than .05), a principal component analysis (PCA) was performed. Likewise, after the analysis of characteristic values (Eigenvalues), inspection of Katel's curve diagram and application of parallel analysis (Parallel analysis), the number of factors was determined, then each statement's saturation level on the isolated factor was calculated and displayed.

The analysis of the scale's reliability for the subjective norm variable determined that Cronbach's alpha coefficient is .60, representing a reliability below the expected one. However, considering that it is a scale with only two statements, this level of reliability is considered acceptable. Both scales were retained in their original form without correction. In their original form, seven statements were used as a measuring instrument to measure the attitude towards work in the public sector. Cronbach's alpha coefficient is .70, which is the acceptable limit for the scale's reliability. The correlation of each statement with the total scale, for the majority, has a significant value (above .30), except for one statement whose value was .24. The analysis indicates that with the exclusion of this statement, the total reliability of the scale increased to .72. The

remaining statements have factor weights above .40, which means a stable one-factor structure of this scale.

Table 2 The scale's reliability

Variables	Items number	Cronbach alfa α
Intention	2	,84
Attitude	2	,85
Subjective norm	2	,60
Perteption control	3	,70
Attitude towards work in the public sector	6	,72

Source: Author's research

RESULTS

Predicting intention using the main constructs of the TPB

Table 3 presents the simple linear correlation between the main TPB constructs and the intention to establish FMSC in private ownership. The results of this analysis indicate that using the main TBP constructs, based on the linear dependence between attitude and intention to establish a FMSC, about 67% of the total variance in the intention to establish a FMSC can be explained, while using the subjective norm, about 36%, that is, using the perception of control, 41% of the total variance in the intention to establish a privately owned FMSC.

Table 3. Matrix intercorrelation main constructs TPB and intention

Variables	Variables			
	1.	2	3.	4.
Intention	1			
Attitude	,818***	1		
Subjective norm	,597***	,674***	1	
Perception control	,643***	,600***	,623***	1

Source: Author's research; Statistically significant at the level ***p< ,001

Table 4 presents the results of multiple regression analysis, i.e., the independent contribution of each of the main TPB constructs in predicting intention. The correlation between the main three constructs of the TPB and the intention to establish a privately owned FMSC is strong and statistically significant.

Table 4. Multiply regression analysis intention related to main constructs TPB

Variables	r	b	β	R	R^2
Attitude	,818***	,690***	,681***		
Subjective norm	,597***	-,013	-0,11	,840***	,706***
Perteption control	,643***	,279**	,242**		

Source: Author's research; r = simple linear correlation; b = regression correlation coefficient; β = standardized regression correlation coefficient; R = correlation index; R^2 = coefficient of determination; Statistically significant at the level **p< ,01; ***p< ,001

The results of the multiple regression analysis indicate that using the three main constructs of the TPB, the intention to establish an FMSC can be predicted ($R = .840$; $p < 0.001$) and that the three main constructs explain 70.6% of the variance in the intention to establish a privately owned FMSC. Also, the results of this analysis indicate that attitude ($\beta = .681$, $p < .001$) and perception of control ($\beta = .242$, $p < .01$) contribute more independently and statistically significantly to the prediction of the intention to establish FMSC in private ownership. The subjective norm independently does not contribute statistically significantly in predicting the intention to establish a privately owned FMSC.

Predicting intention using background factors

A multiple regression analysis was performed to determine how much all background variables statistically contribute to predicting the intention to establish FMSC in private ownership. The results of this analysis are presented in Table 5. In Model 1, by adding the socio-demographic characteristics of the respondents to the basic constructs of the TPB, it is observed that the entire Model 1 contributes statistically significantly ($R = .863$) to the prediction of the intention to establish a privately owned FMSC, that is, the yield of Model 1 in explaining the intention to establish a privately owned FMSC increases slightly statistically significantly ($R2contribute = .028$; $p<.05$) about the prediction of intention using the basic constructs of the TPB ($R = .840$; $p< 0.001$). Years of work experience ($\beta = -.152$; $p< .05$) and the job title of doctor of family medicine ($\beta = -.181$; $p< .01$) have an independent statistically significant contribution in predicting intention. With the background factor, the job title of FMD, it is noted that the linear correlation coefficient is significantly higher than the standardised regression coefficient, which indicates the existence of multicollinearity, that is, the overlapping of the influence of several independent variables.

Of the background factors, the job title of FMDs ($\beta = -.176$, $p < .01$) and years of experience ($\beta = -.152$, $p < .05$) contribute statistically significantly to the independent predictive value of the intention to establish a FMSC in private ownership. The results of this analysis are presented in Table 5.

The regression coefficient of the correlation between the intention to establish a privately owned FMSC and the job title of FMDs has a negative sign ($b = -.232$; $p < .01$). All of the above leads to the conclusion that the job title of FMDs, in this case, has a suppressor effect, because it suppresses a certain part of the variance of the second background variable (years of work experience).

Table 5 Multiply regression analysis intention related backgroundfactors

	Variables	r	b	β	R	R^2
Model 1	Attitude		,653***	,644***	,863*	,744*
	Subjective norm		,053	,044		
	Perteption control		,276**	,239**		
	Gender	-,134	-,189	-,040		
	Age	-,221**	-,006	-,003		
	Experience years	-,253**	-,373*	-,152*		
	Job title	,063	-,243**	-,181**		
Model 2	Attitude		,669**	,659**	,864	,746
	Subjective norm		,047	,040		
	Perteption control		,278**	,240**		
	Gender		-,157	-,034		
	Age		,020	,010		
	Experience years		-,381*	-,152*		
	Job title		-,236**	-,176***		
	Location	-,162	,177	,043		
Model 3	Attitude		,668**	,659**	,864	,746
	Subjective norm		,054	,046		
	Perteption control		,273**	,237**		
	Gender		-,169	-,036		
	Age		,018	,008		
	Experience years		-,379*	-,151*		
	Job title		-,236**	-,176**		
	Location		,169	,040		
	Work in public sector	-,120	,020	,013		

Source: Author's research; r = simple linear correlation; b = regression correlation coefficient; β = standardized regression correlation coefficient; R = correlation index; R^2 = coefficient of determination; Statistically significant at the level *p< ,05; **p< ,01; p< ,001

The belowe (Table 6) is also confirmed through the value of the standard regression coefficient, which for the years of service in Model 1 is β = -.071, while in Model 2, by adding the job title of FMDs, its value increases and statistically significantly independently contributes to the prediction of the intention to establish a privately owned FMSC (β = -.153, $p < .01$). Also, the explanatory value of the variance of the intention to establish FMSC in private ownership is significantly higher compared to Model 1 and its yield in explaining the intention to establish FMSC increases slightly by 2.7% ($R2^{increase} = .027$; $p < .01$).

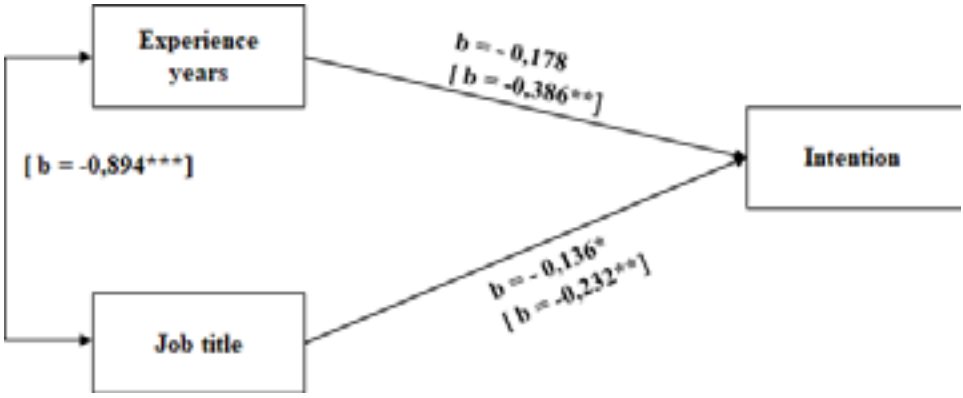
Table 6 Multiply regression analysis intention related years of work experience and title of FMDs

	Variables	r	b	β	R	R^2
Model 1	Attitude		,671***	,662***	,849	,721
	Subjective norm		,026	,022		
	Perteption control		,257**	,223**		
	Experience years	-,253**	-,178	-,071		
Model 2	Attitude		,665***	,656***	,862**	,743**
	Subjective norm		,040	,034		
	Perteption control		,275**	,238**		
	Experience years		-,386**	-,153**		
	Job title	,063	-,232**	-,173**		

Source: Author's research; r = simple linear correlation; b = regression correlation coefficient; β = standardized regression correlation coefficient; R = correlation index; R^2 = coefficient of determination; Statistically significant at the level *p< ,05; **p< ,01; p< ,001

The influence of years of work experience on the intention is only partially realised, as the suppressor variable (the job title of FMDs) is presented in Figure 2. The years of work experience (a) have their indirect influence on the intention through the job title (b) in a value that is statistically significant and amounts to a*b = .207; BCa CI (.046 - .411)

Figure 2. The suppressive effect of years of work experience and the job title of FMDs on the intention to establish a privately owned FMSC



Source: Author's research; b = unstandardised regression coeficients; [] = unstandrised regression coefficient after suppresos effects; Statistically significant at the level *p< ,05; **p< ,01; p< ,001

DISCUSSION

Depending on the type of behaviour and the population to which it relates, intention serves as a mediator between predictors and behaviour (Kolvereid, 1996b; Lortie & Castogiovanni, 2015). Based on the study's results, H1 is accepted; the three basic constructs of TPB (attitude, subjective norm, and perception of control) contribute statistically significantly to predicting the intention to establish an outpatient clinic. In

19 meta-analyses, the average contribution of the three basic constructs in predicting intention has been determined to be R = .71 (Ajzen, 1991). In our study, the three basic predictors together explain 70.6% of the variance in the intention to establish a privately owned FMSC, representing a strong effect ($R^2 = .706$; $p < .001$).

H2 and H4 are accepted in this study; attitude towards the establishment and the perception of control have the most statistically significant independent contribution. Regarding entrepreneurial intention, empirical evidence indicates that the perception of control makes the most significant independent contribution to the expected entrepreneurial behaviour likely to be realised. At the same time, attitude is a stronger predictor of interest in self-employment than to realise it (Autio et al., 2001; Davids, 2017; Krueger et al., 2000; Phan, Wong, & Wang, 2002). Differences in the influence of these two predictors on predicting entrepreneurial intention can be linked to differences in the examined sample, the context in which the study is conducted, and the role of socio-cultural factors in a particular society.

Vice versa, H3 in our study is not accepted because the subjective norm was not proven to have an independent, statistically significant contribution in predicting the intention to establish a privately owned FMSC. According to other studies, an individual can still have a strong intention even when one or more predictors of intention have a lower value (Fishbein & Ajzen, 2010). The author of the TPB explains that the subjective norm has a weaker influence on intention because feelings of pressure from others are lower than the impact of attitudes and perceptions of control on intention (Ajzen, 1991).

The H5 is n accepted because the results of our study did not confirm that the gender of the FMDs makes a statistically significant direct, independent contribution to predicting intention. Contradictions have been established regarding gender differences in entrepreneurial intention (Haus, Steinmetz, Isidor, & Kabst, 2013). According to some statements, gender has a direct impact on entrepreneurial intention, or it appears as a moderator, exerting an insignificant influence indirectly through attitudes and perceptions of control (Vamvaka et al., 2020). According to some research, entrepreneurship is often associated with males (Fagenson & Marcus, 1991). Other studies have shown that the similarities in entrepreneurial activity between the sexes are much greater than the differences (Haus et al., 2013). Women, unlike men, tend to assess their deficiencies in skills and knowledge more accurately, which results in a lower level of self-confidence and a greater perception of obstacles to starting an entrepreneurial venture (Bandura, 1997; Haus et al., 2013).

Based on the results of our study, hypothesis H6 has been partly accepted because ages significantly and negatively correlate indirectly with intention, but it does not improve the direct statistic sigininifant correlation between the ages and intention. In this study sample, more than 1/3 of respondents with FMDs of older age (over 51 years) have less intention to establish a privately owned FMSC. Our findings align with the results of other studies, which indicate that age negatively impacts the prediction of intention or that older employees are less inclined towards entrepreneurship (Hatak, Harms, & Fink, 2015; Blanchflower, Oswald, & Stutzer, 2001). Older people have more resources and opportunities, a better position in society, and a well-developed network of social contacts, which allows them to deviate from their usual business behaviour more easily. Unlike them, younger people are more willing to take the

risk that entrepreneurship entails. They have more enthusiasm and energy for starting a new venture, so even if it is not successful, they have enough time available for another career, through which they can secure income (Bosma et al., 2019).

In our study, the job title of FMDs is confirmed to have a statistically significant correlation, with the intention of establishing a privately owned FMSC (Hypothesis 8). Furthermore, years of work experience have been statistically confirmed to significantly negatively correlate with the intention to establish FMSC in private ownership through the suppressor, specifically the job title of FMDs (Hypothesis 7). The suppressor effect is also confirmed by the negative statistically significant correlation between job title and years of work experience, which indicates that job title and years of work experience on the intention to establish a privately owned FMSC act independently of each other, but the job title suppresses a certain part of the variance of years of work experience and that part that is irrelevant for predicting the intention to establish a privately owned FMSC. In earlier research, the effect of age on years of work experience and level of education was observed (Mata, 1996).

The results of our study do not confirm that the location of the family medicine clinic where FMDs currently work statistically significantly correlates with the intention to establish FMSC (Hypothesis 9). Differences in starting an independent business in urban and rural areas result from the influence of various factors (self-efficacy, demographic, epidemiological, social, financial and cultural).

In many countries, employment in the public sector is traditionally seen as a lifelong career with one employer. Individuals with previous work experience in the public sector are less likely to choose self-employment than those with prior experience in the private sector. Workers tend to evaluate work-related conditions positively in cases where they are strongly identified with their work because the strength of organisational identification is linked to work (Chen, Chi, & Friedman, 2013). Moreover, hypothesis 10 in our study is accepted, that there is no significant correlation between the attitude of FMDs about working in the public sector and the intention to establish a privately owned FMSC. According to earlier research, the previous work in one of the two sectors, private or public, was different in determining whether to start a new venture. The new venture is more pronounced among those with previous work experience in the private sector compared to those with experience in the public sector. (Yuan et al., 2019)

Strengths, Limitations and Further Studies

The strengths of the study are that using a structured survey allows quantifiable data to be collected from a targeted group of respondents and provides an efficient way to collect data from a relatively large sample of FMDs. In addition, the reliability and comparability of the results with previous studies of entrepreneurial intention is enhanced by the use of validated survey instruments, such as those based on the Theory of Planned Behaviour (TPB). In addition, results can directly inform health managers and policy makers about prevalence and predictors of intention to start a business, and help design relevant training or support structures.

As a cross-sectional survey, this study has some limitations. It captures people's views at a single point in time, which limits conclusions on causal relationships or changes over time. Moreover, iIt may be that FMDs who were already interested

in starting their own business were more likely to take part, which may have biased the results towards higher levels of entrepreneurial intent. Also, the survey relies on self-reporting, which may suffer from social desirability bias, recall bias, or respondents overstating entrepreneurial attitudes/intentions. Furthermore, the survey is a measure of intention, not actual behaviour. While intentions can be a useful predictor, they do not confirm whether the respondent has taken, or will take, an entrepreneurial action.

In order to track how entrepreneurial intentions change over time, further follow-up studies could use a longitudinal survey design. To gain deeper insights into the contextual and personal factors that influence entrepreneurial motivation and decision-making, future research could complement the survey with qualitative interviews. Moreover, to allow for comparative analysis and regional benchmarking, similar survey-based research could be extended to other parts of Bosnia and Herzegovina.

CONCLUSION

The findings of this study indicate that attitude, subjective norms, and perceived behavioral control play a significant role in shaping the entrepreneurial intention of family medicine doctors to establish Family Medicine Specialist Clinics (FMSCs) in the Republic of Srpska. Conversely, a significant negative correlation was observed between this intention and factors such as age, years of experience in family medicine, and practice location (urban vs. rural). These results suggest that younger, less experienced physicians may be more inclined toward entrepreneurial ventures in family medicine, highlighting the need for targeted support and policies to foster clinic development across diverse demographics and regions.

As for the practical significance, it is multifaceted. First of all, the research contributes to the understanding of the entrepreneurial intention of doctors of family medicine with the intention of establishing a privately owned FMSC in a situation where there is not enough domestic and international research on the entrepreneurial intention of healthcare workers. The second practical significance of this study refers to the policymakers in the Republic of Srpska, who must equally devote themselves to creating and promoting an entrepreneurial culture because just setting up a legislative framework in entrepreneurship is not enough.

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ORIGINALNI NAUČNI RAD / ORIGINAL SCIENTIFIC PAPER

FINANCIAL PERFORMANCE MEASUREMENT IN BUSINESSES USING MCDM TECHNIQUES: AN APPLICATION ON BIST XKURY BUSINESSES (2015-2019)[1]

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Abstract: *The aim of this study is to analyse the financial ratios of 25 companies listed on the BIST XKURY index by constructing a model using Multi-Criteria Decision-Making techniques (TOPSIS, ELECTRE, GRA, VIKOR, PROMETHEE II, MOORA) and the CRITIC weighting method, which are commonly used in decision-making problems. Within this scope, the 15 financial ratios of the 25 companies listed on the BIST XKURY index between 2015 and 2019 were subjected to analysis. In addition to the rankings obtained with MCDM, the scores used to generate these rankings were also used in the study. The calculated MCDM results were compared with corporate governance rating scores and stock returns from two perspectives: based on rankings and based on scores, and a very low-grade relationship was found between them. Additionally, the MCDM scores and rankings for the years 2014-2018 were compared with those for 2019, and it was observed that MCDM results could be used to predict future years. The main findings indicate that MCDM methods are significantly more reliable for predicting financial performance trends than for correlating with market returns or governance ratings.*

Keywords: *Performance Evaluation, MCDM, Financial Performance Measurement, CRITIC, Optimal Direction of MCDM Criteria*

JEL Classification: *M41, C38, L25*

[1] This study is derived from the doctoral dissertation titled "Measurement of Financial Performance of BIST Corporate Governance Index Enterprises with Multi-Criteria Decision Making Techniques".

INTRODUCTION

In today's competitive environment, it is crucial for businesses to measure and evaluate their performance realistically in order to achieve their growth and sustainability goals. This process is essential for successful management performance, as it enables businesses to compare their planned targets with their actual performance in terms of managerial control (Abdel-Maksoud et al., 2005; Laitinen, 2002). Periodic performance measurements contribute to management's ability to correct negative deviations and take corrective measures. Additionally, accurately and regularly evaluating performance is important not only for the organisation itself (managers and shareholders) but also for external stakeholders such as lenders, suppliers, and customers.

The interest in performance evaluation, which began with productivity measurement at the beginning of the 20th century, has been growing rapidly every day(Amaratunga et al., 2000) . Performance measurement and evaluation, which express the level of achievement of objectives and the benefits obtained, include many qualitative and quantitative indicators (criteria). These indicators are an important factor for business stakeholders, especially investors, in selecting businesses, while also influencing investors' decisions regarding which businesses to choose. Financial performance indicators are at the forefront of these criteria (performance indicators)(Voulgaris et al., 2000).

In today's increasingly competitive business environment, it has become essential for businesses to compare their financial performance with that of their competitors in order to survive and succeed. Managers must accurately measure and evaluate their financial performance, identify areas that pose or may pose problems in achieving their goals, determine the causes of these problems, and develop realistic plans for the future(Ayan, 2016) . This enables businesses to identify their position relative to other companies in the sector and develop effective strategies to improve that position. Although there are many criteria that can be used to measure financial performance, there is no clear consensus on how to measure financial performance in a definitive manner. In contrast, basic financial performance measures that define commercial and economic activities from various perspectives and can be obtained from companies' financial statements can be listed under four main headings as follows (Fatihudin et al., 2018; Ginevičius & Podvezko, 2008; Sayılgan, 2017); 1. Liquidity ratios, 2.Activity ratios (Efficiency ratios), 3.Profitability ratios and 4.Financial ratios (Leverage ratios). The first group measures short-term debt payment capacity, the second shows current capital usage, the third defines profitability, and the last reveals the resource structure, i.e., the types of resources used to finance the company's assets and the proportions of these resources.

Although there are many financial performance measures under these headings, it will not be sufficient to utilise only the experience and expertise of decision makers in the evaluation of these measures. This is because many conflicting performance measures emerge from time to time. The existence and complexity of different financial performance measures may cause difficulties in the measurement and evaluation of financial performance. Therefore, there is a need for modelling to select the most appropriate criteria (Bülbül & Köse, 2011).

Individuals and organisations are faced with complex situations such as choosing among many conflicting alternatives or abandoning their decisions in line with

financial performance criteria and various other criteria. Such problems can be solved by Multi-Criteria Decision Making (MCDM) techniques, which have been used in decision-making processes for more than 50 years (Perez, 1995). These techniques offer a systematic approach to selecting the best possible alternative and using it in decision-making processes by ranking or grouping multiple alternatives in line with various criteria. There are many developed MCDM techniques, and due to the different mathematical operations used in the techniques, the ranking of alternatives may differ depending on the methods adopted (Chakraborty et al., 2015). It is also possible to develop different modelling based on these methods. In the literature, it is seen that many business performance measurements and evaluations, especially the financial performance of companies, have been made by using the aforementioned MCDM techniques or modelling.

Regardless of which technique is preferred or which MCDM models are created, determining the relative importance (weights) of the criteria is a critical factor due to the existence of multiple criteria. Many objective and subjective methods have been developed to determine these weights. While there are assumptions that criteria have equal weights in decision-making problems, there is a tendency to establish criteria with different weights. Subjective weight determination methods provide flexibility specific to each decision-making process from the perspective of decision-makers in decision-making processes that are different from one another. However, difficulties such as decision-makers' reluctance to determine weights or their inability to make a clear assessment may arise (Lahdelma & Salminen, 2001; Ponhan & Sureeyatanapas, 2022) . Furthermore, different individuals approaching the same decision-making process from different perspectives based on their characteristics can make it difficult to establish a common weighting and render comparisons meaningless. For these reasons, objective weighting methods or hybrid methods combining objective and subjective approaches are often preferred in MCDM methods.

It is believed that investment decisions made by companies with corporate governance practices, which are a prominent concept today alongside financial performance, will be more accurate. Successful companies should operate in line with high performance goals that encompass both financial and corporate governance. Although there are numerous studies examining the relationship between corporate governance and financial performance, studies analysing this relationship using multi-criteria decision-making techniques are quite limited.

In this study, the literature on the use of multi-criteria decision-making techniques in financial performance measurement was first reviewed. Subsequently, the financial performance of companies included in the Borsa Istanbul (BIST) Corporate Governance Index (CGI), were obtained using six different multi-criteria decision-making techniques (TOPSIS, GRA, ELECTRE, VIKOR, MOORA Reference -point, and PROMOTHEE II techniques). The relationships between the MCDM results and the CGI and market returns were examined. Studies were conducted on the use of the same MCDM scores and rankings in the subsequent years' rankings of the companies, and the findings were evaluated.

LITERATURE REVIEW

Literature Review on Financial Performance and MCDM Relationship Studies

A literature review on financial performance measurement with MCDM techniques was conducted, and a summary of the reviewed studies is presented in Table 1 below.

Table 1: Summary of Literature Studies on Financial Performance Measurement with MDMC

Studies Analysed	N	Summary of Studies
Baležentis et al. (2012)	1	Rankings and evaluations were made by considering alternative sectors.
Ege and Yaman (2018)	1	MCDM rankings were compared with pay-off rankings, and it was stated that the TOPSIS method had a significant effect while the MOORA method had no significant effect.
Ayan (2016)	1	Effective and ineffective businesses were identified using MCDM techniques, and recommendations were made.
Temizel and Bayçelebi (2016)	1	Rankings were made using the TOPSIS method, and it was stated that there was no correlation between the annual average return.
Demirbaş (2019)	1	It has been stated that MCDM techniques can be applied in predicting financial failure. Additionally, a study on scale transformation for certain financial indicators has been conducted.
Hajihassani (2015); Hsu et al. (2015)	2	It has been stated that the companies ranked at the top of the rankings can be selected as investment targets.
Güler (2019)	1	It has been stated that businesses can achieve better performance in rankings by focusing on criteria with high weighting.
Bülbül and Köse (2011); Mıhçı (2014) Ertikin (2019); İç et al. (2015); Karaoğlan (2016)	5	Different MCDM methods were compared by ranking them, and evaluations were made.
Ege et al. (2013); Esendemirli and Erdener Acar (2016); Sakarya and Aksu (2016); Yıldırım et al. (2018)	4	Rankings were compared with "Corporate Governance Rating Rankings," and it was stated that the Corporate Governance Rating (CGR) rankings do not reflect the MCDM rankings and that there is no significant relationship between them.
(Çonkar et al., 2011; Gemici, 2017)	2	Evaluations were made by comparing CGR score rankings using the TOPSIS method.
(Ünlü et al., 2017)	1	The study indicated that there was no difference in financial performance and shareholder value creation between BIST 30 companies included in the corporate governance index and those not included.

Source: Authors' literature review

In addition to the studies listed above, there are 32 more studies in the literature that have only presented ranking results (e.g., "1st Company A, 2nd Company B...") without providing additional analysis beyond ranking. Due to page limitations, these studies are not individually listed here. However, the MCDM techniques, weighting methods, and criteria used in these studies have been taken into account in this study. The full list of these studies is available from the authors upon request

The MCDM techniques used in the literature and their respective frequencies are presented as follows: TOPSIS (39), VIKOR (13), MOORA (5), PROMETHEE (5), GRA (7), ELECTRE (6), and others (11: COPRAS, FUZZY ARAS, FLOWSORT, MAIRCA, MAUT, DEA, Compromise Programming). Some studies utilized more than one MCDM technique in combination.

The weights and their usage frequencies in literature studies, which have an important place in MCDM techniques for financial performance measurement, are presented in Table 2.

Table 2: Weight Techniques Used in Literature Review Studies

Weight Methods Used	Number of Uses	Weight Methods Used	Number of Uses
Equal Weight	20	AHP	8
ENTROPY	8	Criterion totals, ratioed to criterion totals	2
CRITIC	2	Normalised values divided by the criterion total	2
DEMATEL	1	Expert or Faculty Member Opinion	8
Weight information not specified / not available	4		

Source: Authors' literature review

When examining the weights and usage counts employed in the MCDM techniques in the study, it was observed that the equal weight method was used 20 times, the Entropy method 8 times, and the CRITIC method 2 times among objective methods. In some of the studied works, multiple weighting methods were used.

In the literature, the frequency of use of financial ratio groups is as follows: Activity Rates (119 times), Profitability Ratios (154 times), Leverage Ratios (96 times), Liquidity Ratios (89 times), Market Rates (28 times), Growth Rates (15 times), Absolute Figures (9 times), and Other Indicators (28 times). The most frequently used individual financial ratios are the current ratio (43 times), total debt ratio (41 times), return on equity (41 times), quick ratio (31 times), and asset turnover ratio (30 times). Based on this literature review, 15 financial ratios were determined as criteria for the MCDM model developed in this study. These criteria are presented in Table 4, along with their abbreviations and calculation methods.

Literature Review of Studies on the Relationship Between Corporate Governance and Financial Performance

MCDM-based studies on the relationship between financial performance and corporate governance report that CGR rankings do not reflect MCDM rankings (Ege et al., 2013; Esendemirli & Erdener Acar, 2016; Sakarya & Aksu, 2016; Yıldırım et al., 2018), while others only ranked CGR scores using TOPSIS without financial analysis (Çonkar et al., 2011; Gemici, 2017). Non-MCDM studies present mixed findings: some report a positive relationship between governance and firm performance (Cengiz & Karabayır, 2022; Fernando et al., 2017; Garzón Castrillón, 2021; Zelenyuk & Zheka, 2006), while others find no significant relationship (Farooq et al., 2022; Soylu & Ayanoğlu, 2022).

Studies on the Relationship Between Financial Performance and Market Performance literature review

Studies on the relationship between financial performance and market performance report mixed findings. Ege and Yaman (2018) compared MCDM rankings with pay-off rankings and found that the TOPSIS method had a significant effect, whereas the MOORA method had no significant effect. In contrast, Temizel and Bayçelebi (2016) found no correlation between financial performance rankings and annual stock returns using the TOPSIS method. Other non-MCDM studies also present conflicting results; Büyükşalvarcı (2010) found mostly non-linear relationships between financial indicators and stock returns, and Ünal and Yüksel (2017) reported no statistically significant relationship between financial performance and stock returns using the PROMETHEE technique.

MEASURING FINANCIAL PERFORMANCE WITH MCDM TECHNIQUES

Purpose and Importance of the Research

The purpose of this study is to measure and evaluate the financial performance of the companies by comparing the Corporate Governance Index (CGI) ratings, market returns and financial performances for the coming years through the models to be created with the help of financial performance indicators and Multi-Criteria Decision Making (MCDM) techniques.

In the study, 6 different MCDM methods were used and these are TOPSIS, GRA, ELECTRE Net Incompatibility ranking, VIKOR, MOORA Reference Approach and PROMETHEE II techniques.

In the literature, it has been observed that, in general, by using the rankings obtained with the MCDM, the companies are compared and evaluated by years or with the companies included in the study. In these rankings obtained by MCDM, the ratios between the alternative rankings contain very sharp values (such as a ratio of 100 per cent between the 1st rank and the 2nd rank). On the other hand, it is possible to reveal the relative superiority between two alternatives / data more clearly (an alternative with a CGI score of 91.25 and an alternative with a CGI score of 90.18, etc.) in the scoring that constitutes the MCDM rankings or in the data such as CGI score and return on equity used in the studies. In this respect, unlike the literature, in addition to the rankings, the study also tried to make financial performance measurements by using the ratings, CGI ratings and market return ratios, which constitute the MCDM rankings, in addition to the rankings. In order to avoid a subjective evaluation for the determination of criteria weights in the use of CRITIC techniques, CRITIC weighting method was used to determine objective criteria weights.

Based on the view that analyzing five years of historical financial statements is sufficient to identify trends within a company, this study was designed to cover the period from 2014 to 2019(Hitchner, 2003). The companies included in the study are the companies that are independently audited and continuously traded in the BIST Corporate Governance Index (XKURY) between 2015-2019.

Research Questions

The research questions related to the three main relationship dimensions and sub-headings formed in line with the research objectives are listed below:

1)Analysing the relationship between MCDM techniques and corporate governance ratings

a. What is the relationship between the 5-year MCDM scores and the 5-year CGI scores

b. What is the relationship between the 5-year MCDM rankings and the 5-year CGI score rankings

2) Analysing the relationship between stock return and MCDM techniques

a. What is the relationship between the 5-year MCDM scores and the 5-year stock return rates.

b. What is the relationship between the 5-year CGI rankings and the 5-year stock return rankings.

3) Analysing the relationship between the 2015-2018 MCDM data and the 2019 MCDM data

a. What is the level of the relationship between the 2015-2018 MCDM scores and the 2019 MCDM scores

b. What is the level of the relationship between the Combined Single MCDM rankings of 2015-2018 and the MCDM rankings of 2019

Research Data

a. Determination of Alternatives and Criteria

- *Identification of alternatives:* The 25 BIST (XKURY) index companies, which were taken as alternatives in the application, are given in Table 3 for the years 2015-2019 and BIST stock names (abbreviations) were used in the application.

Table 3: Enterprises and Abbreviations Used in the Application

Companies	Abbr	Companies	Abbr
Anadolu Efes Biracılık ve Malt Sanayii A.Ş.	Aefes	Otokar Otomotiv ve Savunma Sanayi A.Ş.	Otkar
Aksa Akrilik Kimya Sanayii A.Ş.	Aksa	Pınar Entegre Et ve Un Sanayii A.Ş.	Petun
Arçelik A.Ş.	Arclk	Pegasus Hava Taşımacılığı A.Ş.	Pgsus
Aselsan Elektronik Sanayi ve Ticaret A.Ş.	Asels	Pınar Su ve İçecek Sanayi ve Ticaret A.Ş.	Pınsu
Aygaz A.Ş.	Aygaz	Pınar Süt Mamulleri Sanayii A.Ş.	Pnsut
Coca-Cola İçecek A.Ş.	Ccola	Türk Prysmian Kablo ve Sistemleri A.Ş.	Prkab
Doğuş Otomotiv Servis ve Ticaret A.Ş.	Doas	Park Elektrik Üretim Madencilik San.ve Tic. A.Ş.	Prkme
Enka İnşaat ve Sanayi A.Ş.	Enkaı	Tofaş Türk Otomobil Fabrikası A.Ş.	Toaso
Ereğli Demir ve Çelik Fabrikaları T.A.Ş.	Eregl	Türk Telekomünikasyon A.Ş.	Ttkom
Hürriyet Gazetecilik ve Matbaacılık A.Ş.	Hurgz	Türk Traktör ve Ziraat Makineleri A.Ş.	Ttrak
İhlas Ev Aletleri İmalat Sanayi ve Tic. A.Ş.	Iheva	Tüpraş-Türkiye Petrol Rafinerileri A.Ş.	Tuprs
Logo Yazılım Sanayi ve Ticaret A.Ş.	Logo	Vestel Elektronik Sanayi ve Ticaret A.Ş.	Vestl
Migros Ticaret A.Ş.	Mgros		

Source: Prepared by the authors

- *Determination of Performance Indicators (criteria):* The criteria to be used in the MCDM model developed for financial performance measurement were determined based on a literature review and are presented in Table 4, which includes 15 criteria.

Table 4: Performance Indicators (Criteria)

Abbreviation	Criteria	Calculation
CR	Current Ratio	Current Assets / Current Liabilities
LR	Liquidity Ratio	(Current Assets - Inventory) / Current Liabilities
QR	Quick Ratio	Cash and Cash Equivalents / Current Liabilities
DR	Debt Ratio	(Current Liabilities + Long-Term Liabilities) / Total Assets
CA/TA	Current Assets to Total Assets	Current Assets / Total Assets
FA/PC	Fixed Assets Permanent Capital Ratio	Fixed Assets / (Equity + Long-Term Liabilities)
CL/LTL	Current Liabilities to Long-Term Liabilities	Current Liabilities / Long-Term Liabilities
RTR	Receivable Turnover Rate	Net Sales / Trade Receivables
ETR	Equity Turnover Rate	Net Sales / Equity
ATR	Asset Turnover Rate	Net Sales / Total Assets
ITR	Inventory Turnover Rate	Cost of Sales / Inventories
OPM	Operating Profit Margin	Operating Profit / Net Sales
ROA	Return on Assets	Net Income / Total Assets
ROE	Return on Equity	Net Income / Shareholders' Equity
NPM	Net Profit Margin	Net Income / Net Sales

Source: Prepared by the authors based on the literature

b. Obtaining Data

- *Obtaining financial statement information and creating financial performance indicators (criteria):* The financial statement data used in the application was obtained by transferring the individual share names of the companies subject to the application from the financial statements section of the(https://isyatirim.com.tr) website to Excel, and accuracy checks were performed by conducting sample comparisons via the Public Disclosure Platform. The financial statement items and amounts of the financial statements of the relevant companies were programmed in Excel, and the financial indicators (criteria) were calculated separately for the years 2015-2019 to form the initial matrix (decision matrix) for the CRITIC weight determination method and the MCDM technique, thereby creating data sets.
- *Obtaining Corporate Governance Rating Scores:* Data related to corporate governance rating scores were obtained from the relevant sections of the Turkey Corporate Governance Association (TKYD) website**(https://www.tkyd.org/tr, 2022) .** For companies with multiple rating scores in the same year, the most recent rating score was considered. Due to the different dates of the ratings, the calendar year in which the rating score was obtained was

accepted as the year of the rating score. For companies with more than one same rating, the same rankings were given and the next rankings continued from where they left off.

- *Obtaining the market return data and constructing the return percentages:* The information required to calculate annual returns for businesses includes the year-end closing prices of shares and the amounts of dividends distributed. The aforementioned amounts were obtained from the "Historical Price Information" section of "İş Yatırım Menkul Değerler A.Ş."'s website:(https://isyatirim.com.tr, 2022) . The data obtained were calculated using the *following* formula (Hanifah & Khafid, 2016; Huda et al., 2015; Okka, 2015; Sakarya et al., 2018; Sayılgan, 2017).

$$\textit{Rate of return per share} = \frac{(P_t - P_{t-1}) + D_t}{P_{t-1}}$$

Here, P_t = current period stock price, P_{t-1} = previous period stock price, D_t = dividend amount paid in the current period.

Restrictions

The limitations related to the application are listed below.

- The years 2020 and 2021 were excluded from the study due to the pandemic period, during which some sectors were highly active while others came to a standstill.
- During the application period (2015-2019), there were 48 companies listed in the BIST Corporate Governance Index. However, 21 financial institutions in the index and 2 companies that were not included in the Corporate Governance Index throughout the entire 5-year period were excluded from the study.
- In the literature review, it was observed that the indicators "ratio of debt to total assets" and "ratio of equity to total assets" were used intensively as criteria. Since the ratio of equity to total assets = (1-debt) ratio of total assets, only one of these two criteria (ratio of debt to total assets) was included in the study.
- While the ENTROPI method was the most commonly used weighting determination method in literature reviews, methods that perform logarithmic calculations do not work with negative-valued criteria (such as profit/loss that can be negative). Therefore, the CRITIC method, which finds application in objectively determining weights, was used in this study.

Application of the Study

Determining Criteria Weights (CRITIC Method)

To objectively determine the criterion weights to be used in multi-criteria decision-making techniques, the CRITIC technique was applied using Excel to calculate separate weights for each year 2015–2019(Ayçin, 2019) . The average of the 5-year weights prepared has been used as the weight in all applications in the study and is presented in the following Table 5.

Table 5: Criteria Weights Determined Using CRITIC Method (%)

	CRITERIA														
	CR	**LR**	**QR**	**DR**	**CA/TA**	**FA/PC**	**CL/LTL**	**RTR**	**ETR**	**ATR**	**ITR**	**OPM**	**ROA**	**ROE**	**NPM**
5-Year Avg. Weights (Total 100)	6,85	6,40	8,66	10,87	8,54	6,95	8,04	4,94	6,25	7,65	5,82	4,80	5,22	4,03	5,00

Source: Authors' calculations using CRITIC method in Excel

Determination of Criteria Directions (Maximum - Minimum)

The criteria used in the study and their aspects (benefit or cost) are given in Table 6. For criteria that cannot be expressed as maximum or minimum, the ideal dimensions are also indicated in the table.

Table 6: Criteria and Aspects Used in the Study

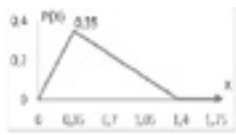
CRITERIA		**DIRECTIONS**
CR	Current Ratio	Optimal 2,00 (Akdoğan & Tenker, 1998)
LR	Liquidity Ratio	Optimal 1,00 (Akgüç, 1994)
QR	Quick Ratio	Optimal 0,35 (Erdemir, 2019)
DR	Debt Ratio	Optimal 0,50 (Başar, 2012)
CA/TA	Current Assets to Total Assets	MINIMUM
FA/PC	Fixed Assets Permanent Capital Ratio	MINIMUM
CL/LTL	Current Liabilities to Long-Term Liabilities	MINIMUM
RTR	Receivable Turnover Rate	MAXIMUM
ETR	Equity Turnover Rate	MAXIMUM
ATR	Asset Turnover Rate	MAXIMUM
ITR	Inventory Turnover Rate	MAXIMUM
OPM	Operating Profit Margin	MAXIMUM
ROA	Return on Assets	MAXIMUM
ROE	Return on Equity	MAXIMUM
NPM	Net Profit Margin	MAXIMUM

Source: Authors' own work based on the literature review

Multi-criteria decision-making techniques are used by considering the benefit or cost (max-min) aspects of the criteria. As seen in the literature review, almost all studies have applied all criteria (financial indicators) with their benefit or cost aspects. A contrary situation was observed in a single application by (Demirbaş) in 2019, where scale transformations were performed for some criteria (criterion functions were created). In this study, an application similar to that of(Demirbaş, 2019) was also performed. Transformation functions were created for the first four criteria in Table 6, where the benefit or cost direction could not be clearly specified. For the first three criteria (CR, LR and QR), functions were created in such a way that the values 4 times the optimum value and above are taken equal to 0, and for the fourth criterion (leverage ratio with a value between 0 and 1), functions were created in such a way that those above the opti-

mum value (0.50) are (1-DR). The criterion direction conversion table, which displays the graphs related to the created functions and criteria, is provided in Table 7.

Table 7: Criteria Directions Conversion Table

Criteria	Most Suitable Values	Function	Graphic
CR	2,00	$P(X)=\begin{cases} X & X \le 2 \\ (8-X)/3 & 2 < X < 8 \\ 0 & X \ge 8 \end{cases}$	
LR	1,00	$P(X)=\begin{cases} X & X \le 1 \\ (4-X)/3 & 1 < X < 4 \\ 0 & X \ge 4 \end{cases}$	
QR	0,35	$P(X)=\begin{cases} X & X \le 0{,}35 \\ (1{,}40-X)/3 & 0{,}35 < X < 1{,}40 \\ 0 & X \ge 1{,}40 \end{cases}$	
DR	0,50	$P(X)=\begin{cases} X & X \le 0{,}50 \\ (1-X) & 0{,}50 < X < 1{,}00 \end{cases}$	
Other Criteria	Max-Min	$P(X)=\{ X \quad -\infty \le x \le \infty$	

Source: Authors' own work, inspired by Demirbaş (2019)

Application of Multi-Criteria Decision Making Methods

The data sets created for each year using the transformation functions for the criteria directions specified in Table 7 have been converted into the initial matrices (decision matrices) required for all MCDM techniques in the study.

For the application of MCDM methods, Excel programs were prepared for each technique by utilizing the applications in the studies of (Özbek, 2019), (Çakın, 2019), (Ayçin, 2019) and (Dağ & Yıldırım, 2018) MCDM technique rankings were created for the years 2015-2019.

Conversion of Scores and Rankings Obtained by Different MCDM Methods into Single Scores and Single Rankings

The 5-year MCDM scores and rankings obtained by all MCDM applications (6 methods) were prepared separately, a single common ranking for each year is provided in the following two items;

- **Conversion of Multiple MCDM Technique Scores into a Single Score:**

MCDM techniques create scores/grades for alternatives based on criteria in order to obtain rankings. Since each MCDM technique has different scoring techniques

from the others, a normalisation process was performed in the study to convert these different scores into a single score. In the normalisation process, the formulas of the GRA technique, which assign values between 0 and 1, were used. The combination of different MCDM technique ratings to be used in the study, has been prepared based on the cost/benefit studies of the MCDM techniques.

- **Conversion of Multiple MCDM Technique Rankings into a Single Ranking (COPELAND Technique):**

COPELAND technique is utilised in order to combine different rankings into a single ranking in cases where there are more than one MCDM techniques. With the COPELAND technique, the ranking value of each alternative is compared with the ranking value of other alternatives to determine whether it is superior or not, and COPELAND scores are obtained by determining the total gain and loss scores. By ranking these scores, a new single ranking is obtained(Eş, 2013; Zavadskas et al., 2017) . In the application of the technique, an Excel programme was prepared using the studies of Özdağoğlu et al. (2021), and the results of the six different MCDM techniques used in the study were converted into single rankings for each year separately.

Conversion of Scores and Rankings Obtained by MCDM Methods for Multiple Years into Single Scores and Rankings

In the study, in order to compare the 2015-2018 years (four years of data) with the 2019 data, the scoring and ranking of the MCDM techniques were combined into a single data in the form of two items.

- **Conversion of Multiple Year Rankings into Single Rankings (COPELAND Technique):**

The 2015-2018 (four-year) rankings of the studies, which were converted into a single ranking for each year by COPELAND method with 6 different MCDM techniques, were converted into a single ranking by using the same method (COPELAND method). For those with the same score, the same ranking number is given, and the next same scores are given the next ranking number and added as an addition to the last column.

- **Conversion of multiple years' MCDM scores into a single score:**

In the study, it was aimed to compare the 2015-2018 MCDM scores with the 2019 MCDM scores. For this purpose, the 2015-2018 (four-year) scores of the MCDM techniques used in the study were combined into a single score. The combined MCDM scores for the years 2015-2018 were created by normalizing and averaging the scores of the different MCDM methods annually. Subsequently, the four-year average of these combined annual scores was calculated.

Research Findings

The scores and rankings obtained using the MCDM techniques, CGR scores and rankings, and stock return rates and rankings were subjected to a correlation analysis prepared in Excel to answer the three main research questions of the study. The correlation coefficient expresses the linear relationship between two variables, ranging from -1 to +1. Values close to +1 indicate a strong positive relationship, values close to -1 indicate a strong negative relationship, and values close to 0 indicate no linear relationship (Sönmez, 2012).

The correlation values obtained for the research questions are given in Table 8, Table 9, and Table 10 and were evaluated according to the direction and degree of the correlation coefficient.

Table 8: Examination of the relationship between MCDM techniques and Corporate Governance Ratings

	RESEARCH QUESTIONS	Correlation Value
a.	***What is the relationship between 5 years MCDM scores and 5-year CGR scores?***	
	- What is the level of the relationship between the Unified Single MCDM scores and the CGR scores?	0,17
	- What is the level of the relationship between MCDM-TOPSIS scores and CGR scores?	0,16
	- What is the level of the relationship between MCDM -GRA scores and CGR scores?	0,06
	- What is the level of the relationship between MCDM-ELECTRE Net Incompatibility scores and CGR scores?	-0,04
	- What is the level of the relationship between MCDM -VIKOR scores and the CGR scores?	-0,18
	- What is the level of the relationship between MCDM -MOORA Reference Approach scores and CGR scores?	-0,07
	- What is the level of the relationship between MCDM -PROMETHEE scores and CGR scores?	0,11
b.	***What is the relationship between the 5-year* MCDM *Rankings and the 5-year* CGR *score Rankings?***	
	- What is the level of the relationship between the Unified Single MCDM rankings and the CGR score rankings?	-0,02
	- What is the level of the relationship between MCDM -TOPSIS rankings and CGR score rankings?	0,04
	- What is the level of the relationship between MCDM -GRA rankings and CGR score rankings?	-0,05
	- What is the level of the relationship between MCDM -VIKOR rankings and CGR score rankings?	0,11
	- What is the level of the relationship between MCDM-ELECTRE Net Incompatibility rankings and CGR score rankings?	-0,06
	- What is the level of the relationship between MCDM -MOORA Reference Approach rankings and the CGR score rankings?	0,17
	- What is the level of the relationship between MCDM -PROMETHEE rankings and CGR score rankings?	-0,05

Source: Authors' calculations based on the study results

Table 8 shows the research questions and the correlation values of the binary relationships and it is seen that the relationship between the Corporate Governance Rating Scores (CGRS) and the MCDM ratings is at a very low level.

The Unified Single MCDM scoring and the CGRS have a correlation value of (0.17). Among the six different MCDM techniques, the relationship between the MCDM-ELECTRE Net Incompatibility scoring and the CGRS is the lowest, with a correlation of (-0.04), while the relationship with the MCDM-VIKOR scoring has the largest but inverse correlation, with a value of (-0.18). The ELECTRE Net Incompatibility, VIKOR, and MOORA Reference Approach scoring methods work in a mini-

mum directional (where lower values appear at the top ranks), and therefore, the scoring correlations for these methods have occurred in a negative direction.

It has been observed that there is almost no relationship between the MCDM rankings and the Corporate Governance Rating Rankings (CGRR). The relationship between the unified single MCDM rankings and CGRR has a correlation value of (-0.02), and among the six different MCDM techniques used with CGRR, the MCDM-TOPSIS rankings have the lowest correlation (0.04), while the MCDM-MOORA Reference Approach rankings have the highest correlation (0.17). All rankings in the study are minimum directional. Both the MCDM rankings and CGRR work in the same direction (in the minimum direction), meaning lower values are considered better (for example, the 1st rank is better than the 2nd).

Table 9: Examining of the relationship between MCDM techniques and stock returns

	RESEARCH QUESTIONS	Correlation Value
a.	***What is the relationship between 5-year MCDM scores and 5-year stock return rates?***	
-	What is the level of the relationship between the Unified Single MCDM scores and stock return rates?	-0,01
-	What is the level of the relationship between MCDM-TOPSIS scores and stock return rates?	0,18
-	What is the level of the relationship between MCDM-GRA scores and stock return rates?	0,04
-	What is the level of the relationship between MCDM-ELECTRE Net Incompatibility scores and stock return rates?	-0,04
-	What is the level of the relationship between MCDM-VIKOR scores and stock return rates?	-0,05
-	What is the level of the relationship between MCDM-MOORA Reference Approach scores and stock return rates?	0,31
-	What is the level of the relationship between MCDM-PROMETHEE scores and stock return rates?	0,01
b.	***What is the relationship between 5-year MCDM rankings and 5-year stock return rankings?***	
-	What is the level of the relationship between the Unified Single MCDM rankings and stock return rankings?	0,20
-	What is the level of the relationship between MCDM-TOPSIS rankings and stock return rankings?	0,18
-	What is the level of the relationship between MCDM-GRA rankings and stock return rankings?	0,14
-	What is the level of the relationship between MCDM-VIKOR rankings and stock return rankings?	0,16
-	What is the level of the relationship between the MCDM-ELECTRE Net Incompatibility rankings and stock return rankings?	0,19
-	What is the level of the relationship between MCDM-MOORA Reference Approach rankings and stock return rankings?	0,14
-	What is the level of the relationship between CRM-PROMETHEE rankings and stock return rankings?	0,23

Source: Authors' calculations based on the study results

When Table-9 analyses the relationship between the stock return ratios and the MCDM scores, it is seen that there is no relationship between the combined single MCDM scoring and the stock return rates with a correlation value of -0.01. Among the 6 different MCDM techniques used with stock return ratios, MCDM-PROMETHEE II ratings have the lowest correlation with 0.01, and MCDM-MOORA Reference Approach ratings and stock return ratios have the highest correlation with 0.31.

When the relationship between the stock return rankings and the MCDM rankings is analysed, it is seen that the relationship between the combined single MCDM ranking and the stock return rankings is low with a correlation value of 0.20. Among the 6 different MCDM techniques used with the stock return rankings, it is seen that MCDM-GRA and MCDM-MOORA Reference Approach ratings have the lowest correlation degree with 0.14, while MCDM-PROMETHEE II rankings and stock return ratios have the highest correlation degree with 0.23.

Table 10: Examining the relationship between the 2015-2018 MCDM data and the 2019 MCDM data

	RESEARCH QUESTIONS	Correlation Value
3.	**Analysing the relationship between 2015-2018 MCDM data and 2019 MCDM data**	
a.	***What is the level of relationship between the 2015-18 MCDM scores and the 2019 MCDM scores?***	
	- What is the relationship between the four-year (2015-2018) the Unified Single MCDM scores and the fifth year (2019) the Unified Single MCDM scores?	0,87
	- What is the relationship between the four-year (2015-2018) the Unified Single MCDM-TOPSIS scores and the fifth year (2019) MCDM-TOPSIS scores?	0,85
	- What is the relationship between the four-year (2015-2018) the Unified Single MCDM-GRA scores and the fifth year (2019) MCDM-GRA scores?	0,86
	- What is the relationship between the four-year (2015-2018) the Unified Single MCDM- ELECTRE Net Incompatibility scores and the fifth year (2019) MCDM-ELECTRE Net Incompatibility scores?	0,82
	- What is the relationship between the four-year (2015-2018) the Unified Single MCDM- VIKOR scores and the fifth year (2019) MCDM- VIKOR scores?	0,80
	- What is the relationship between the four-year (2015-2018) the Unified Single MCDM- MOORA Reference Approach scores and the fifth year (2019) MCDM-MOORA Reference Approach scores?	0,44
	- What is the relationship between the four-year (2015-2018) the Unified Single MCDM- PROMETHEE scores and the fifth year (2019) MCDM- PROMETHEE scores?	0,87
b.	***What is the level of relationship between the 2015-18 MCDM rankings and the 2019 MCDM rankings?***	
	- What is the relationship between the four-year (2015-2018) the Unified Single MCDM rankings and the fifth year (2019) the Unified Single MCDM rankings?	0,76
	- What is the relationship between the four-year (2015-2018) the Unified Single MCDM-TOPSIS rankings and the fifth year (2019) MCDM-TOPSIS rankings?	0,68
	- What is the relationship between the four-year (2015-2018) the Unified Single MCDM-GRA rankings and the fifth year (2019) MCDM-GRA rankings?	0,81
	- What is the relationship between the four-year (2015-2018) the Unified Single MCDM- ELECTRE Net Incompatibility rankings and the fifth year (2019) MCDM-ELECTRE Net Incompatibility rankings?	0,70

- What is the relationship between the four-year (2015-2018) the Unified Single MCDM- VIKOR rankings and the fifth year (2019) MCDM- VIKOR rankings?	0,75
- What is the relationship between the four-year (2015-2018) the Unified Single MCDM- MOORA Reference Approach rankings and the fifth year (2019) MCDM-MOORA Reference Approach rankings?	0,67
- What is the relationship between the four-year (2015-2018) the Unified Single MCDM- PROMETHEE rankings and the fifth year (2019) MCDM- PROMETHEE rankings?	0,80

Source: Authors' calculations based on the study results

Table 10, which examines the relationship between the 4-year (2015-2018) MCDM scores and rankings and the scores and rankings of the following year (2019), shows a high level of correlation in terms of both scoring and ranking. The comparison of the combined MCDM scores from the four-year period with the MCDM rankings from the fifth year showed a correlation coefficient of 0.76, while the comparison of the MCDM scores alone yielded a higher correlation coefficient of 0.87, indicating that these methods can be used to predict future years. When examined separately by technique, PROMETHEE Scoring showed the same level of correlation with the combined MCDM scores in terms of ranking, while GRA ranking had a correlation value of 0.81 and PROMETHEE ranking had a correlation value of 0.80, indicating a high level of relationship in terms of rankings. In terms of ranking and scoring values for the years 2015-2018, the MOORA Reference Approach method was found to have a moderate relationship with the following year (2019) with a correlation value of 0.44 in terms of scoring and 0.67 in terms of ranking, and a lower relationship compared to other methods in the study.

CONCLUSION AND RECOMMENDATIONS

There are many performance indicators that are realised and quantified for internal and external purposes. These performance indicators are primarily classified according to whether they are financial or not, and financial performance indicators are used in many studies due to the reliability and accessibility of financial information of companies listed on the stock exchange. While each of these indicators has different meanings for the company, evaluating only a single indicator or comparing it with other companies does not provide a healthy evaluation or comparison. In order to make healthy evaluations, the number of performance indicators must be increased, which brings with it difficulties in valuation, observation, and calculation. The large number of companies compared can also create a matrix structure that makes these evaluations more difficult and complex. In this study, a model was established using Multi-Criteria Decision Making techniques to measure financial performance from the perspective of multiple companies using these complex performance indicators.

The study utilized 25 BIST Corporate Governance Index companies and 15 financial performance indicators (criteria) for the years 2015-2019. Among the numerous evolving MCDM techniques, the most widely used ones in the literature—TOPSIS, GRA, ELECTRE Incompatibility, VIKOR, MOORA Reference Approach, and PROMOTHEE II—were selected for this study.

In the study, a financial performance measurement model was developed by combining the CRITIC objective weight determination method, six different MCDM

techniques, and COPELAND ranking methods to obtain rankings for the years 2015-2019 based on the aforementioned criteria. These rankings do not indicate how well a company performs compared to others, but rather its position in the ranking. With the data obtained, company managements can evaluate financial performance rankings of the included companies to support decision-making regarding current or potential investors, as well as develop strategies to maintain a high ranking or avoid dropping to lower positions.

Since the MCDM rankings do not show the relative advantages of businesses, the MCDM scores or ratings obtained in the creation of these rankings were included in the study, as they may show the relative advantages of businesses. In addition, the study examined the criteria (financial indicators) used in the application of MCDM techniques and developed functions for financial indicators that do not have a benefit or cost dimension but have an ideal value.

The study found that there is only a minimal level of correlation between the comparison of financial performance measurements using CGR and MCDM methods (in terms of separate rankings and scores), and that this is consistent with the results obtained in the literature. This result may be attributed to the fact that all the companies included in the study possess the minimum corporate governance rating scores required to be listed on the BIST Corporate Governance Index (XKURY). It has been observed that the general belief that corporate governance positively contributes to financial performance does not hold true for companies listed on the BIST CGI index.

In the comparison of Equity Returns and MCDM methods in terms of Financial Performance measurements, it was observed that MOORA Reference Approach and TOPSIS methods had a low level of positive correlation in terms of MCDM scores, while there was no correlation in terms of other methods and combined MCDM scores. On the other hand, in the analysis made in terms of MCDM rankings and Stock Return rankings, it was observed that there was a positive and low level of correlation (between 0.14 and 0.20 correlation values) in the individual and combined rankings of all criteria.

The study found that there is a strong relationship between MCDM techniques and the rankings and scores of subsequent years, both in terms of combined rankings and combined scores, and that this relationship is much stronger in terms of MCDM scores. It was also observed that the model can be used to predict the financial performance of companies in future years. In terms of methodology, PROMETHEE II and GRA methods showed a high level of relationship with subsequent years in terms of scoring and ranking, while the MOORA Reference Approach method showed a moderate level of relationship.

Even if there were a high correlation between MCDM and stock returns, it would have been possible to make predictions for achieving high stock returns using MCDM techniques in future years. However, based on the application data and model in the study, the very low correlation between MCDM rankings and scores and stock returns, coupled with the high correlation between MCDM rankings and scores across subsequent years, indicates that MCDM techniques cannot be used to predict stock returns in future periods.

While attempting to answer the research questions, it is considered that the use of MCDM scores, which allow for a clearer assessment of the relative superiority

among alternatives, alongside MCDM rankings, as well as the conversion of different MCDM scores into a single score using normalisation methods, could contribute to the literature. Moreover, consolidating MCDM scores from multiple years into a single score, and demonstrating that both the scores and rankings can be used to predict MCDM scores and rankings in subsequent years, is also among the contributions this study could make to the literature.

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ORIGINALNI NAUČNI RAD / ORIGINAL SCIENTIFIC PAPER

EVALUATING WHEAT HEDGING EFFICIENCY USING PRECIOUS METALS: A PORTFOLIO ANALYSIS FROM VOJVODINA

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Abstract: *This study analyzes the effectiveness of hedging wheat in Vojvodina, Serbia, using gold and silver to reduce portfolio risk and stabilize returns. Wheat is a key regional commodity, highly sensitive to global price fluctuations and local market conditions. Daily CBOT wheat futures and historical gold and silver prices from 2019–2024 are used to calculate log returns. Minimum-variance portfolios are constructed following the Markowitz framework. Hedging efficiency is measured with the Hedge Effectiveness Index (HEI) and risk-adjusted performance with the Sharpe ratio. Results show that hedging with gold provides the highest risk reduction (HEI 94.38%, Sharpe 0.2025), while silver offers moderate protection (HEI 87.40%, Sharpe 0.0456). These findings demonstrate that precious metals effectively stabilize wheat portfolios and improve the risk–return trade-off. The study highlights practical implications for producers and investors in Vojvodina, enabling portfolio protection against price volatility. Future research could extend the analysis to other Western Balkan countries, additional commodities, and futures contracts.*

Keywords: *wheat, Vojvodina, hedging, precious metals, portfolio risk*

JEL Classification: *G11; G13; Q11*; *Q14*

INTRODUCTION

Wheat is one of the most important cereals globally , ranking immediately after maize in terms of production volume. In the economies of the Western Balkans, agriculture plays a crucial role, with Serbia leading in wheat production, and Vojvodina accounting for more than 70% of the national output. A similar situation is observed in Bosnia and Herzegovina, where wheat self-sufficiency stands at approximately 54%,

with notable territorial disparities.

Crises such as the COVID-19 pandemic, the Russia–Ukraine war, and challenges related to sustainable development have highlighted the need to strengthen local food production to enhance the resilience of food systems. Research indicates that Western Balkan countries generally have lower self-sufficiency in cereals and weaker competitiveness compared to most European nations, with factors such as GDP per capita, political stability, and agricultural productivity significantly influencing these outcomes.

In this context, the wheat market in Vojvodina has faced pronounced price fluctuations in recent years. Global supply chain disruptions and rising world wheat prices directly affect domestic prices and yields, while Serbia partially imports wheat and exports a portion of its production. According to, wheat prices increased by 24.53% in March 2022, while reported a 55% increase immediately after the outbreak of the war in Ukraine. These data quantify heightened volatility and emphasize the connection between the local market and global developments.

Market mechanisms also play a role in price formation. demonstrate that storable commodities, such as wheat, have an empirically confirmed price floor, which encourages producers to delay sales to contribute to market stabilization. In such an environment, hedging strategies that combine agricultural products with more stable financial instruments, such as gold and silver, effectively reduce portfolio risk. Precious metals were selected due to their relatively low volatility, historical correlation with agricultural commodities, and status as safe assets , providing protection against market fluctuations and extreme shocks.

The aim of this study is to assess the effectiveness of hedging wheat prices in Vojvodina using precious metals. To this end, two minimum-variance portfolios were constructed – wheat–gold and wheat–siver. Hedging effectiveness is measured using the Hedge Effectiveness Index (HEI), while the Sharpe ratio evaluates the risk–return profile of the portfolios. The analysis is based on daily wheat futures from the CBOT, which serve as a global price benchmark and reflect price movements in Vojvodina, alongside precious metal prices. The methodological framework relies on the portfolio approach, which allows optimization of the risk–return trade-off under various market conditions.

This study contributes to a better understanding of mechanisms for mitigating price risks in the wheat market, providing practical guidance for farmers, exporters, and policymakers. At the same time, it enriches the literature on commodity hedging in smaller and open economies, highlighting the role of precious metals in portfolio stabilization and the preservation of production value

Based on the research objectives and previous literature, the following hypotheses were formulated:

H1: Hedging wheat with gold significantly reduces portfolio risk in Vojvodina, as reflected in high values of the Hedge Effectiveness Index (HEI).

H2: Hedging wheat with silver reduces portfolio risk, although it is less efficient compared to gold.

H3: Combining wheat with precious metals improves the risk–return trade-off, as indicated by an increased Sharpe ratio compared to the unhedged portfolio.

The remainder of the paper first presents a review of the relevant literature,

followed by a description of the methodology. Subsequently, empirical findings are presented, and the discussion section interprets the research results. The final part of the paper is dedicated to conclusions and practical implications of the study.

LITERATURE REVIEW

This section reviews studies on hedging strategies employing precious metals across various asset classes, including agricultural commodities, equities, and other financial instruments. investigate the use of spot corn prices combined with futures of precious metals, utilizing variance (Var), value at risk (VaR), and conditional value at risk (CVaR) within a dynamic conditional correlation (DCC) framework. Their results indicate that gold represents the most efficient hedging instrument due to its low correlation with corn and reduced overall risk, with an optimal portfolio allocation of 27:73 in favor of gold. emphasize gold's role as a safe-haven asset and store of value, demonstrating its ability to stabilize portfolios during periods of market stress. further confirm the importance of precious metals in mitigating geopolitical risk (GPR), showing that gold and silver provide effective short- and medium-term protection, while platinum and palladium mainly act during severe supply shocks.

The application of these findings to European commodity markets illustrates that geopolitical events, including the war in Ukraine, significantly influence wheat and corn price volatility . employs parametric Value-at-Risk models and the Omega ratio to analyze extreme portfolio risk for cereal- and "soft"-commodity combinations, underlining the importance of diversification and advanced risk measures. demonstrate that combining agricultural commodities with precious metals, particularly gold and silver, reduces exposure to geopolitical and market risks, providing reliable protection and stabilizing returns.

Research on European equity portfolios further supports the stabilizing role of precious metals. apply GARCH models and Markowitz mean-variance optimization, showing that gold consistently delivers stable returns, the highest Sharpe ratios, and protection against losses, while silver contributes to diversification with higher volatility. utilize TVP-VAR and multi-asset portfolio optimization, revealing that dynamic portfolios including agricultural commodities often outperform the S&P 500, highlighting the importance of incorporating commodities into diversified strategies. illustrate that combining equities with precious metals enhances the risk–return profile, with gold functioning as a key stabilizer and the application of minimum variance and HEI indices further improving protection against market fluctuations.

For the analysis of the wheat market in Vojvodina, international CBOT futures were employed as reliable and liquid reference prices, accurately reflecting global market movements . The use of these data enables precise assessment of volatility and hedging efficiency, confirming the methodological appropriateness of using futures in the regional context. The findings emphasize the significance of gold and silver as instruments for mitigating price risk, providing practical guidance for stabilizing the returns of agricultural portfolios in Vojvodina.

The wheat market in Vojvodina during 2019–2024 experienced moderate price fluctuations reflecting both global and local shocks, including the COVID-19 pandemic and the war in Ukraine. In 2022, total traded volume reached 156,719 tons, including government purchases of 82,875 tons for strategic reserves, with a peak price of

44.00 RSD/kg for the 2021 crop in May . Between March and April 2024, prices ranged from 23.20 to 23.50 RSD/kg, with a weighted average of 23.29 RSD/kg (25.61 RSD/kg including VAT), reflecting moderate fluctuations and underscoring the relevance of hedging strategies to mitigate market risk. These observations confirm that local wheat prices in Vojvodina are sensitive to global disruptions, supporting the implementation of risk management tools such as portfolios incorporating precious metals.

METHODOLOGY

The methodology of this study uses logarithmic returns to measure daily price changes of wheat, gold, and silver. Minimum variance portfolios, along with the Hedging Effectiveness Index (HEI) and Sharpe ratio, are applied to evaluate risk reduction and risk-adjusted returns for hedged wheat portfolios.

Daily logarithmic returns of wheat were calculated based on futures prices, whereas for the precious metals, gold and silver, their daily spot prices were employed. The returns were computed according to the following formula:

$$r_t = \ln \frac{P_t}{P_{t-1}} \tag{1}$$

Here P_t denotes the asset price on day t. This approach allows for a precise assessment of volatility and the interdependence between wheat and precious metal prices, forming the basis for constructing minimum-variance portfolios.

For the construction of bivariate wheat–gold and wheat–silver portfolios, the principles of Markowitz's portfolio theory were applied, using the formula of to determine the optimal weights of the hedging asset:

$$Ws = \frac{\sigma p^2 - COVp,s}{\sigma p^2 + \sigma s^2 * 2 * COVp,s} \tag{2}$$

$$Wp = 1 - Ws \tag{3}$$

Where:
W_s – the weight of the secondary asset (s) in the two-asset portfolio,
W_p – the weight of the primary asset (p),
σ_p^2 – the variance of the primary asset,
σ_s^2 – the variance of the secondary asset,
COV_{ps} – the covariance between the two assets.

Based on the covariance and return volatilities, the weights that minimize the overall portfolio risk are calculated, achieving an efficient and time-adjusted allocation of capital.

Hedging effectiveness is quantified using the Hedge Effectiveness Index (HEI), which measures the contribution of the secondary asset in reducing portfolio risk. The HEI is calculated as:

$$HEI = \frac{\sigma^2 nehedžirana - \sigma^2 hedžirana}{\sigma^2 nehedžirana} \tag{4}$$

The index compares the variance of an unhedged portfolio with that of a hedged portfolio (investment in both primary and secondary assets). HEI values close to 1 indicate effective hedging, values near zero suggest minimal impact, and negative values imply that hedging may increase risk . This approach quantifies risk reduction while acknowledging that risk can never be fully eliminated, a core principle of modern hedging theory.

Finally, portfolio performance is assessed using the Sharpe ratio. While HEI captures hedging efficiency, the Sharpe ratio evaluates the risk–return trade-off, measuring the additional return per unit of risk and enabling performance comparison across portfolios . Mathematically, it is expressed as:

$$Sharpe\ racio = \frac{r_p - r_f}{\sigma_p} \tag{5}$$

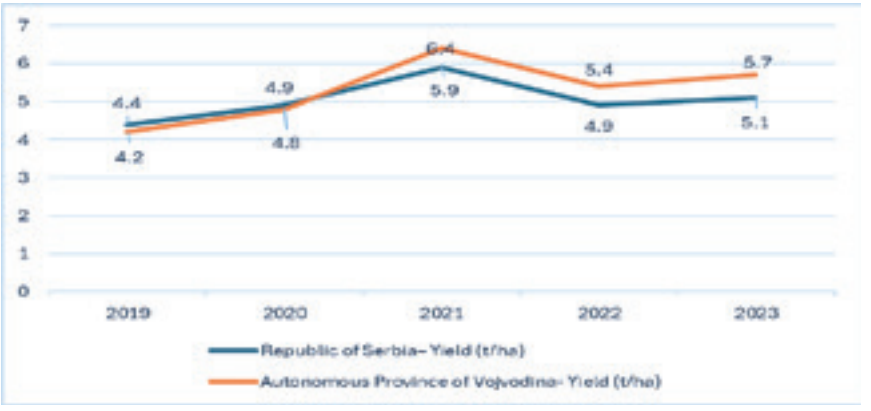
Where:
r_p – portfolio return,
r_f – risk-free rate, and
σ_p – portfolio standard deviation.

As one of the most relevant and widely used measures of investment performance in contemporary academic literature and practice , it serves as a key tool for evaluating portfolio efficiency under conditions of market volatility.

RESULTS AND DISCUSSION

The aim of this analysis is to evaluate the effectiveness of hedging wheat prices in Vojvodina using precious metals, gold and silver. Bivariate minimum variance portfolios were constructed combining wheat with each metal. The analysis is based on daily CBOT wheat futures (ZW.F) and daily spot prices of gold and silver, retrieved from the Stooq platform. The data cover the period from January 2019 to April 2024, including the COVID-19 pandemic and the war in Ukraine. Figure 1 shows wheat yields in Serbia and Vojvodina, emphasizing the importance of Vojvodina in total production.

Figure 1. Wheat Yields in Serbia and Vojvodina (2019–2023)



Source: Compiled by the author using RZZS data

Figure 1 illustrates the average wheat yields (t/ha) in the Republic of Serbia and the Autonomous Province of Vojvodina for the period 2019–2023. The data show that Vojvodina consistently achieves slightly higher yields than the national average, highlighting its significant regional role in wheat production. In 2019–2020, the difference in yields between Vojvodina and Serbia was minimal (2019 – 4.2 t/ha in Vojvodina vs. 4.4 t/ha in Serbia; 2020 – 4.8 t/ha in Vojvodina vs. 4.9 t/ha in Serbia). The year 2021 recorded the highest yield increase for both regions, with Vojvodina reaching 6.4 t/ha and Serbia 5.9 t/ha, reflecting favorable agro-economic conditions. After 2021, yields slightly declined and stabilized: in 2022, Vojvodina reached 5.4 t/ha and Serbia 4.9 t/ha, while in 2023 there was a modest increase (Vojvodina – 5.7 t/ha; Serbia – 5.1 t/ha). Data for 2024 are not yet available, which is why the analysis is presented up to 2023.

The increased stability and relatively high average wheat yields in Vojvodina suggest that this region may be suitable for implementing hedging strategies, which will be further examined through the calculated indicators of minimum variance portfolios, HEI index, and Sharpe ratio.

Descriptive Statistics of Individual Assets

Table 1. Descriptive statistics of returns for wheat, gold, and silver over the period from January, 2019, to April, 2024.

Assets	Mean	Variance	Skewness	Kurtosis
Wheat	0,00801	0,93645	0,66222	5,24861
Gold	0,01976	0,16014	-0,37791	3,22626
Silver	0,02524	0,65830	-0,52725	7,71184

Source: Author's calculations based on data retrieved from www.stooq.com

Based on Table 1, silver and gold exhibit the highest mean returns, while wheat has the lowest. Wheat's average daily growth rate is near zero, indicating that despite high prices, its series experienced significant negative returns due to strong price fluctuations. Variance, as a measure of risk, is highest for wheat (0.936) and lower for precious metals (silver 0.658, gold 0.160), suggesting that these metals are suitable hedging instruments. Skewness shows negative values for gold (-0.377) and silver (-0.527), and positive for wheat (0.662), reflecting the distribution of returns around the mean. High kurtosis values (kurtosis > 3) indicate extreme daily deviations, with silver showing the highest (7.711) due to economic and geopolitical turbulence, while gold remains relatively stable (3.226), confirming its role as a safe-haven asset. These skewness and kurtosis characteristics do not affect the construction of bivariate portfolios, which rely solely on variances and covariances.

Comparison of Minimum Variance Portfolios

Tabela 2. Comparative Allocation of Portfolio Instruments (in %)

Weight	Wheat_gold	Wheat_silver
Wheat	31.00	44.91
Secondary instruments	69.00	55.09
Total	100.00	100.00

Source: Author's calculations based on data retrieved from www.stooq.com

Table 2 presents the results of the constructed bivariate portfolios aimed at minimizing wheat risk, showing wheat as the primary asset and gold and silver as secondary assets. In our analysis, precious metals account for 55.09% of silver and 69% of gold in the portfolios. It is evident that the secondary assets hold a substantially higher share than the primary asset, which is expected given their significantly lower risk. The high allocation of precious metals, particularly gold, reflects their lower volatility and safe-haven role, with their portfolio weight increasing as the risk of the primary asset rises. Our findings are consistent with in the context of equities and gold, indicating that optimal metal shares depend on market trends. During periods of rising prices, metals enhance the risk–return profile, whereas in declining markets they help reduce risk, albeit with lower returns. These results confirm that gold and silver act as effective hedging instruments in wheat portfolios, highlighting the importance of adjusting metal shares in accordance with market conditions.

Descriptive Statistics of Wheat and Constructed Portfolios

Table 3: Descriptive statistics of constructed portfolios and the wheat

Portfolio's combination	Mean	Variance	Skewness	Kurtosis
Wheat	0,00801	0,93645	0,66222	5,2486
Wheat_gold	0,01065	0,05260	-0,11725	6,20046
Wheat_silver	0,00537	0,11798	-0,09434	4,74616

Source: Author's calculations based on data retrieved from www.stooq.com

After constructing the bivariate portfolios, the next step is to evaluate their performance in terms of the first four moments. To this end, Table 3 presents the descriptive statistics of the constructed portfolios. As shown in Table 3, both portfolios exhibit substantially lower variance compared to the primary asset, as well as lower variance relative to the empirical series of the auxiliary assets. This finding confirms the effectiveness of diversification, indicating that the risk of wheat is significantly reduced through the inclusion of precious metals in the portfolio. For instance, the variance of the unhedged wheat portfolio amounts to 0.936, while it decreases to 0.117 after adding silver. An even more pronounced effect is observed in combination with gold, where the variance of the wheat–gold portfolio is only 0.052, nearly 18 times lower than that of the unhedged wheat portfolio, confirming that gold serves as a more efficient risk-hedging instrument.

Regarding the third moment, i.e., skewness, the wheat–silver portfolio exhibits more favorable characteristics, with lower negative skewness and lower kurtosis of

4.746 compared to the wheat–gold portfolio, indicating a more desirable return distribution. In addition to Table 3, which presents the portfolio characteristics, Figure 2 shows a combined view of the time series for the constructed portfolios and the primary asset. This visualization clearly illustrates the daily return dynamics over the observed period, with the portfolios exhibiting considerably lower fluctuations compared to the empirical wheat series.

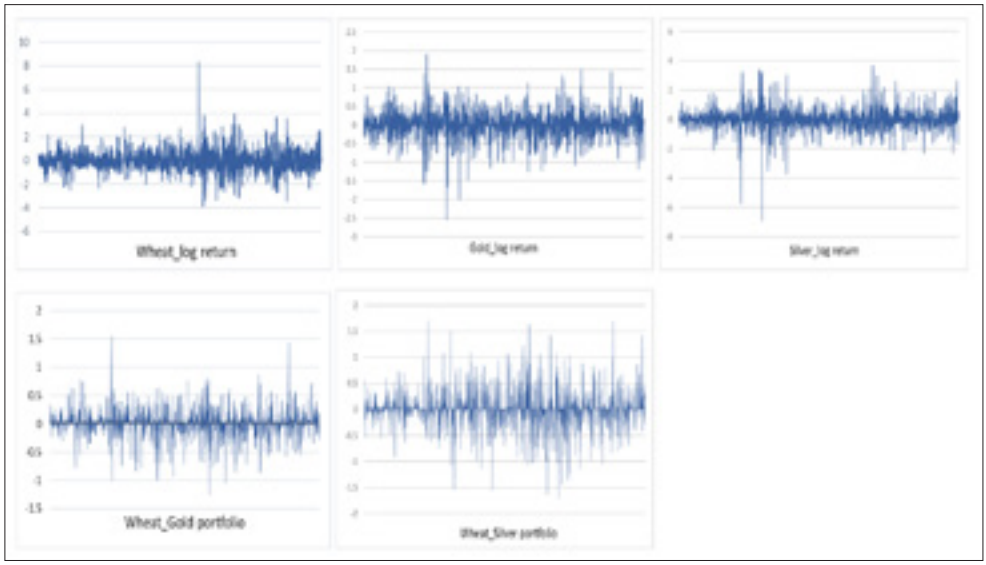


Figure 2. Comparison of Returns of Individual Assets and the Portfolio

Source: Author's calculation based on data retrieved from Stooq.com

As shown in Figure 2, during the COVID-19 pandemic, wheat returns increased by approximately +10%, followed by a decline of around –5% due to supply chain disruptions and heightened market uncertainty. In early 2022, amid the war in Ukraine, another period of volatility occurred, with a short-term price surge followed by a drop in returns of about –4%. Gold exhibited stable positive returns (up to +2% during the pandemic and around +1.5% during the war), whereas silver experienced wider fluctuations (ranging from –8% to +6%) due to its industrial exposure. In the Vojvodina market, these global shocks led to higher input costs and elevated production risks, while wheat–gold and wheat–silver portfolios, showing lower volatility (approximately –1.5% to +1.5%), confirmed the effectiveness of diversification and the hedging role of precious metals.

Performance and Hedging Efficiency Analysis

The analysis of portfolio performance and hedging efficiency, based on the Hedging Effectiveness Index (HEI) and the Sharpe ratio, highlights the role of gold and silver in stabilizing wheat portfolios from Vojvodina under conditions of heightened market uncertainty.

Table 4: HEI index values

Portfolios' combinations	HEI index
Wheat_gold	94,38%
Wheat_silver	87,40%

Source: Author's calculations based on data retrieved from www.stooq.com

Our results indicate that hedging wheat with precious metals effectively reduces exposure to price volatility. These findings support Hypothesis H1, which states that hedging wheat with gold significantly lowers portfolio risk in Vojvodina, as reflected in high values of the Hedge Effectiveness Index (HEI). As shown in Table 4, the HEI confirms this effect. The wheat–gold portfolio achieves 94.38%, while the wheat–silver portfolio reaches 87.40%, demonstrating substantial risk reduction and strong protection during crisis periods.

Table 5: Comparative overview of Sharpe ratio values

Portfolios' combinations	Sharpe ratio of wheat	Sharpe ratio of portfolios
Wheat_gold	0,0086	0,2025
Wheat_silver	0,0086	0,0456

Source: Author's calculations based on data retrieved from www.stooq.com

Building on this, our results also support Hypothesis H2, showing that hedging with silver reduces portfolio risk, although to a lesser extent than gold. Similarly, Hypothesis H3 is confirmed, as the Sharpe ratio illustrates improved risk–adjusted returns: the wheat–gold portfolio achieves a Sharpe ratio of 0.2025, whereas the wheat–silver portfolio reaches 0.0456, compared to 0.0086 for the unhedged wheat portfolio. Together, these metrics demonstrate that hedging with precious metals not only lowers absolute risk but also enhances the risk–return trade-off, offering practical protection for wheat producers and investors in Vojvodina against price fluctuations caused by global shocks, such as the COVID-19 pandemic and the war in Ukraine.

These findings are consistent with, confirming gold as the most efficient instrument for risk reduction in agricultural portfolios, and align with prior studies. show that precious metals serve as effective hedges against geopolitical risks across various commodities, while demonstrate that combining gold with the S&P 500 reduces portfolio risk and improves both HEI and Sharpe ratios. Furthermore, these results correspond with, who reported that gold improves risk-adjusted returns in bullish markets and reduces risk in bearish markets at the cost of lower returns. In our study, gold proves to be the most efficient hedging instrument for wheat, while silver provides moderate risk reduction, confirming that precious metals are effective hedging tools and that their optimal allocation depends on market conditions.

CONCLUSSION

The results of this study demonstrate that hedging wheat with precious metals, particularly gold, effectively reduces portfolio risk and improves the risk–return trade-off in the Vojvodina market. Hedging with gold achieves the highest efficiency (HEI 94.38%, Sharpe 0.2025), while silver provides moderate risk reduction (HEI 87.40%,

Sharpe 0.0456), confirming Hypotheses H1–H3. These findings align with, who identifies gold as the most effective hedging instrument in agricultural portfolios, as well as with and, which highlight the protective role of precious metals against geopolitical and market risks. The results also support , showing that gold enhances risk-adjusted returns in bullish markets and reduces risk in bearish markets, whereas silver provides moderate protection. Practically, these strategies help wheat producers and investors in Vojvodina mitigate price volatility, stabilize portfolios, and increase predictability of returns, especially under conditions of heightened market uncertainty such as the COVID-19 pandemic and the war in Ukraine. This study contributes to understanding market mechanisms in Serbia's agricultural sector and confirms the effectiveness of precious metals as hedging instruments locally. Future research could extend the analysis to other Western Balkan countries, incorporate futures contracts, and include additional commodities to further optimize regional agricultural portfolios.

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ORIGINALNI NAUČNI RAD / ORIGINAL SCIENTIFIC PAPER

SHAPING DIGITAL CULTURE FOR SUSTAINABLE COMPETITIVE ADVANTAGE: EVIDENCE FROM BOSNIA AND HERZEGOVINA AND BULGARIA

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Abstract: *Digital culture is recognised as one of the key company competencies associated with a sustainable competitive advantage. Leaders play a vital role in creating a digital culture that enhances the company's digital competencies by investing in individual and company knowledge to increase its innovation capacity. The study indicates that combining transformational and transactional leadership is essential for shaping digital culture successfully. The positive correlation between the level of development of digital culture and competitive advantage highlights the strategic importance of digital culture in raising a company's digital maturity and ability to compete. The findings that companies in Bosnia and Herzegovina and Bulgaria invest more in company knowledge than individual knowledge open new perspectives in strategic planning. Companies should balance knowledge investment at individual and company levels to foster innovation. As leadership, digital culture, and balanced knowledge investment collectively contribute to innovation and sustainable competitive advantage, there is a need for a holistic approach to address this issue.*

Keywords: *digital culture, leadership, digital knowledge investment, innovation, competitive advantage*

JEL Classification: *L21, M15, M54, O32*

INTRODUCTION

The notion of sustainable competitiveness pertains to the attributes and proficiencies of the company that enable it to surpass competitors in meeting consumer

demands, i.e., producing value that is hard to replicate. This necessitates ongoing investments in company and individual knowledge to boost innovative potential. Digital innovations and the effective execution of digital transformation are critical components of sustainable competitiveness (Chege, Wang, & Suntu, 2020). Digital transformation involves the integration of internal and external resources through information and communication technologies to adapt to the changing digital world, reshaping the corporate vision, strategy, organizational structure, processes, capabilities and culture (Vial, 2019). Evolving technology enables managers to organize employees' tasks better to increase productivity and effectiveness (Ilić, Ostojić, & Ilić, 2024). Businesses that embark on a digital transformation journey undergo significant organizational changes. This implies new business forms and the application of innovative solutions inherent in the modern digital age. Digital transformation is not only about digital technologies (Kuczewska, Praničević, Borowicz, & Talaja, 2023).

Leaders need to help employees embrace change and provide support in creating a new belief system woven into the organisational culture that supports digital transformation. A leader should be emotionally intelligent, lead the process democratically, share responsibilities, be decisive and cooperative, motivate employees, and give them regular feedback (Oberer & Erkollar, 2018). Digital transformation is complex and is often an obstacle to digital transformation (Velyako & Musa, 2023). Organisational culture often reflects the surface level of the relationship between employees and the organisational environment (Ryan, Horvath, Ployhart, Schmitt, & Slade, 2000). Knowledge management can only be successful if the organisational culture supports knowledge flow (Davenport, DeLong, & Breers, 1998). Technology is often at odds with organisational culture, so changing organisational culture is one of the most challenging tasks of leaders (Zhou & Fink, 2003; Gallivan & Srite, 2005). Social measures, such as proactive leadership and a culture of openness, create a positive organisational climate and the technical infrastructure facilitates knowledge flow (Jaganjac, Pulić, Radovanović, Virijević Jovanović, & Handžić, 2018). To successfully shape a digital culture, leaders need to have the knowledge, skills, and abilities that create the climate for a sustainable competitive advantage. This implies industry knowledge, strategic agility, negotiation, managerial, and digital skills, and the ability to build business networks (Jaganjac, & Lukić-Nikolić, 2023)

Leaders often consider conflicting ideas about future business directions in a business taking place under numerous economic, political, social, and technological influences. At the same time, they should demonstrate the ability to ensure the day-to-day functioning of the organisation. Leadership focuses on transforming organisational culture by reinforcing fundamental values that highlight the intended outcome and developing new values that support the more effective performance of the individual, group, and company, taking into account the internal and external business environment. Bolman and Deal (2013) emphasise the importance of aligning organisational behaviour and leadership with the changes that working in a digital environment entails.

According to Peters and Waterman (2006), the stronger and more market-oriented the organisational culture is, the less there is a need for strict structures, procedures, and rules, and organisations are more driven by creating value for all interested parties. Inadequate organisational culture detrimentally impacts business operations as

it tends to be inflexible, inefficient, and resistant to change. Moreover, a strong organisational culture can hinder an organisation's ability to adapt to new technology and environmental situations as quickly as needed. This can cause organisations to lose their competitive advantage over their rivals. An organisational culture suitable for digital transformation does not have a fixed set of characteristics. However, certain key features can be identified, such as a focus on the external environment, a high level of decentralisation, investment in knowledge and employee skills, technology, a willingness to take calculated risks and tolerate errors, teamwork, innovation, and response to changes in the environment (Tuukkanen, Wolgsjo & Rusu, 2022).

Digital culture requires leaders to take on roles beyond traditional management functions. Leaders should be catalysts for change, shaping an organisational culture that promotes digital innovation and learning (Petrie, 2011). Companies with a strong digital culture use digital tools, have a developed digital infrastructure, are focused on the customer, invest in the knowledge and skills of employees, and innovate to ensure a sustainable competitive advantage.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Digital culture, leadership, sustainable competitiveness

Digital culture aims to increase a company's maturity for successful digital transformation. Digital culture is based on cooperation, creativity, and innovation, leading to business improvement by exchanging digital strategies between leaders and employees. Leaders help digital transformation by managing the process and ensuring its sustainability (Estensoro, Larrea, Muller, & Sisti, 2022). Thmeans that digital leaders should be able to develop new business models (Durmus, 2022) while ensuring the balance of old and new ways of working during the transformation process. Leaders with a digital transformation mindset build networked organisations for collaboration and find digital competencies (Frankowska& Rzeczycki, 2020; Bresciani, Huarng, Malhotra, & Ferraris, 2021).

Understanding digital leadership implies analysing the effectiveness of transactional and transformational styles when creating a digital culture. Transactional leadership ensures efficient performance of routine tasks, while transformational style ensures initiatives that add value. Transactional leaders tend to rely on established processes and resist change, hindering the implementation of digital tools and strategies (Tams & Burke, 2018). Numerous studies have shown transformational leadership is the best for initiating organisational culture changes and innovation processes (Matzler, Schwarz, Deutinger, & Harms, 2008; Garcia-Morales, Jimenez-Barrionuevo, & Gutierrez-Gutierrez, 2012; Klaic, Burtscher, & Joans, 2020). These leaders encourage followers to transcend their interests in favour of organisational goals, thereby developing a strong digital culture (Schwarzmüller, Brosi, Duman, & Welpe, 2018). Transformational leaders change an organisation's culture by inspiring a sense of mission and purpose about the importance of the group's work and stimulating new ways of thinking and problem-solving (Gavrić & Jaganjac, 2020).

Transformational leadership has been proven to enhance employee and organisational performance, particularly in fast-paced, dynamic digital environments (Fitzgerald, Kruschwitz, Bonnet, & Welch, 2014) (Purvanova & Bono, 2019). According to Hess, Matt, Benlian, & Wiesböck (2016), transformational leaders can motivate and

strategize, utilising digital tools to effectively develop and implement changes that enhance digital culture and competitiveness. While transformational leadership is acknowledged as authentic digital leadership (Ghafoor, Qureshi, Khan, & Hijazi, 2011) transactional leadership also plays a part in digital transformation, necessitating staff members to maintain their attention on particular tasks and objectives associated with digital initiatives (Brynjolfsson & McAfee, 2014). In the digital age, where leaders must strike a balance between allowing creativity and experimentation and establishing clear expectations, a blend of both leadership philosophies known as situational leadership has proven very effective (Bass & Riggio, 2006; Avolio & Gardner, 2005). By employing this approach, managers can efficiently supervise daily tasks, motivate creativity in problem-solving, and investigate new digital possibilities. Combining transformational and transactional leadership helps companies establish structure and order while encouraging innovation and adaptability for long-term success in the digital era (Nguyen, Groth, & Johnson, 2016).

According to Bogdanić (2012), depending on the company's operations and demographics, mid-level managers in Bosnia and Herzegovina are dedicated to participatory leadership but also hold onto some aspects of non-participative leadership. Similar to the production sector (Pencheva, 2018), research on the characteristics of leadership styles in the service industry in Bulgaria (Petkova-Gourbalova, 2015) revealed that transactional and transformational leadership styles are equally applicable. Studies on leadership styles in the Balkans (Doğar, 2021) revealed that, while autocratic leadership components remain prevalent, a general shift towards transformational leadership is noticeable. Organisational culture is recognised as the main competence associated with sustainable competitiveness, given that it is specific for each company and difficult to imitate (Lismen, Margaret, & Ed,2004).

Business development and competitiveness are achieved through a high-performance culture (Azeem, Ahmed, Haider, & Sajjad, 2021). Building key company capabilities based on organisational culture enables better market positioning and a sustainable competitive advantage (King & Zeithaml, 2000). Digital organisational culture significantly affects the sustainable performance of the company (Gonzales, Guijarro, & Guzman, 2023). According to Velyako and Musa (2023), digital culture improves a company's digital capabilities, contributing to innovations that ensure a sustainable competitive advantage. According to Strukan, Makić, Ibrahimpašić, Bećiraj, & Fazlić (2017), organisational culture and economic performance in Bosnian and Herzegovina's businesses are strongly correlated, which can result in long-term competitive advantages. Bearing in mind the role and significance of transformational and transactional leadership styles in shaping digital culture, as well as the relation between digital culture and sustainable competitive advantage, the following hypotheses are developed:

H1: When shaping the digital culture in companies in Bosnia and Herzegovina and Bulgaria, a combination of transformational and transactional leadership styles is mostly applied.

H2: There is a positive correlation between the level of digital culture development and the sustainable competitive advantage of companies in Bosnia and Herzegovina and Bulgaria.

Investment in individual and company knowledge, innovations

In a rapidly changing technological environment, it is necessary to meet the equally changing demands of customers. As a result, businesses depend on digital technology to boost employees' and process efficiency (Hervé, Schmitt, & Baldegger, 2020). The synergy theory between human resources and sustainable development is based on understanding the impact of digitalization processes on human capital development and responding to current challenges to achieve organizational success (Vasilev, Stefanova, & Popescu, 2023). In addition to giving staff members the time, resources, and technological access they need to engage in digital innovation, a supportive digital culture encourages candid communication and teamwork (Chillakuri & Vanka, 2022). Investments in the company and individual knowledge should be aligned so that (Klingenberg, Borges, & Antunes Jr, 2021) the company stays ahead of the competition and leverages knowledge towards innovation by utilising employee digital skills in conjunction with digital technology. By integrating and mobilising knowledge, a company's digital capabilities speed up innovation (Cohen, Amoros, & Lundy, 2017). Depending on the digital strategy, knowledge can be directed towards innovations related to products, services, processes, marketing, or business models.

Companies cannot keep pace with technological innovation due to a gap in employees' digital skills, leading to a loss of competitive advantages (Feijao, Flanagan, Van Stolk, & Gunashekar, 2021). A lack of digital skills affects innovation, customer experience, and satisfaction. For companies to be agile and respond to changes in the environment, leaders need to find a way to integrate learning into the daily work experience (Lundqvist, Wallo, Coetzer, & Kock, 2023). Comparing investments in company knowledge in Bosnia and Herzegovina with European countries (Turulja, Alagić, Džananović, & Kačapor, 2021), companies using Enterprise Resource Planning (ERP) rank low along with Bulgaria, Romania, and Hungary, while companies using Customer Relationship Management (CRM) to analyse customer data are at the penultimate place. Only 14% of companies use two or more social media, while Hungary, Bulgaria, and Romania have a slightly lower percentage.

The total turnover of SMEs from sales via e-commerce was 5%, ahead of Bulgaria and Cyprus, with a turnover of 2%. As for innovation results, Bosnia and Herzegovina is at the bottom of the ranking, behind Bulgaria, Romania, and Hungary. In Bosnian companies operating on the international market, digital transformation is incorporated through ERP software solutions, Document Management Systems (DMS), CRM systems and Supply Chain Management (SCM) systems in the public or private cloud, and the situation is more favourable in these companies. Most companies in Bosnia and Herzegovina invest less than 5% of their annual turnover in digitization and the improvement of the digital competencies of their employees. Most employees have below-average digital skills, except basic digital skills such as using e-mail, Internet browsers, and social networks. Bosnia and Herzegovina, Cyprus, and Bulgaria rank lowest amongst the countries whose employees have been given portable devices that enable a mobile connection to the Internet for business use.

In the USA, the situation with digital skills is also not better. According to research (Bergson-Shilcock, & Taylor, 2023), 92% of the jobs that were analysed required digital skills across all industries, and one-third of workers lacked basic digital skills, while another portion did not have the opportunity to acquire them. Considering

the fact that companies generally invest insufficiently in the digital skills of their employees, the hypothesis is developed:

H3: Companies in Bosnia and Herzegovina and Bulgaria invest to a lesser extent in the development of employees' digital skills compared to company knowledge.

RESEARCH METHOD AND DATABASE

To explore the relationship between leadership style and the shaping of organizational culture in the digital era, an online survey was used to collect responses from companies in Bosnia and Herzegovina and Bulgaria.

Sample. Service companies in Bosnia and Herzegovina and Bulgaria were taken as a sample. A stratified selection of participants was used to ensure representativeness across the entire service sector, including health, education, tourism and hospitality, finance, and insurance. The stratified sample was based on the following criteria: industry, company size, market presence (whether the company operates locally, regionally, or internationally), and company age (including startups to established companies over 25 years old).

To reach a representative number of companies according to this segmentation, we utilized business connections, employer associations, and social platforms. The invitation was sent with a clear message about the research's purpose and a guarantee of anonymity.

Process. The analysis of the conducted research is divided into two parts. First, respondents were asked to answer a series of demographic questions to determine their suitability for inclusion in the study. The demographic section of the questionnaire included questions such as the service sector to which they belong, the size of the market, the age of the company, and the number of employees. The second part of the questionnaire addressed questions that tested the hypotheses. Thus, the second part of the questionnaire included digital culture and leadership, where leadership style was investigated and how it affects digital culture in the organization, the sustainability of competitive relations, i.e. the observed impact of digital culture on the company's long-term competitiveness and investment in company knowledge - where the level of investment in company knowledge, as well as individual digital skills, was evaluated.

Table 1. Demographic and main features of the database (% of respondents)

Feature	Bosnia and Herzegovina	Bulgaria	Total
Service Industries			
- Healthcare	48.2%	32.2%	40.2%
- Education	21.2%	25.4%	23.3%
- Tourism and Hospitality	11.8%	12.7%	12.25%
- Finance and Insurance	18.8%	26.3%	22.55%
Number of Employees			
- Over 250 employees	7.1%	9.3%	8.2%
- 50-249 employees	29.4%	22.9%	26.15%

- 10-49 employees	40%	36.4%	38.2%
- Under 10 employees	23.5%	31.4%	27.45%
Market Orientation			
- Domestic	55.3%	64.4%	59.85%
- Regional	34.1%	26.3%	30.2%
- International	10.6%	9.3%	9.95%
Company Longevity			Total
- Over 25 years	47.1%	50.8%	
- 10-25 years	42.4%	25.4%	40.2%
- 2-9 years	9.4%	19.5%	23.3%
- Less than 2 years	1.1%	4.3%	12.25%

Source: Own editing

Table 1. Demographic characteristics of respondents provide insight into participants' business characteristics in two service-focused countries. For both countries, Bosnia and Herzegovina and Bulgaria, the table contains sample data on industry type, company size, market orientation, and company age. The table shows that in Bosnia and Herzegovina, most of the companies in the sample are in the health services sector, whereas the education sector is better represented in Bulgaria. Most companies in both countries are small, with 10 to 49 employees. The companies primarily serve the domestic market, but a significant percentage is present at the regional level. Additionally, a significant percentage of companies have been operating for over 25 years in both countries, indicating the maturity of the service sector. This data can provide insight into factors that influence digital culture and sustainable competitiveness in the service sectors of both countries.

Data analysis. Data analysis was conducted based on responses to an online questionnaire designed to measure digital culture, leadership style, sustainable competitiveness, and investment in digital knowledge and skills within the organization. The questionnaire used a 5-point Likert scale (1 = completely disagree to 5 = completely agree) and covers three key dimensions. 1) Leadership style – here, questions measured transformational and transactional leadership approaches. The questions aim to measure the impact of the leadership approach on digital transformation and the overall work environment. For example: "Our leader regularly shares the vision of the company's digital transformation with the entire team," or "In our company, innovative ideas about digital projects are always welcome and encouraged." 2) Sustainable competitiveness – questions in this segment explore how digital culture contributes to sustainable competitive advantage.

Example questions include: "Compared to competitors, we manage costs more efficiently" and "Our products and services have a higher quality than those of our competitors." 3) Investment in individual and company knowledge – this section explores the extent to which organizations invest in the digital skills and knowledge of their employees and in knowledge at the level of the entire company. This includes questions like: "To what extent does your company invest in developing employees' digital skills, such as collaboration platforms, online customer communication, and

data analysis?" or "To what extent does your company invest in company knowledge to improve business processes, such as improved web presence, CRM, and digital marketing tools?"

The answers were analyzed in SPSS. Descriptive statistics were used to summarize demographic variables. Internal consistency was assessed using Cronbach's alpha, with all constructs achieving values greater than 0.70. To test the first hypothesis, multiple linear regression analysis was applied to examine the impact of transformational and transactional leadership styles on the development of digital culture in companies from Bosnia and Herzegovina and Bulgaria. To test the second hypothesis, Pearson's correlation coefficient was used to determine the relationship between digital culture and sustainable competitive advantage. Finally, a paired t-test was used to compare the level of investment in digital skills against the overall investment in company knowledge. This analytical approach enabled the verification of the data's validity and reliability.

RESULTS

Before testing the hypotheses, the data's reliability and validity were assessed, as shown in Table 2. Table 2 presents the results of the reliability measurements, as indicated by Cronbach's alpha. All analyzed variables demonstrated high internal consistency, with leadership (0.872), company knowledge (0.913), individual knowledge (0.827), competitiveness (0.864), and digital culture (0.827) all exceeding the recommended threshold of 0.7.

Table 2. Reliability and factor analysis results

Construct	Cronbach's Alpha	Number of Items	Communalities Initial	Communalities Extraction	Component Matrix
Leadership	0.872	8	1.000	0.656	0.810
Company Knowledge	0.913	6	1.000	0.753	0.868
Individual Knowledge	0,827	3	1.000	0.843	0.918
Competitiveness	0.864	7	1.000	0.694	0.833
Digital Culture	0,827	2	1.000	0.551	0.742

Source: Own editing

To test the first hypothesis, a multiple linear regression analysis was conducted to examine the impact of transformational and transactional leadership styles on the development of digital culture in companies in Bosnia and Herzegovina and Bulgaria. In each national sample, digital culture was treated as a dependent variable, and transformational and transactional leadership as independent predictors. The regression models were evaluated using the coefficient of determination (R^2), ANOVA tests for overall model significance, and Durbin–Watson statistics to assess autocorrelation in the residuals. This approach allowed for a detailed assessment of the extent to which leadership styles explain variations in digital culture across the two contexts. The use of regression analysis provided insights not only into the strength and direction of the relationships but also into the relative contribution of each leadership style in predicting digital culture development.

Table 3. Regression analysis results for the impact of leadership styles on digital culture

Dependent Variable: Digital Culture	Transformational Leadership (BiH)	Transactional Leadership (BiH)	Transformational Leadership (BUL)	Transactional Leadership (BUL)
Standardized Coefficient (β)	0.58	0.32	0.46	0.27
Significance (Sig.)	0.000	0.021	0.000	0.031
R^2	0.73		0.68	
ANOVA (F; Sig.)	F = 41.414; Sig. = 0.000		F = 32.214; Sig. = 0.000	
Durbin–Watson	1.88		1.83	

Source: Own editing

The analysis of regression models carried out for two countries — Bosnia and Herzegovina and Bulgaria — examined the influence of transformational and transactional leadership on the development of digital culture. In both models, the dependent variable was digital culture, while the independent variables represented two forms of leadership. The obtained results show that the models are statistically significant, satisfying the level of variability explanation. The coefficient of determination (R^2) for the model of Bosnia and Herzegovina is 0.73, while for the model of Bulgaria it is slightly lower at 0.68. These indicators suggest that the selected variables explain approximately 70% of the variability of digital culture, which points to the good representativeness of the model and the adequacy of the included predictors.

In terms of regression coefficients, the results show that transformational leadership has a more pronounced impact on digital culture than transactional leadership. In the model for Bosnia and Herzegovina, the standardized beta coefficient for transformational leadership is $\beta = 0.58$ ($p < 0.01$), while for transactional $\beta = 0.32$ ($p < 0.05$). In the model for Bulgaria, the values are somewhat lower, where transformational leadership has a coefficient of $\beta = 0.46$ ($p < 0.01$), and transactional $\beta = 0.27$ ($p < 0.05$). These data clearly indicate that in both contexts the transformational style has a stronger connection with the development of digital culture, while transactional leaders have a moderate, but still statistically significant influence.

The results of the Durbin–Watson test are 1.83 for the model of Bosnia and Herzegovina and 1.88 for the model of Bulgaria, which indicates a slight negative autocorrelation of the residuals, but within acceptable limits, as the values are in the interval between 1.5 and 2.5. This means that there is no significant problem of serial correlation of errors, and the models can be considered reliable.

Overall, the regression analyses confirm that both models are well specified and statistically valid. The higher value of beta coefficients and R^2 in the model for Bosnia and Herzegovina indicates that in this context, leadership — especially transformational — is a stronger driver of the development of digital culture than in Bulgaria. This finding can be connected with the fact that organizations in Bosnia and Herzegovina are more intensively facing the processes of digital adaptation, so the role of leaders in motivating and directing employees is of crucial importance.

In conclusion, the results empirically confirm that leadership style has a statistically significant influence on the formation of digital culture, with the transformational approach showing greater predictive power than the transactional approach.

Both models achieve high reliability and explained variability greater than 70%, with minimal indications of autocorrelation. This confirms the stability of the regression models and the clearly defined connection between leadership and digital culture in both analysed national contexts. To test Hypothesis 2, Pearson's correlation coefficient was used. Hypothesis 2 posits a positive correlation between the level of development of digital culture and sustainable competitive advantage in companies in Bosnia and Herzegovina and Bulgaria (Table 4).

Table 4. Pearson Correlation Coefficients between competitiveness sustainability and digital culture

Correlations			
		Competitiveness_ sustainable	**Digital_culture**
Competitiveness_sustainable	Pearson Correlation	1	,652**
	Sig. (2-tailed)		,000
	N	203	203
Digital_culture	Pearson Correlation	,652**	1
	Sig. (2-tailed)	,000	
	N	203	203

**. Correlation is significant at the 0.01 level (2-tailed).
Source: Own editing

The sample size is 203, and the Pearson correlation coefficient shows a strong positive relationship between the development of digital culture and sustainable competitive advantage ($r = .652$, $p < .001$). The correlation is statistically significant at the 0.01 level, which means that the results are not random. The value of the coefficient $r = .652$ indicates a strong connection: as digital culture improves, so does competitive advantage. The results confirm Hypothesis 2, which posits that companies in Bosnia and Herzegovina and Bulgaria with a developed digital culture are highly likely to achieve a longer-term competitive advantage. To test Hypothesis 3, which asserts that companies in Bosnia and Herzegovina and Bulgaria invest to a lesser extent in the development of employees' digital skills than in company knowledge, the independent-samples t-test was used. This statistical test was selected to compare the mean scores for company knowledge and individual knowledge across the two countries (Table 5).

Table 5. Independent samples t-test results for company and individual knowledge

Independent Samples Test										
		t-test for Equality of Means								
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Company_ knowledge	Equal variances assumed	21,230	,000	-5,164	201	,000	-1,29310	,25041	-1,78687	-,79934
	Equal variances not assumed			-4,924	147,433	,000	-1,29310	,26260	-1,81205	-,77416
Individual_ knowledge	Equal variances assumed	11,644	,001	-5,124	201	,000	-2,37931	,46434	-3,29491	-1,46371
	Equal variances not assumed			-4,896	149,021	,000	-2,37931	,48599	-3,33964	-1,41898

Source: Own editing

Levene's test showed that the variances for company knowledge ($F = 21.230$, $p < .001$) and individual knowledge ($F = 11.644$, $p < .001$) are not equal, meaning that the assumption of equal variances is not met. However, the t-test shows a statistically significant difference between the mean values of company and individual knowledge ($p = .000$ for both variables). Negative mean differences indicate that the values are higher for company knowledge than for individual knowledge (for company knowledge: -1.29310 ($t = -4.924$, $df = 147.433$, $p = .000$), and for individual knowledge: -2.37931 ($t = -4.896$, $df = 149.021$, $p = .000$)) Companies in Bosnia and Herzegovina and Bulgaria invest more in the development of digital capacities at the company level than in helping individuals to improve their digital skills, which supports hypothesis 3.

DISCUSSION

This paper examines the influence of leadership and investment in knowledge and skills on the evolution of digital culture and the attainment of sustainable competitive advantages. The research results show that leaders play a key role in shaping the digital culture. Multiple regression analyses conducted separately for Bosnia and Herzegovina and Bulgaria demonstrate that **transformational leadership has a stronger and more significant impact on the development of digital culture than transactional leadership.** In the Bosnian model, transformational leadership ($\beta = 0.58$, $p < .01$) shows a stronger predictive power compared to transactional leadership ($\beta = 0.32$, $p < .05$), while in the Bulgarian model, the respective coefficients are slightly lower ($\beta = 0.46$, $p < .01$; $\beta = 0.27$, $p < .05$). Both models explain a high proportion of the variance in digital culture ($R^2 = 0.73$ for BiH and $R^2 = 0.68$ for Bulgaria), indicating their robustness and statistical validity. This is consistent with previous research that emphasizes the importance of transformational leadership in fostering innovation and adaptation to the digital environment (Smith & Tushman, 2005).

Hypothesis H2 states that there is a positive correlation between the level of digital culture development and sustainable competitive advantage in Bosnia and Herzegovina and Bulgaria. A significant positive correlation exists between the development of digital culture and competitive advantage ($r = .652$, $p < .001$), indicating that organizations with a more developed digital culture achieve a better market position. These results are consistent with resource theory, which predicts that organizational capabilities, such as digital culture, contribute to sustainable competitive advantage (Barney, 1991). Furthermore, these findings align with Teichert **(2019),** who highlights that an organization's *digital maturity*—defined as the extent to which digital technologies are integrated into all aspects of business—plays a crucial role in achieving and sustaining competitive advantage. This suggests that companies with higher levels of digital maturity are more likely to develop a culture that supports continuous innovation and adaptability.

The third hypothesis concerns investments in corporate and individual knowledge. The results showed that companies invest more in corporate knowledge than in the development of individual employee skills ($t(201) = -5.124$, $p < .001$ for individual knowledge). These results are in contrast to trends that indicate a growing need to strengthen individual digital skills as a key component in digital transformation (Huang & Rust, 2018). This pattern is in line with the arguments of Schwartz, Dodge, Smith, & Etzioni **(2019),** who emphasize that organizational knowledge serves as a strategic asset that enhances long-term competitiveness and efficiency. To develop a digital culture, companies must reassess their strategies to achieve a better balance between individual and organizational knowledge development. Additionally, an initiative is needed to change the attitudes and behaviors of those responsible within the organization, creating strategies that simplify processes and reduce obstacles in pursuit of solutions to existing challenges (Cardoso, Pereira, Sá, Powell, Faria, & Magalhães, 2023). A holistic learning approach that integrates knowledge across all organizational levels, as proposed by (Chronéer & Backlund, 2015)**,** can enhance this balance and strengthen the organization's overall adaptability in the context of digital transformation.

CONCLUSIONS

This research contributes to a comprehensive understanding of the influence of leadership style on shaping digital culture in Bosnian and Bulgarian organizations. Transformational leadership, which focuses on vision, inspiration, intellectual stimulation, and individual support, emerges as a key enabler of digital transformation (Uhl-Bien & Arena, 2018; Erhan, Uzunbacak, & Aydin, 2022). At the same time, transactional leadership provides structure, clear goals, and efficiency, thus enabling the continuity required for successful innovation implementation (Miller, 2019; Johnson, 2022). These findings are consistent with those of (Mgqibi, 2019), highlighting the vital impact of transformational leadership on addressing the challenges of the digital era. His research demonstrates that leaders who can inspire a shared vision and transcend existing boundaries are crucial to guiding organizations through digital transformation. As Bass and Riggio (2006) noted, such a leadership approach not only promotes the development of a digital culture but also enables organizations to effectively use digital technologies to gain competitive advantages.

This shift highlights the importance of a holistic approach in which organizational and individual learning complement each other, enabling companies to cope with the complex challenges of digital transformation (Wang, Kung, & Byrd, 2018). Digital culture, as a set of values, practices, and beliefs that drive innovation and transformation, should therefore be at the center of strategic planning. It enables faster adaptation to market changes, more effective implementation of new technologies, and the creation of environments open to experimentation, continuous learning, and improvement (Tumbas, Berente, & Vom Brocke, 2018). By positioning digital culture as a strategic imperative, organizations can better utilize their resources, optimize processes, and create value that is difficult to replicate, thereby ensuring long-term competitiveness and sustainability.

At the same time, there are some limitations. The research was conducted in Bosnia and Herzegovina and Bulgaria, which may limit the generalizability of the findings. Although stratified sampling was applied, the sample size and structure do not reflect the full diversity of companies in the region. Moreover, the quantitative nature of the study provided important statistical insights, but did not capture deeper qualitative aspects of leadership and culture. Future research should therefore adopt a more comprehensive approach, combining quantitative and qualitative methods, including case studies and interviews, to gain a deeper understanding of how leadership and digital culture interact in practice. Comparative and longitudinal studies across countries, industries, and company sizes would also provide richer insights. Research on specific technologies, such as artificial intelligence and blockchain, could offer targeted guidance for implementation. Despite these limitations, the study makes a significant contribution to understanding the dynamics of digital transformation in Southeastern Europe, a region that remains underrepresented in the academic literature. By highlighting the interconnected roles of leadership, organizational culture, and knowledge investment, this research highlights the need for a holistic approach to digital transformation. Organizations that manage to build strong digital cultures, supported by leaders who can balance inspiration and structure, will be best positioned to adapt to technological change, drive innovation, and achieve a sustainable competitive advantage.

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ORIGINALNI NAUČNI RAD / ORIGINAL SCIENTIFIC PAPER

HUMAN RESOURCE MANAGEMENT AND PERSONAL PROFESSIONAL DEVELOPMENT IN THE CASE OF GENERATIONS Y-Z WITH SPECIAL EMPHASIS ON ECOLOGY

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Abstract: *To date, numerous studies have been conducted with the aim of identifying generational differences, particularly in the business world. Of special interest is the research on the current Generation Y (1980–2000) and Generation Z (2000–present). In addition to traditionally managed leadership, the ability to understand human emotions positively affects not only the leader, but also the organization and its employees. Today, modern companies are introducing the principles of a green sustainable economy that emits low levels of carbon and makes proper use of limited natural resources. This paper places special emphasis on these issues. Alongside the introductory theoretical framework, a survey study was conducted during the first half of 2024, using a heterogeneous sample of N=98 respondents. The aim of the paper was to investigate the attitudes and perceptions of Generations Y and Z regarding Human Resource Management and personal professional development, with a special emphasis on ecology. The methods used in this research included the method of theoretical analysis, survey research, and descriptive (statistical) methods. The results showed that nine hypotheses were not accepted, while three were confirmed: readiness for personal and professional coaching development is conditioned by internal motivators; colleagues' attitudes toward ecological processes are conditioned by the ecological literacy of managers; and the potential of a manager to lead a group is not conditioned by the definition of a good leader. Furthermore, self-assessment of personal work experience within the company and self-assessment of the application of ecological principles within the company were both rated as good.*

Keywords: *human resource management, green economy, Generation Y-Z*

JEL Classification: *M12, M14, J24, Q56*

INTRODUCTION

To date, numerous studies have been conducted to determine differences among generations, and in addition, popular texts can also be found online discussing how generational differences are managed in the business world . "A generation or generational group is a group of people born within the same period who are exposed to similar social and historical life events during the critical phases of their formative development" [Schaie, 1965, cited in]. The classification is as follows: Traditionalists: before 1943; Baby Boom generation: 1943–1960; Generation X: 1960–1980; Generation Y: 1980–2000; and Generation Z: 2000–present [Zemke et al., 2000, cited in]. It is evident that Generation Z will soon be replaced by Generation Alpha (technologically more advanced generations in the future) .

It is predicted that the latter generation will have the least face-to-face communication and will primarily communicate through computer-mediated interaction . Their key ability is the simultaneous performance of two or more tasks with highly impressive results, the so-called multitasking ability [Enyon & Helsper, 2009, cited in]. It is important to emphasize that for more than a thousand years, social interaction was predominantly built through face-to-face communication. With the advancement of communication technologies and the internet, new social forms have emerged that are not universal for all types of people today .

Human resource management is of exceptional importance in the successful operation of an organization. In order for management to justify its business role, employee motivation is a crucial factor . The power of understanding emotions positively affects the organization itself, its employees, and the leader who possesses empathy for people . Since our environment is becoming increasingly digital and artificial, the humanization of leadership is becoming even more necessary .

Motivation is studied in many scientific fields, with efforts being made to define it in a unified and comprehensive manner that is practically applicable. The starting point is based on the premise that human behavior is directed toward goals individuals wish to achieve, while motivation can be understood as a kind of "substance" within a person that directs and encourages the achievement of goals .

Team building is a complex and serious process with its own rules and duration. Bringing people together through common goals, values, and activities is impossible without motivation . Destructive management has negative consequences on employee commitment, job satisfaction, and physical-emotional well-being .

The circular or green economy represents the sustainable economy of the 21st century, characterized by low carbon emissions, efficient use of limited natural resources, and reduced risks to the human environment .

"Greening the economy must be on the priority list of every country. There are numerous definitions of the green economy. According to the definition of UNEP (United Nations Environment Programme), a green economy is one that results in improved human well-being and social equity while significantly reducing environmental risks and ecological degradation".

The fundamental goals in the development of a green economy include harmonizing socio-economic development with other policies, efficient use of natural resources, development with low greenhouse gas emissions, green public procurement, economic and fiscal policy reforms, support for creating new jobs, reduction of unem-

ployment, and more. Green economy is not limited only to energy efficiency and renewable energy sources, but also includes striving for smart technologies, a high level of waste use, processing and recycling, green construction, sustainable and cleaner transport, and sustainable forest and agricultural management, among others .

Since 2008, national and international policies have increasingly implemented the concept of the "green economy." The United Nations Environment Programme (UNEP) was among the first to promote so-called "green stimulus packages" aimed at avoiding global recession . Contemporary business today strives toward a green economy in order to meet the needs of society, follow the development of modern technologies, and ensure environmental protection through continuous focus on sustainable development . Protection of the human environment is of exceptional importance for tourism development due to the mutual integration of tourism and the environment .

A growth model focused on the green economy and green entrepreneurship can be a strong driver of growth toward sustainable economic development . It is also important to mention the concept of green auditing, which refers to the auditing of the natural environment, i.e., accounting information related to the environment. In this way, environmental pollution is monitored and controlled .

MATERIALS AND METHODS

The research sample (N=98) was heterogeneous and consisted of respondents (students of the University of Applied Sciences in Šibenik and University of Applied Sciences "Marko Marulić" in Knin) from Šibenik and its surrounding area (N=43), Knin and its surrounding area (N=10), and other cities and settlements (N=45). The research was conducted during the first half of 2024. The gender structure of respondents consisted of 30 male and 68 female participants. The respondents' age range was divided into three categories. The first category included respondents aged 18 to 20 years (N=51), the second category included respondents aged 21 to 30 years (N=42), and the third category included respondents aged 31 to 40 years (N=5).

Regarding educational attainment, respondents had the opportunity to select one of five categories: unqualified (without schooling or incomplete primary education), primary school education, secondary school education, higher vocational education, and university degree (graduate degree, academy, master's degree, and doctorate). Although none of the respondents selected the unqualified category (without schooling or incomplete primary education), for ethical reasons related to the study and research, it was included in the tabular presentation but excluded from the statistical analysis. The following categories were included in the statistical analysis: secondary school education (N=86), higher vocational education (N=6), and university degree (graduate degree, academy, master's degree, doctorate) (N=6). The methods used in this research were: the method of theoretical analysis, survey research, and descriptive (statistical) methods.

The research was conducted using a printed questionnaire consisting of eighteen questions related to human resource management and personal development in the context of Generations Y-Z, with special emphasis on ecology, and two dimensions: self-assessment of personal work experience within the company (13 items) and self-assessment of the application of ecological principles within the company (10 items). Respondents were offered five possible answers for these dimensions (1-insufficient, 2-sufficient, 3-average, 4-very good, 5-excellent).

The questionnaire was anonymous and voluntary, and respondents were informed that the survey questionnaire was being used for scientific purposes and were encouraged to provide honest and objective answers in order to ensure the precision and objectivity of the research results. After the research had been conducted, the collected data were recorded and analyzed using the IBM SPSS software, version 26. Descriptive statistical procedures and inferential nonparametric statistical procedures (Mann–Whitney and Kruskal–Wallis tests, and the Likelihood Ratio instead of the χ^2 test) were used for the analysis. The reason for using the Likelihood Ratio instead of the χ^2 test was that in tables (6, 7, 8, 9, 10, 11, 12, and 13), the cell frequency was lower than 5.

Research Hypotheses

H1 – There is a statistically significant difference in the overall self-assessment of personal work experience and the overall self-assessment of the application of ecological principles within the company with regard to gender.

H2 – There is a statistically significant difference in the overall self-assessment of personal work experience and the overall self-assessment of the application of ecological principles within the company with regard to age.

H3 – There is a statistically significant difference in the overall self-assessment of personal work experience and the overall self-assessment of the application of ecological principles within the company with regard to place of residence.

H4 – There is a statistically significant difference in the overall self-assessment of personal work experience and the overall self-assessment of the application of ecological principles within the company with regard to level of education.

H5 – The most important business values at work are statistically conditioned by the main work motives.

H6 – Personal and professional development through coaching is statistically conditioned by internal motivators in job performance.

H7 – Preferred methods of receiving feedback on completed work are conditioned by the decision-making style.

H8 – Control of emotional state at work is statistically associated with reactions to conflicts.

H9 – Colleagues' attitudes toward ecological processes are conditioned by the ecological literacy of managers.

H10 – The potential of a manager to lead a group is conditioned by the definition of a good leader.

H11 – The way of listening to others is conditioned by the communication style of managers.

H12 – Reactions to ecological topics at work are conditioned by "time thieves" in professional life.

RESULTS

Table 1 shows that the data for both variables are negatively asymmetrical and leptokurtic. The Kolmogorov–Smirnov test for all variables indicates that the deviation from normal distribution is statistically significant ($p<0.05$). Since the deviation of both variables from normal distribution is statistically significant, nonparametric statistical procedures will be used for the statistical analysis in this paper.

Table 1. Arithmetic Mean, Standard Deviation, Skewness, Kurtosis, and Results of the Distribution Normality Test

Variable	M	SD	Skew	Kurt	K-sz	P
Self-assessment of personal work experience within the company	3,11	1,44	-0,054	-1,384	0,177	0,00
Self-assessment of the application of ecological principles within the company	3,03	1,38	-0,032	-1,231	0,155	0,00

Source: Processed by the authors

The average scores of 3.11 for self-assessment of personal work experience within the company and 3.03 for self-assessment of the application of ecological principles within the company may indicate that the company meets certain standards and recognizes the value of ecological principles, but not at the level at which it potentially could. In order to improve the company's performance in both segments, it is necessary to consider new sustainable business strategies oriented toward the principles of sustainable development.

Today, the future of progress tends toward a green economy, as it enables a fairer distribution of resources and assets, reduces poverty and social inequality, and is better prepared for the effects of climate change and improved management of natural resources.

Small economies face specific challenges in adapting to and implementing the green transition. Today, the most important challenges include a lack of resources and capacities, attracting investments, market adaptation, and limited financing .

H1 – There is a statistically significant difference in the overall self-assessment of personal work experience within the company and the overall self-assessment of the application of ecological principles within the company with regard to gender.

Table 2. Testing the Statistically Significant Difference in the Overall Self-Assessment of Personal Work Experience within the Company and the Overall Self-Assessment of the Application of Ecological Principles within the Company with Regard to Gender.

Variable	Sex	N	M	SD	Man-Whitney	P
Self-assessment of personal work experience within the company	Muški	30	2,86	1,54		
	Ženski	68	3,22	1,40	882,500	0,288
Self-assessment of the application of ecological principles within the company	Muški	30	2,86	1,25		
	Ženski	68	3,10	1,44	913,500	0,411
Total	98					

Source: Processed by the authors

The results in Table 2 show that there is no statistically significant difference in the overall self-assessment of personal work experience within the company (0.288 > 0.05) and in the overall self-assessment of the application of ecological principles within the company (0.411 > 0.05) with regard to gender. This hypothesis was not confirmed; however, it indicates that male and female respondents demonstrate a unified attitude toward the self-assessment of their own work experience within the company and toward the self-assessment of the application of ecological principles within the company.

Today, there is a tendency toward humane ecology, which insists on the concept of the so-called ecology of man, based on human relationships directed toward both the living and non-living environment .

H2 – There is a statistically significant difference in the overall self-assessment of personal work experience within the company and the overall self-assessment of the application of ecological principles within the company with regard to age.

Table 3. Testing the Statistically Significant Difference in the Overall Self-Assessment of Personal Work Experience within the Company and the Overall Self-Assessment of the Application of Ecological Principles within the Company with Regard to Age

Variable	Age	N	M	SD	Kruskal-Wallis	P
Self-assessment of personal work experience within the company	18-20	51	3,15	1,51		
	21-30	42	2,95	1,36		
	31-40	5	4	1,41	2,565	0,277
Total		98				
Self-assessment of the application of ecological principles within the company	18-20	355	3,17	1,35		
	21-30	298	2,79	1,40		
	31-40	9	3,60	1,51	3,242	0.198
Total		98				

Source: Processed by the authors

The results in Table 3 show that there is no statistically significant difference in the overall self-assessment of personal work experience within the company (0.277 > 0.05) and in the overall self-assessment of the application of ecological principles within the company (0.198 > 0.05) with regard to age. The hypothesis was not confirmed, and the results also indicate that regardless of age and employees' own experience, attitudes toward the overall self-assessment of personal work experience and the overall self-assessment of the application of ecological principles are the same or similar.

H3 – There is a statistically significant difference in the overall self-assessment of personal work experience and the overall self-assessment of the application of ecological principles within the company with regard to place of residence.

Table 4. Testing the Statistically Significant Difference in the Overall Self-Assessment of Personal Work Experience and the Overall Self-Assessment of the Application of Ecological Principles within the Company with Regard to Place of Residence

Variable	Place of Residence	N	M	SD	Kruskal-Wallis	P
Self-assessment of personal work experience within the company	Šibenik and surrounding area	43	3,18	1,43		
	Knin and surrounding area	10	3,10	1,37		
	Other towns and cities	45	3,11	1,50	0,185	0,912
Total		98				

Self-assessment of the application of ecological principles within the company	Šibenik and surrounding area	43	3,13	1,39		
	Knin and surrounding area	10	3,10	1,72		
	Other towns and cities	45	3,03	1,32	0,185	0,737
Total		98				

Source: Processed by the authors

The results in Table 4 show that there is no statistically significant difference in the overall self-assessment of personal work experience within the company (0.912 > 0.05) and in the overall self-assessment of the application of ecological principles within the company (0.737 > 0.05) with regard to place of residence. The hypothesis was not confirmed, and the results also indicate that attitudes toward the overall self-assessment of personal work experience and the overall self-assessment of the application of ecological principles are the same or similar regardless of place of residence.

H4 – There is a statistically significant difference in the overall self-assessment of personal work experience within the company and the overall self-assessment of the application of ecological principles within the company with regard to the level of education.

Table 5. Testing the Statistically Significant Difference in the Overall Self-Assessment of Personal Work Experience and the Overall Self-Assessment of the Application of Ecological Principles within the Company with Regard to Level of Education

Variable	Level of Education	N	M	SD	Kruskal-Wallis	P
Self-assessment of personal work experience within the company	Unqualified (without schooling, incomplete primary school)	0	-	-		
	Primary school	0	-	-		
	Secondary school education	86	3,05	1,44		
	Higher vocational education	6	3,33	1,36		
	University degree (graduate studies, academy, master's degree, doctorate)	6	3,11	1,44	1,623	0,444
Total		98				
Samoprocijena primjene ekoloških principa u tvrtki	Unqualified (without schooling, incomplete primary school)	0	-	-		
	Primary school	0	-	-		
	Secondary school education	86	2,98	1,42		
	Higher vocational education	6	3	1,26		
	University degree (graduate studies, academy, master's degree, doctorate)	6	3,03	1,38	1,374	0,503
Total		98				

Source: Processed by the authors

In Table 5, the results are focused only on three categories: secondary school education, higher vocational education, and higher education (graduate studies, acad-

emy, master's degree, and doctorate). The results show that there is no statistically significant difference in the overall self-assessment of personal work experience within the company (0.444 > 0.05) and in the overall self-assessment of the application of ecological principles within the company (0.503 > 0.05) with regard to the level of education. The hypothesis was not confirmed because attitudes are similar and the same regardless of educational level; however, questions arise as to how education can contribute more effectively to improving and creating more positive attitudes toward the overall self-assessment of personal work experience and the overall self-assessment of the application of ecological principles, since the current level of attitudes is average.

For some time now, there has been a study program entitled "Green Economy," which consists of interdisciplinary graduate academic studies for students educated in the field of green economy and sustainable development. The study program was created in cooperation with universities from the region, Central Europe, and Eastern Europe .

H5 – The most important business values at work are statistically conditioned by the main work motivation factors.

Table 6. Most Important Business Values and Main Job Satisfaction Motivators

Main Motivators at Work	Most Important Business Values			Total
	Respect	Team work	Results	
Salary	23	6	9	38
Interpersonal relationships	19	8	1	28
Advancement	23	5	4	32
Total	65	19	14	98
χ^2=6,728	LR=7,195		p=0,126	

Source: Processed by the authors

The results in Table 6 indicate that the main job satisfaction motivators and the most important business values are not statistically related (0.126 > 0.05). More precisely, the most important business values are not statistically conditioned by the main job satisfaction motivators. Although the hypothesis was not confirmed, Table 6 shows that the greatest value emphasized by respondents is respect.

The research results of showed that the greatest motivation factors for employees are salary and job security, while the most important business elements are regular salary payment, working hours, and job stability. In the self-assessment of work performance, respondents rated their own reliability and adaptability the highest.

H6 – Personal and professional development through coaching is statistically conditioned by internal motivators in job performance.

Table 7. Personal and Professional Development through Coaching and Internal Motivators in Job Performance

Internal Motivator in Job Performance	Readiness for Personal and Professional Coaching Development			Total
	Yes	No	Not sure	
Curiosity	19	3	4	26
Independence	23	11	10	44
Respect and honor	11	4	13	28
Total	53	18	27	98
χ^2=10,253	LR=9,883		p=0,042	

Source: Processed by the authors

The results in Table 7 indicate that readiness for personal and professional development through coaching is conditioned by internal motivators in job performance and that there is a statistically significant relationship (0.042 < 0.05). The table shows that a larger number of respondents confirmed their readiness for coaching, so in addition to the indication of a statistically significant relationship, it can be concluded that the hypothesis was confirmed.

Based on the results of , it can be concluded that coaching has a positive impact on decision-making, while decision-making has a positive impact on employee productivity and satisfaction.

H7 – Preferred methods of receiving feedback on completed work are conditioned by the decision-making style.

Table 8. Preferred Method of Receiving Feedback on Completed Work and Decision-Making Style

Decision-Making Style	Preferred Method of Receiving Feedback on Completed Work			Total
	I need to see evidence	I need to hear evidence	I need to experience it	
Slow	1	3	1	5
Emotional	1	8	3	12
Relying on facts	26	24	31	81
Total	28	35	35	98
χ^2=7,966	LR=7,998		p=0,092	

Source: Processed by the authors

The results in Table 8 indicate that preferred methods of receiving feedback on completed work are not conditioned by decision-making style and that there is no statistically significant relationship (0.092 > 0.05). Although the hypothesis was not confirmed, it can be observed that respondents, in every situation related to preferred feedback methods, rely mostly on facts when making decisions.

The research results of showed that personality traits such as extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience are not associated with greater confidence in decision-making.

H8 – Control of emotional state at work is statistically significantly associated with reactions to conflicts.

Table 9. Control of Emotional State at Work and Reactions to Conflicts

Control of Emotional State at Work	Reaction to Conflicts			Total
	Passive	Aggressive	Assertive (direct, open, honest)	
I have difficulty controlling myself	1	1	2	4
I am stable during work	12	4	58	74
I sometimes have irrational behavior	6	1	13	20
Total	19	6	73	98
χ^2=4,756	LR=3,637		p=0,457	

Source: Processed by the authors

The results in Table 9 indicate that there is no statistically significant relationship between control of emotional state at work and reactions to conflicts (0.457 > 0.05). Although the hypothesis was not confirmed, the results show that respondents who are emotionally stable during work mostly react assertively (directly, openly, and honestly).

The results of showed that "there is a high negative correlation between exposure to organizational-professional conflict and the level of job satisfaction, as well as a significant moderate negative correlation between exposure to organizational-professional conflict and work engagement."

Care for employees' mental health, especially in highly stressful professions such as healthcare, judiciary, police work, and similar occupations, should be considered a professional obligation .

H9 – Colleagues' attitudes toward ecological processes are conditioned by the ecological literacy of managers.

Table 10. Ecological Literacy of Managers and Colleagues' Attitudes toward Ecological Processes

Ecological Literacy of Managers	Colleagues' Attitudes toward Ecological Processes			Total
	Concerning	Uninterested	High awareness	
High level	5	6	16	27
Medium level	12	33	15	60
Lower level	0	9	2	11
Total	17	48	33	98
χ^2=16,359	LR=18,159		p=0,001	

Source: Processed by the authors

The results in Table 10 indicate that colleagues' attitudes toward ecological processes are conditioned by the ecological literacy of managers (0.001 < 0.05). This indicates that managers have a very important role in shaping employees' attitudes toward topics related to ecological processes. This hypothesis was confirmed.

Work motivation, in addition to basic needs satisfied through strategies and systems of material motivation, can be further enhanced by non-material motivational strategies. These include job design, managers and their leadership style, flexible working hours, opportunities for training and future development, organizational culture, recognition and feedback, management by objectives, and employee participation.

Environmentally conscious consumers with a market orientation are inclined to use their consumer power to exert pressure on industry. Manufacturers have already recognized the growing demand for environmentally friendly products in developed markets.

H10 – The potential of a manager to lead a group is conditioned by the definition of a good leader.

Table 11. Potential for Managerial Group Leadership and the Definition of a Good Leader

Definition of a Good Leader	Potential for Managerial Group Leadership			Total
	Easily adapts to change	Successfully motivates people	Delegates tasks effectively	
Consistency	8	19	4	31
Flexibility	7	14	8	29
Social responsibility	5	19	14	38
Total	20	52	26	98
χ^2=5,912	LR=6,341		p=0,175	

Source: Processed by the authors

The results in Table 11 indicate that the potential of a manager to lead a group is not conditioned by the definition of a good leader (0.175 > 0.05). The hypothesis was not confirmed; however, according to the results in the table, it can be highlighted that a good leader primarily plays a role in successfully motivating people.

Previous scientific studies have confirmed the positive influence of leader empathy on employee and leadership work behavior and attitudes. Expressing and developing empathy in leadership is uncomfortable and demanding, but it fulfills both those who receive it and those who provide it .

During the last decade, the number of studies in the field of the so-called dark triad traits in management has increased. These consist of narcissism, Machiavellianism, and psychopathy—personality traits associated, positively or negatively, with success in the business world .

H11 – The way of listening to others is conditioned by the communication style of managers.

Table 12. Ways of Listening to Others and Managers' Communication Style

Managers' Communication Style	Ways of Listening to Others				Total
	Interested	Confused	Impatien	I selectively listen to what the person says	
Assertive	44	3	5	19	71
Aggressive	2	0	2	2	6
Passive	11	1	4	5	21
Total	57	4	11	26	98
χ^2=6,235	LR=5,649			p=0,464	

Source: Processed by the authors

The results in Table 12 indicate that the way of listening to others is not conditioned by the communication style of managers (0.464 > 0.05). The hypothesis was not confirmed; however, according to the results in the table, assertive communication by managers is associated with greater interest in listening.

Recent scientific considerations support the fact that emotions are a significant variable of successful leadership. Since emotions serve as a medium in achieving leadership goals, it is important to develop certain emotional skills . For example, a low level of dark personality traits in a leader may contribute to successful leadership .

Certain results indicate that women demonstrated slightly more empathy than men .

H12 – Reactions to ecological topics at work are conditioned by "time thieves" in professional life.

Table 13. Reactions to Ecological Topics and "Time Thieves" in Professional Life

Time Thieves in Professional Life	Reactions to Ecological Topics			Total
	Proactive	Passive	Indifferent	
Failure to set priorities	12	5	7	24
Inability to say NO	12	12	17	41
Inadequate preparation for conversations and agreements	17	4	12	33
Total	41	21	36	98
χ^2=5,808	LR=6,065		p=0,194	

Source: Processed by the authors

The results in Table 13 indicate that reactions to ecological topics at work are not conditioned by "time thieves" in professional life (0.194 > 0.05). Respondents do not prioritize ecological topics, and according to their responses, there is an average balance between proactivity and indifference, which resulted in the hypothesis not being confirmed.

Today, all types of business organizations strive to achieve their own contribution to environmental protection by controlling the impact of their activities, products, and services on the environment, in accordance with their environmental protection policies and goals .

CONCLUSION

Based on the conducted research, it was found that the self-assessment of personal work experience within the company and the self-assessment of the application of ecological principles within the company were both rated as good. The proposed hypotheses yielded the following results:

- There is no statistically significant difference in the overall self-assessment of personal work experience within the company and in the overall self-assessment of the application of ecological principles within the company with regard to gender, age, place of residence, and level of education. All four hypotheses were not accepted.
- The main job satisfaction motivators and the most important business values are not statistically related. The results showed that the greatest value em-

phasized by respondents is respect. The hypothesis was not confirmed.
- Readiness for personal and professional development through coaching is conditioned by internal motivators in job performance, and there is a statistically significant relationship. The hypothesis was confirmed.
- Preferred methods of receiving feedback on completed work are not conditioned by decision-making style, and there is no statistically significant relationship. The hypothesis was not confirmed.
- There is no statistically significant relationship between control of emotional state at work and reactions to conflicts. The results showed that respondents mostly react assertively at work. The hypothesis was not confirmed.
- Colleagues' attitudes toward ecological processes are conditioned by the ecological literacy of managers, meaning that managers have an important role in shaping employees' attitudes toward topics related to ecological processes. The hypothesis was confirmed.
- The potential of a manager to lead a group is not conditioned by the definition of a good leader. According to the results, it must be emphasized that a good leader plays a role only in the successful motivation of people. The hypothesis was confirmed.
- The way of listening to others is not conditioned by the communication style of managers. The results showed that an assertive communication style of managers positively influences listening. The hypothesis was not confirmed.
- Reactions to ecological topics at work are not conditioned by "time thieves" in professional life. The hypothesis was not accepted.

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ORIGINALNI NAUČNI RAD / ORIGINAL SCIENTIFIC PAPER

BEYOND DECLARATIONS: THE REALITY OF INCLUSIVE TRAINING IN POST-SOCIALIST EUROPE

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Abstract: *In recent years, organizations operating across different sectors have been facing increasing demands for socially responsible business practices, which also implies the development of inclusive work environments. In an effort to adapt to these changes, many organizations are introducing diversity-oriented training programs. In this paper, research was based on empirical data and examines whether there are differences between private and public organizations in post-socialist countries regarding the implementation of diversity-oriented training. In addition, the analysis explores whether organizational size acts as a moderating factor in this relationship. Overall, the results indicate a low level of diversity training implementation in both sectors. However, performed non-parametric analysis indicates greater engagement and proactivity of organizations operating in the private sector, compared to organizations from the public sector, while the applied hierarchical linear regression showed that the size of the organization does not have a statistically significant moderating effect. The findings suggest that, in the context of developing inclusive and socially responsible human resource management practices, institutional logic is more important than organizational capacities. In addition to presenting the results of the empirical analysis, this paper also provides insights into how diversity-oriented training contributes to organizational adaptability and employee development.*

Keywords*: diversity-oriented training; human resources; inclusive HRM; social sustainability; post-socialist countries*

JEL Classification: *M53, M14*

INTRODUCTION

Today, many organizations are exposed to growing pressures to align their operations with the principles of social responsibility and global sustainability goals. In this context, organizations are increasingly investing in the development of inclusive

work environments, with diversity training becoming an integral component of contemporary human resource management (HRM). Diversity training programs can be described as planned learning activities aimed at increasing awareness of individual differences, reducing prejudice and discriminatory behavioral patterns, and developing the competencies necessary for effective collaboration in diverse work settings (Ehrke, Ashoee, Steffens, & Louvet, 2020). Therefore, it can be concluded that such training programs serve both to raise awareness of diversity and to enhance employees' specific skills (Ferdman, 1996; Bezrukova, Jehn, & Spell, 2012), while prior research indicates that the integration of these two elements produces stronger and more enduring effects (Bezrukova, Spell, Perry, & Jehn, 2016). Aust, Cooke, Müller-Camen, and Wood (2024), as well as Campos-García, Alonso-Muñoz, González-Sánchez, and Medina-Salgado (2024), emphasize that these initiatives should not be viewed solely through an ethical lens, but also as a strategic instrument for improving environmental, social, and governance (ESG) performance and advancing the United Nations Sustainable Development Goals (SDG).

Despite the growing importance of such initiatives and practices in the global discourse, it should be emphasized that sustainable HRM practices, including diversity training, are unevenly represented across organizations, sectors, and even national contexts. These observed differences can be attributed to variations in managerial traditions, organizational cultures, and national cultures (Čutura & Jerković, 2020). The extent to which organizations engage in socially responsible initiatives and practices depends on managers' perceptions of their relevance, as well as on prevailing institutional logics and organizational capacities. For example, public sector organizations often operate under conditions of bureaucratic inertia, political oversight, and fragmented governance systems (Pollitt & Bouckaert, 2017). Such institutional logic contributes to formal and declarative support for inclusive principles, but not to their operationalization in everyday practice. In contrast, organizations in the private sector, particularly those operating in a competitive environment, view diversity as one of the strategic instruments that contributes to their legitimacy, fosters innovation and facilitates talent attraction (Barney, 1991). These patterns indicate the need for theoretical and empirical consideration of sectoral affiliation as one of the factors influencing the application of diversity-oriented HRM practices.

The literature still offers a limited understanding of these sectoral patterns in the post-socialist context, where specific institutional and cultural legacies continue to have a strong influence on organizational behavior. In this sense, post-socialist European countries represent a particularly relevant research context, because transitional processes have led to the formation of hybrid forms of HRM practices in the private sector, while in the public sector employee management patterns are still strongly influenced by politicization (Zolak Poljašević, Gričnik and Šarotar Žižek, 2025). Numerous authors (Fylling, Baciu and Breimo, 2020; Bartlett, Puratic and Sarajlić, 2024; Husar Holmes, Elias and D'Agostino, 2023) observe that most of these countries are formally committed to the development of inclusive work environments, but that the actual application of such activities is usually limited, uneven or symbolic. Examining the role of sectoral affiliation in shaping and implementing diversity training within this specific context may therefore contribute to a deeper understanding of the institutional constraints that affect their application.

This paper examines whether sectoral affiliation (public versus private sector) influences the implementation of diversity training programs in post-socialist European organizations. In addition, it analyzes whether organizational size, as an indicator of structural and organizational capacity, serves as a moderating factor in this relationship. Although previous research indicates that larger organizations are more inclined to adopt progressive HRM practices (Wyatt-Nichol and Antwi-Boasiako, 2012), the interrelationship between size and sector remains insufficiently explored, especially in the post-socialist context. Accordingly, this paper aims to answer the following research question: how do specific institutional logics, which are present in the private and public sector, influence the implementation of diversity training in post-socialist organizations, and to what extent does organizational size influence this relationship?

The paper presents the results of an empirical data analysis based on the CRANET survey. Appropriate statistical methods were applied, including nonparametric testing and hierarchical linear regression. To measure the level of engagement in the implementation of diversity training, a composite scale encompassing eight key dimensions of diversity was used. This paper contributes to the literature on sustainable HRM by highlighting differences in the implementation of diversity training between the public and private sectors. The analysis demonstrate that the degree of their application depends on the institutional environment in which organizations operate. By focusing on post-socialist countries, which are often underrepresented in global diversity debates, the study enhances understanding of the challenges and constraints organizations face in developing inclusive HR practices.

The rest of the paper is structured as follows. The next section presents the theoretical framework and formulates the research hypotheses. This is followed by a description of the methodology and a presentation of the key empirical findings. The paper concludes with a discussion of the results, conclusions, limitations, and directions for future research.

LITERATURE OVERVIEW

Diversity training represents planned organizational activities, that are aimed at managing individual and group differences among employees. These differences include gender, ethnicity, age, disability, religion, sexual orientation, and related socio-demographic characteristics of the emplozyees. Such training intends to reduce prejudice and discriminatory behavior, promote equal opportunities for all employee groups, and develop the competencies necessary for effective collaboration in diverse work environments. Diversity training constitutes an integral component of sustainable HRM. These initiatives and practices are increasingly adopted under the influence of ESG frameworks and global sustainability goals (Aust, Cooke, Muller-Camen i Wood, 2024; Campos-García, Alonso-Muñoz, González-Sánchez i Medina-Salgado, 2024).

Contemporary research indicates that such initiatives are not implemented solely under the influence of ethical principles, but also driven by organizational interests. Specifically, existing studies show that inclusive and socially responsible human resource management practices contribute to organizational resilience, performance, and competitiveness in the labor market (Abad & Wynn, 2022; Duchek, Raetze, & Scheuch, 2020; Okatta, Ajayi, & Olawale, 2024). In this sense, diversity training links standards of fairness, inclusion, and social responsibility with organizational develop-

ment.

Diversity training is not only an instrument of sustainable human resource management, but rather a strategic tool (Aust, 2024) that fosters organizational sustainability and adaptability (Sult, Wobst, & Lueg, 2024; Bilderback, 2024). In the case when such training programs are developed with an explicit focus on inclusivity, they extend beyond individual competence development and at the same time promote issues of fairness and equitable participation among different employee groups (Adegbite, 2024; Kuknor & Kumar, 2024). This approach to HR development underscores the importance of socially responsible and ethical organizational behavior, especially in contexts characterized by pronounced inequalities or the underrepresentation of certain social groups (Folbre, 2012; Trofimov & Baawi, 2020). Diversity training also contributes to raising awareness of bias and strengthening inclusive leadership (McGuire & Bagher, 2010). Empirical studies further associate these initiatives with enhanced mutual respect, psychological safety, and team-level innovation (Shore et al., 2011), while at the organizational level they contribute to the reinforcement of organizational legitimacy (Aust, Cooke, Müller-Camen, & Wood, 2024).

It should be emphasized that the real effect of such training programs largely depends on institutional support, which implies their permanent inclusion in formal policies and organizational practices. Without institutional support, the effects of diversity-oriented initiatives are usually short-term and symbolic, with no real impact on behaviors, decisions and relationships within the organization (Dobbin and Kalev, 2018; Dasborough, 2025). In the literature, this kind of exclusively declarative support for diversity programs is described by the term "diversity washing" (Baker, Larcker, McClure, Saraph and Watts, 2024; Beckert and Koch, 2025).

In addition, prior research highlights the importance of factors such as leadership commitment, alignment between diversity initiatives and existing organizational policies, structures, and governance mechanisms, as well as the systematic evaluation of their effects over time (Nishii & Mayer, 2009; Devine & Ash, 2022; Bezrukova, Jehn, & Spell, 2012). The outcomes of diversity programs also vary depending on the institutional environment. Organizations operating within clear regulatory frameworks and supportive organizational cultures tend to achieve more substantive results than those constrained by institutional inertia or formalistic approaches to HRM (Dobbin & Kalev, 2018; Cocchiara, Connerley, & Bell, 2010). Real progress in inclusive HR development can be achieved only through continuous learning processes supported by top management (Nishii, 2013; Roberson, 2006; Fujimoto & Härtel, 2017) and embedded within existing HRM practices. As can be concluded from the previous literature review, ths topic received considerable academic attention, but still remains relatively underexplored within the post-socialist context.

Post-socialist countries represent a specific institutional framework for analyzing the processes discussed above. In these counitries, the practices of sustainable HRM remain underdeveloped, and progress largely depends on the attitudes and support of the management, as well as on the available organizational capacities (Brajković, 2018; Serafini, Wood and Szam, 2020). The still present legacy of centralized control and the often ambivalent approach to diversity further hinder the diffusion of inclusive HRM practices (Chepurenko & Szanyi, 2021; Serafini, Wood, & Szam, 2020).

Training activities are primarily oriented toward the acquisition of technical competencies required for effective job performance, while competencies related to communication, collaboration, and interpersonal relations tend to receive less attention (Kupets, 2018; Chankseliani & Silova, 2018). This observation also applies to diversity training. Limited resources, weak coordination, and insufficient financial capacity are among the most frequently cited reasons for the low prevalence of inclusive HRM practices. Unfortunately, this issue does not represent an isolated organizational problem, but rather reflects broader institutional constraints (Doh, Rodrigues, Saka-Helmhout, & Makhija, 2017; Bartlett, Purać, & Sarajlić, 2024).

In Western Balkan countries, inclusion policies have been formally adopted as part of the European integration process; however, their practical implementation is largely symbolic (Milovanovitch, Simić, Smak, & Bacher, 2022). The understanding of diversity is further burdened by ethno-nationalist narratives and entrenched social resistance to pluralism (Glorius, 2020; Boduszyński, 2010). As a result, existing structural inequalities are strengthened, and access to developmental opportunities for marginalized groups becomes increasingly constrained (Kulić, 2024; Ivlevs & Veliziotis, 2018). Nevertheless, some studies indicate that the processes of European integration, donor initiatives and multinational networks contribute to the spread of inclusive HRM practices within the post-socialist contex (Bartlett, Puratic and Sarajlić, 2024; Poór et al., 2020).

The level of organizational engagement in diversity-oriented initiatives, including training programs, is further shaped by ownership structure, which influences resource availability, accountability patterns, and the degree of managerial autonomy (Thornton, Ocasio, & Lounsbury, 2012). This sectoral differentiation is particularly pronounced in the post-socialist context. Public sector organizations operate under conditions of procedural rigidity, political influence, and, in many cases, chronic resource constraints. Given the very limited level of managerial autonomy in the public sector, such institutional conditions tend to encourage the development of a formalistic approach to human resource management (Lapuente & Suzuki, 2020; Pollitt & Bouckaert, 2017; Meyer-Sahling, 2009). As a consequence, diversity initiatives and programs in the public sector often assume a largely symbolic character and are further constrained by modest budgets and the socio-political sensitivity of diversity-related issues (Dobbin & Kalev, 2018; Husar Holmes, Elias, & D'Agostino, 2023).

On the other hand, organizations that operate in the private sector are significantly more exposed to competition, both on the market of products and services, and also on the labor market. Some of these organizations recognize diversity initiatives and training programs as strategic tools. They acknowledge that diversity training can contribute to higher employee engagement, innovation, and market adaptability (Roberson, 2006; Roberson, Moore, & Bell, 2024; Shore, Cleveland, & Sanchez, 2018; Jentjens, Georgiadou, & Hennekam, 2025). This strategic orientation differs substantially from the normative–administrative and politically constrained nature of HRM in public institutions. Regardless of the view of some authors, who argue that even in the private sector, programs focused on diversity are more driven by ESG compliance requirements than by real readiness for change (Ahmed, 2012; Meyer and Peng, 2016), it can be expected that diversity training is more prevalent in private organizations, even within the post-socialist context. Based on the previous analysis of sectoral differences, the following hypothesis was formulated:

H1: Compared to public sector organizations, private sector organizations implement diversity-oriented training and development programs to a greater extent.

In addition to the ownership structure, the size of the organization can also influence the application of inclusive HRM practices. Larger organizations typically have more developed HR structures, greater financial resources for HR programs, and higher public visibility. These factors increase both their capacity and their motivation to develop and implement diversity-oriented initiatives (Cox, 1993; Barney, 1991; Pfeffer & Salancik, 1978; Forcadell & Elisa, 2022). From a resource-based perspective, larger organizations are better positioned to design and sustain such initiatives and programs, including diversity training (Lawrence & Lorsch, 1967). In line with these arguments, the following hypothesis is proposed:

H2: Organizational size positively moderates the relationship between sectoral affiliation and the implementation of diversity training.

The formulated hypotheses provide the foundation for the empirical analysis, which is presented in the subsequent section.

METHODOLOGY AND EMPIRICAL EVIDENCE

In this paper, a cross-sectional research design was applied in order to examine the prevalence of diversity training across different organizational settings. As already elaborated in the previous segments of the paper, such HRM practices are relevant for the improvement of the social responsibility of the organization, are therefore increasingly linked to ESG performance and the Sustainable Development Goals. In this research, diversity training is viewed as an instrument of sustainable HRM, aimed both at raising awareness of diversity and at developing employees' specific skills. In this way, the research contributes to a better understanding of how HR development can support the creation of socially responsible work environments.

The main objective of the study is to assess the extent to which diversity-oriented training programs are implemented in the public and private sectors and to examine how organizational size moderates this relationship. In this context, diversity training is conceptualized as a signal of organizational readiness to ensure greater representation and equal participation of marginalized or underrepresented groups within organizational processes. The prevalence of diversity training programs thus also reflects a broader organizational commitment to diversity-related issues. Unlike purely declarative policies, diversity training programs require tangible investments, organizational support, and active leadership involvement. Their presence may therefore be considered a relevant indicator of genuine institutional commitment to diversity. Such analytical approach provides a foundation for understanding how institutional and organizational conditions shape sustainable HRM practices in the post-socialist context.

The data used in this research were drawn from the international CRANET project (Cranfield Network of International Human Resource Management), which conducts standardized surveys of HRM practices across several dozen countries worldwide. The CRANET survey is carried out cyclically at multi-year intervals and is based on a unified research methodology that enables systematic comparison of HRM practices across countries, as well as across different institutional and organizational contexts (Zolak Poljašević & Berber, 2024; Zolak Poljašević, Berber, & Došenović Milaković, 2025). For the purposes of this analysis, data from the most recent survey

wave (2021–2022) were used, comprising a sample of 1,118 organizations from 11 post-socialist European countries.

According to the CRANET methodology, the survey includes organizations with more than 100 employees, and respondents are HR professionals or individuals responsible for human resource management within their organizations. The analysis in this study includes only organizations operating in the public or private sector, while organizations classified as mixed, non-governmental, or non-profit were excluded from the sample. The final sample consisted of 75% private sector organizations and 25% public sector organizations.

A composite measure called the Inclusive Training Scale (ITS) was used to measure the degree of representation of training programs focused on diversity. This scale was used to identify training and development programs targeted at underrepresented or marginalized employee groups. Respondents indicated whether their organization offered training or career development programs aimed at promoting diversity for eight target groups: ethnic minorities, older employees (50+), persons with disabilities, women, immigrants, refugees, young workers (under 25 years of age), and LGBTQ+ individuals. The internal consistency of the eight binary items was checked using Cronbach's alpha coefficient, and the obtained result ($\alpha = 0.792$) confirms the good reliability of the scale and justifies their unification into a single measure. Accordingly, the ITS was constructed by summing the binary responses (range: 0–8), where higher values indicate that an organization's diversity programs encompass a broader range of underrepresented employee groups. Conceptually, this scale reflects the degree to which organizations invest in diversity-related initiatives and their overall orientation toward socially responsible HRM practices.

Sectoral affiliation (private versus public sector) constitutes the independent variable in this research. It was operationalized as a binary variable (0 = public sector, 1 = private sector). This coding scheme also reflects a theoretically grounded expectation that private sector organizations are more strongly oriented toward diversity-related practices, as they operate under greater market pressures and enjoy higher levels of managerial autonomy. This assumption is consistent with institutional and contingency theories, which emphasize sector-based differences in HRM practices.

Organizational size was included in the research as a moderating variable. It was measured by the total number of employees. Due to pronounced positive skewness in the original data (Skewness = 13.666; Kurtosis = 239.746), a logarithmic transformation was applied, resulting in a normally distributed variable (LogSize) suitable for regression analysis. Conceptually, organizational size reflects an organization's structural and resource capacities for implementing diversity training, as derived from resource-based theory. On the one hand, larger organizations typically have more developed HR structures and greater availability of resources for HR programs. On the other hand, larger organizations are more visible and subject to stronger expectations from key stakeholders. For these reasons, the inclusion of organizational size as a moderating variable is theoretically justified.

The analytical procedure applied in this research consists of two steps through which the proposed hypotheses are tested. In the first step of the analysis, it was determined whether there is a difference in the degree of application of diversity training between organizations in the private and public sectors. For this purpose, the non-para-

metric Mann-Whitney U test was applied. The choice of a nonparametric test was based on several characteristics of the primary data. First, a substantial imbalance exists in the size of the observed organizational groups. Second, the composite ITS measure has an ordinal nature. Finally, the Shapiro-Wilk test was applied to the primary data and, in the case of the dependent variable, confirmed a significant deviation from normal distribution ($p < 0.001$), accompanied by pronounced positive skewness and kurtosis. Considering these data characteristics, the Mann-Whitney U test was deemed appropriate for testing the first hypothesis.

The second step of the analysis aimed to examine whether organizational size moderates the relationship between sectoral affiliation and the implementation of diversity training. For this purpose, hierarchical linear regression was applied. In Model 1, the ITS was regressed on sector (public = 0; private = 1) and LogSize. In Model 2, an interaction term (Sector × LogSize) was introduced to test the moderation hypothesis. All continuous variables were mean-centered prior to analysis in order to reduce multicollinearity and facilitate interpretation of the results. Variance Inflation Factors remained below commonly accepted thresholds (VIF < 2), indicating no multicollinearity concerns. This analytical approach was therefore considered appropriate for testing the second hypothesis.

All statistical analyzes were performed in the SPSS program (version 27.0), using the standard level of statistical significance $p < 0.05$ for hypothesis testing.

RESULTS AND DISCUSSION

This section presents the main findings derived from the previously described analytical procedure. The results relate to the observed sectoral differences and the absence of a moderating effect of organizational size on the relationship between sectoral affiliation and the implementation of diversity training programs.

The values of the ITS ranged from 0 (no programs implemented) to 8 (all programs implemented), with a mean value of 1.01 (SD = 1.65). It should be noted that the distribution of the data was highly asymmetric (Skewness = 2.028) and strongly leptokurtic (Kurtosis = 4.190), indicating that the majority of organizations in the observed sample implemented either a very limited number or no diversity training programs. This conclusion is further supported by a median value of 0 at the level of the full sample, pointing to an exceptionally low prevalence of diversity training practices in the post-socialist context.

Differences in the distribution of results between sectors were also observed. Public sector organizations exhibited a narrower interquartile range (IQR = 1), whereas a wider distribution of values was recorded in the private sector (IQR = 2), indicating greater variability in the implementation of diversity training programs among private organizations. To determine whether the observed differences were statistically significant, the Mann–Whitney U test was applied. The results of this analysis are presented in Table 1 and indicate a statistically significant difference in the level of diversity training implementation between public and private sector organizations.

Table 1. Mann–Whitney U test: Sectoral differences in the Inclusive Training Scale

Sector	N	Mean Rank	Sum of Ranks
Public	279	486.51	135,737.00
Private	839	583.77	489,784.00
Test Statistics[a]			Value
Mann–Whitney U			96,677.000
Wilcoxon W			135,737.000
Z			–4.841
Asymp. Sig. (2-tailed)			.000

[a]. Grouping Variable: Sector
Source: Authors' calculations

Organizations operating in the private sector exhibited a higher mean rank (583.77) compared to public sector organizations (486.51). This result indicates a greater tendency of diversity training implementation in the private sector. The Mann-Whitney U test confirmed the presence of a statistically significant difference between the two sectors ($U = 96{,}677.000$; $Z = -4.841$; $p < 0.001$), thereby supporting Hypothesis 1. This finding is consistent with theoretical expectations suggesting that private sector organizations are more inclined to adopt diversity-oriented programs due to competitive pressures, the need for market adaptability, and alignment with international standards and business practices. Although the overall prevalence of diversity training programs remains low in both sectors, the existence of a statistically significant sectoral difference underscores the importance of organizational context in shaping sustainable HRM practices.

Following the analytical procedure described above, the subsequent analysis examined whether organizational size moderates the relationship between sectoral affiliation and the implementation of diversity training programs. Hypothesis 2 assumed that the association between private sector affiliation and the extent of diversity training implementation would be stronger in larger organizations. As outlined in the methodology section, this hypothesis was tested using hierarchical linear regression.

In Model 1, the Inclusive Training Scale was regressed on sectoral affiliation and mean-centered organizational size (log-transformed). The model explained a small but statistically significant proportion of variance ($R^2 = 0.016$; $F(2, 1065) = 8.451$; $p < 0.001$). Sectoral affiliation emerged as a statistically significant predictor ($B = 0.472$; $p < 0.001$), whereas organizational size did not demonstrate a significant effect ($B = 0.142$; $p = 0.152$). The inclusion of the interaction term (Sector × LogSize) in Model 2 did not improve model fit ($\Delta R^2 = 0.001$; $p = 0.410$), indicating the absence of a moderating effect of organizational size. These results are presented in Table 2.

Table 2. Hierarchical Regression Model Summary for Sector Type and Size Interaction

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.125[a]	.016	.014	1.669	.016	8.451	2	1065	.000
2	.127[b]	.016	.013	1.669	.001	.678	1	1064	.410

a. Predictors: (Constant), centeredlogsize, sector
b. Predictors: (Constant), centeredlogsize, sector, interactionlogsize
Source: Authors' calculations

The results presented in Table 3 indicate that sectoral affiliation is a statistically significant predictor in both models ($p < 0.001$), whereas neither organizational size nor the interaction term reached statistical significance. Multicollinearity diagnostics did not reveal any concerns, as all variance inflation factor values remained below the recommended threshold (VIF < 2).

Table 3. Coefficients for the Moderating Effect of Organizational Size on the Relationship between Sector and Inclusive Training Scale

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.729	.106		6.891	.000		
	Private or public	.472	.121	.119	3.905	.000	.999	1.001
	centeredlogsize	.142	.099	.044	1.434	.152	.999	1.001
2	(Constant)	.730	.106		6.893	.000		
	Private or public	.464	.121	.117	3.822	.000	.992	1.008
	centeredlogsize	.082	.123	.025	.668	.504	.649	1.542
	interactionlogsize	.174	.212	.031	.824	.410	.648	1.543

Dependent Variable: Inclusive Training Scale
Source: Authors' calculations

The results of the hierarchical linear regression indicate that Hypothesis 2 was not supported. In this case, organizational size did not have a direct impact on the application of diversity training, nor did it moderate the relationship between its application and sector affiliation. These findings suggest that sectoral affiliation represents a more influential determinant of sustainable HRM practices in the post-socialist context than organizational size. From a conceptual perspective, the results lend support to the greater relevance of institutional factors over organizational capacities, thereby opening space for a broader interpretation of the empirical findings.

The confirmation of Hypothesis 1 highlights the importance of institutional context in shaping diversity-oriented HRM practices. This finding is consistent with theoretical expectations derived from institutional and contingency theories, which emphasize sectoral differences in managerial practices. The results further support the view that competitive pressures and a higher degree of strategic autonomy in the private sector create more favorable conditions for the adoption of such initiatives (Pollitt

& Bouckaert, 2017). Previous research indicates that diversity training is often implemented for reputational purposes in the labor market, to enhance talent attraction, and in response to stakeholder expectations (Jentjens, Georgiadou, & Hennekam, 2025; Roberson, Moore, & Bell, 2006). This pattern is particularly pronounced in multinational companies. Although these motivations do not necessarily lead to substantive changes in organizational values, they partly explain the higher prevalence of diversity training programs in private sector organizations.

In contrast, public sector organizations in the post-socialist context often operate under conditions of rigid administrative procedures, limited managerial autonomy, and pronounced politicization (Meyer-Sahling, 2009; Kopecký, Mair, & Spirova, 2012; Zolak Poljašević, Gričnik, & Šarotar Žižek, 2025). As previously noted, public sector organizations tend to adopt diversity policies in a largely declarative and symbolic manner in response to external pressures, while their practical implementation frequently remains limited (Husar Holmes, Elias, & D'Agostino, 2023). The findings of this study further indicate that sectoral context represents an important factor for understanding organizational behavior (DiMaggio & Powell, 1983; Ahmed, 2012; Shore, Cleveland, & Sanchez, 2018).

Contrary to expectations, organizational size did not significantly moderate the relationship between sectoral affiliation and the implementation of diversity training in this empirical study. Despite theoretical assumptions grounded in the resource-based view (Barney, 1991; Cox, 1993), the interaction effect proved to be negligible. These findings suggest that, in the post-socialist context, sectoral affiliation, that reflect broader institutional conditions, exerts a stronger influence on organizational behavior in the field of HRM than structural capacities alone (Howard, 2003). This interpretation is consistent with the study by Richard, Roh, and Pieper (2013), who argue that smaller organizations may demonstrate greater openness toward diversity initiatives due to lower levels of bureaucratic inertia and stronger internal alignment. Such results challenge the assumption that larger organizations are inherently better positioned to implement diversity-oriented initiatives and programs.

Overall, the findings of this study assign greater explanatory power to sectoral and institutional factors, indicating that the mere existence of organizational resources is not, in itself, a sufficient condition for the development of sustainable HRM practices.

CONCLUSION

This paper primarily analyzes the differences between the public and private sectors regarding the application of diversity-oriented training programs in post-socialist European countries. In addition, it explores the moderating role of organizational size in the relationship between the observed variables. The findings confirm the existence of a statistically significant difference in the level of diversity training implementation between private and public sector organizations. Although the majority of organizations in the sample implement few or no diversity-oriented training programs, private sector organizations nonetheless demonstrate higher levels of adoption. The results further indicate greater variability in diversity training practices among private organizations. With respect to organizational size, the findings reveal that this moderating variable does not exert a statistically significant effect. From a conceptual

standpoint, the results point to the greater importance of institutional factors compared to structural capacities in shaping diversity-oriented HRM practices.

From a theoretical perspective, the findings presented in this study contribute to the literature on sustainable human resource management. Empirically, the research offers new insights into the post-socialist context. Given that post-socialist countries remain relatively underrepresented in the global discourse on sustainability and diversity-oriented practices, the results enhance understanding of the specific institutional conditions under which such practices emerge.

Post-socialist societies are characterized by the legacy of centralized control and fragmented reform processes. In some countries, attitudes toward diversity remain ambivalent, while in others these issues are further shaped by ethno-nationalist narratives and deeply rooted societal resistance to pluralism. Experiences from Western Balkan countries indicate that formal commitment to diversity policies does not necessarily translate into substantive organizational change. This conclusion applies to both public and private sector organizations. Competitive pressures and the need to align management practices with international standards and ESG frameworks may encourage the formal adoption of diversity-oriented practices, yet they do not inevitably lead to meaningful organizational transformation.

Given that diversity training programs require leadership commitment, organizational support, and tangible investments, their presence can be regarded as a relevant indicator of genuine institutional commitment to diversity-related issues. Therefore, the exceptionally low level of diversity training implementation observed among organizations from 11 post-socialist countries constitutes an important empirical finding and suggests the need for a more substantial shift toward bridging the gap between formal declarations of diversity and their actual organizational enactment.

Despite the contributions outlined above, this study has several limitations. Some of these stem from the CRANET methodology itself. The cross-sectional research design does not allow for the examination of changes in diversity-related practices over time. Since the research is based on self-reported data, the general applicability of the findings is limited, and at the same time there is a risk of socially desirable responding. In addition, the survey instrument used for data collection does not capture qualitative aspects of the observed training programs, such as their content or contextual adaptation, which could reveal more complex patterns of variation. Given the generally low level of diversity training implementation in both sectors, future research should focus on identifying factors that either facilitate or constrain their broader adoption. Future research could involve comparative analyses between post-socialist countries and advanced market economies, which would help clarify whether the patterns identified in this study reflect broader structural dynamics or remain specific to the post-socialist context.

Ultimately, the findings suggest that the development of organizational practices oriented toward sustainability and diversity requires institutional conditions that enable a true transition from words to action.

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ORIGINALNI NAUČNI RAD / ORIGINAL SCIENTIFIC PAPER

BUSINESS CYCLES IN BOSNIA AND HERZEGOVINA: CHRONOLOGY, VOLATILITY, AND SYNCHRONIZATION WITH THE BUSINESS CYCLES OF ITS MAJOR TRADING PARTNERS

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Abstract: *This paper examines the chronology, volatility, and synchronization of business cycles in Bosnia and Herzegovina over the period 2000Q1-2025Q1, with a particular focus on their relationship with the cycles of the country's main foreign trade partners. Real gross domestic product is used as the primary indicator of aggregate economic activity. To eliminate seasonal fluctuations, the X13-ARIMA procedure is applied. The cyclical component of output is extracted using two complementary non-parametric filters, the Hodrick-Prescott filter and the Corbae-Ouliaris filter, allowing for robustness in cycle estimation. Business cycle turning points are identified using the Bry-Boschan Quarterly algorithm, which enables the construction of a consistent chronology of expansionary and recessionary phases for this transition economy. Volatility is measured as the standard deviation of the extracted cyclical components, while synchronization with partner economies is assessed using the Harding-Pagan Concordance Index and cross-correlation analysis. The empirical results indicate that business cycles in Bosnia and Herzegovina exhibit moderate volatility, broadly comparable to those observed in its main trading partner economies. Furthermore, the findings provide evidence of statistically meaningful co-movement and procyclicality, with the Bosnian and Herzegovinian business cycle showing moderate to strong synchronization with external cycles. These results suggest a significant degree of macroeconomic interdependence and external sensitivity of the domestic economy within its trade network.*

Keywords: *Bosnia and Herzegovina, business cycle volatility, business cycle synchronization, trading partners*

JEL classification: *C29, E32, O4*

INTRODUCTION

Although the literature on business cycles encompasses a wide range of conceptualizations and definitional approaches to this economic phenomenon, the formulation proposed by Burns and Mitchell remains the most frequently cited: „Business cycles are a type of fluctuation found in the aggregate economic activity of nations that organize their work mainly in business enterprises...a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals which merge into the expansion phase of the next cycle; this sequence of changes is recurrent but not periodic; in duration business cycles vary from more than one year to ten or twelve years; they are not divisible into shorter cycles of similar character with amplitudes approximately their own.“

In addition to the two aforementioned American economists, substantial contributions to the existing body of knowledge on business cycles have been made by numerous eminent figures in economic thought, including Marx, Keynes, Schumpeter, Hayek, Friedman, Samuelson, Lucas, etc. The considerable attention these economists devoted to the analysis of business cycles highlights the fundamental importance of this phenomenon for understanding the mechanisms underlying the functioning of an economic system. Cyclical fluctuations in economic activity constitute an inherent feature of the complex and heterogeneous system of the economy and should not be interpreted merely as short-term deviations from a long-run trend, devoid of connections with broader processes such as economic growth and development. As emphasized in standard macroeconomic literature and supported by empirical evidence, a strong causal relationship exists between short-term economic fluctuations and long-term structural transformations, commonly referred to in economic theory as the hysteresis effect.

The fact that business cycles constitute an inherent and indisputable feature of economic reality, and that the duration and intensity of their individual phases are difficult to predict, does not imply that they are beyond influence. Policymakers actively seek to manage different phases of the business cycle, mitigating or amplifying them, through the use of various policy instruments, including monetary, fiscal, macroprudential, and labor market policies. A key conclusion emerging from a substantial body of empirical research is that developed and developing economies exhibit differing institutional responses to macroeconomic instability induced by business cycles, particularly in the choice between procyclical and countercyclical policy approaches. It is therefore evident that a “one-size-fits-all” approach cannot be applied to the regulation of cyclical economic fluctuations. Moreover, it is important to recognize that the adoption of an inappropriate policy stance or the mistiming of implemented measures constitutes an error that economic reality seldom, if ever, forgives: ather than stabilizing the system, such missteps may amplify the volatility of cyclical fluctuations in aggregate output, thereby intensifying hysteresis effects

Cyclical fluctuations in economic activity are not a feature exclusive to market-based system. They are also observed in centrally planned economies, as well as in systems undergoing complex transitions from one socio-economic order to another. Bosnia and Herzegovina belongs precisely to this latter category, as a small open economy in which the transition from a centrally planned system to a market-oriented economy commenced nearly three decades ago.

Although public discourse in Bosnia and Herzegovina often reflects the belief that the country is in a state of permanent economic recession, economic theory does not recognize "permanent recession" as a meaningful analytical category. This raises several important questions: Which phase of the business cycle is Bosnia and Herzegovina currently experiencing? How long did previous expansionary and recessionary periods last, and what internal or external shocks triggered them? To what extent did the long-term effects of the COVID-19 pandemic prolong the recessionary phase, and how have recent geopolitical tensions, armed conflicts, and growing trade barriers affected economic recovery and the return to stable growth? Finally, are business cycles in Bosnia and Herzegovina more volatile than those of its main trading partners, and do expansions and contractions occur simultaneously across the region?

Given that the manifestation of cyclical fluctuations in an economy is considered a key constraint on the effective implementation of a predefined macroeconomic development framework, and bearing in mind that Bosnia and Herzegovina, due to its monetary regime (currency board), is exposed to the influence of the monetary policies of its trading partners within the European Union (EU) and the European Monetary Union (EMU), it becomes evident why addressing these questions is of critical importance for policymakers in this small transition economy. A review of the available academic literature reveals a lack of comprehensive and satisfactory answers to these issues, thereby justifying the need for original scientific research.

BUSINESS CYCLE DATING PROCEDURE AND LITERATURE REVIEW

Whether the aim is to forecast recessions and expansions, analyze volatility, or examine business-cycle synchronization across economies, the first step is to identify (date) business cycles. In cases where reliable secondary data on the chronology of periodic cyclical fluctuations in aggregate economic activity around its trend are unavailable, or when the researcher, for specific reasons, opts to base the analysis on primary data, the "classical" approach to business cycle dating is applied, typically consisting of several fundamental steps:[1]

- *selection of a reference series that accurately reflects the dynamics of aggregate economic activity;*
- *filtering of the reference series (seasonal adjustment and detrending); and*
- *identification of turning points in the cyclical component of the reference series.*

The absence of consensus in economic science regarding the most comprehensive measure of aggregate economic activity has resulted in diverse research practic-

[1] With regard to the available "official" business cycle registers, the United States was the first country to establish a specialized institution tasked with identifying phases of economic expansion and contraction according to a clearly defined methodological framework. This refers to the Business Cycle Dating Committee, established within the National Bureau of Economic Research (NBER), which has, since 1978, assessed and publicly announced the timing of transitions in the U.S. economy between recessionary and expansionary phases, and vice versa. Inspired by the U.S. experience in business cycle dating, the Centre for Economic Policy Research (CEPR) established in 2003 the Euro Area Business Cycle Dating Committee (EABCDC), which is widely regarded as the official arbiter in determining the beginning and end of business cycle phases in the member states of the EMU.

es concerning the selection of macroeconomic indicators used to capture the cyclical nature of an economy. The use of composite (synthetic) indicators in business cycle dating traces back to the seminal study by Burns and Mitchell , whose index of leading economic indicators laid the foundation for the development of a wide range of subsequently constructed composite measures for this purpose . The rationale for relying on such "complex" representations of economic dynamics is typically grounded in the argument that simple aggregate measures are insufficient for accurately capturing these temporary and recurrent "events," compared to indicators whose value incorporates multiple economic aggregates, often combined through weighting schemes, indices, and composite formulas. Nevertheless, the existing body of empirical literature in this field shows a prevailing preference for "core" macroeconomic aggregates, primarily real gross domestic product.

Once a reference series with sufficient observations has been selected, the data must be seasonally adjusted so that the cyclical component can be identified. Seasonal adjustment, which involves eliminating seasonal variations from time series data, has a long tradition in economic analysis, as documented by Hylleberg , Bell and numerous other authors. Although a wide range of statistical techniques for seasonal adjustment has been developed, *TRAMO-SEATS* and *X13-ARIMA* are widely accepted as leading standardized procedures for producing seasonally adjusted data. The extraction of the cyclical component from seasonally adjusted data can be performed using various parametric and non-parametric methods. It is important to note, however, that none of these techniques can be considered statistically superior in terms of the accuracy of cyclical component estimation or methodological neutrality.

The extracted cyclical component is subsequently used to identify recessionary and expansionary phases of economic activity, which represents the final stage of business cycle dating. The essence of this economic phenomenon is characterized by a recurring pattern of "downturn phase-trough-upturn phase-peak." The identification of this standardized cyclical scheme for a given economy requires the application of parametric or non-parametric statistical methods used to determine upper and lower turning points in aggregate economic activity (i.e., points of transition between the main phases), thereby enabling a precise determination of both the duration and intensity of business cycles.[2] Among parametric techniques for identifying turning points in economic activity, the Markov-switching model is the most widely used, while the Bry-Boschan algorithm represents the most popular non-parametric method for detecting cyclical periods of economic expansion and contraction within a given system. Since the chronology of business cycles in Bosnia and Herzegovina is not the sole objective of this study, which also examines business-cycle volatility and synchronization in this small transition economy with those of its key foreign trade partners, this section also reviews the results of existing empirical studies relevant to the research question.

The view that the volatile nature of business cycles is determined by the size of an economy is emphasized by Gerlach and Head , whose studies suggest that small

[2] A recession begins after the economy reaches the peak of the business cycle, marking the end of the expansion phase, and ends at the trough, when a new expansion commences. The duration of the business cycle is defined as the time interval between two successive peaks or two successive troughs, while the difference between the peak and the trough serves as an indicator of the cycle's intensity and amplitude.

economies tend to exhibit more pronounced cyclical volatility than large economic systems. As a possible explanation for this phenomenon, Gerlach points to differences in the degree of economic diversification and, consequently, varying exposure to external shocks. However, these arguments are not supported by the findings of Darvas and Szapáry , whose analysis of several small economies reveals significantly lower volatility in cyclical fluctuations compared to those observed in large economic players over the same period.

Given that these countries pursued stabilization-oriented economic policies that contributed to currency and inflation stability, Darvas and Szapáry conclude that economic policy, rather than economic size, plays a decisive role in determining cyclical volatility. Business cycle volatility can also be examined through the lens of the level of economic development, where the empirical evidence is considerably more consistent. For instance, Pallege and Robe find that cyclical fluctuations in aggregate economic activity are substantially stronger in developing countries than in developed ones. This finding is further supported by Rand and Tarp , although their results indicate a less pronounced gap, showing that output volatility in developing economies is approximately 15-20% higher than in industrialized countries. In the case of the Bosnia and Herzegovina, Kovačić and Vilotić show that the country belongs to the group of European economies characterized by relatively high business-cycle volatility. Similar conclusions regarding higher volatility in developing economies are reached by Kohn et al. and Casal and Guntin , who attribute these differences to structural disparities in production patterns and foreign trade structures between developed and developing market systems. Regardless of differences in size and level of development, the global chronology of business cycles indicates a clear trend of declining volatility across most countries and regions . According to The International Monetary Fund in its *World Economic Outlook*, this decline is primarily attributed to advances in monetary and fiscal policy frameworks, as well as improvements in overall institutional development.

Foreign trade represents an important determinant of business cycle synchronization. The impact of trade exchange on cyclical comovement may operate in both directions, and the mechanisms underlying this causality have been thoroughly examined by Calderón, Chong, and Stein . In an effort to empirically address this issue regarding the relationship between international trade and business cycle synchronization across different spatial and temporal contexts, a substantial body of literature has emerged . Academic and research interest in the study of business cycle synchronization has further intensified with the establishment and enlargement of the EMU, given that optimal currency area theory explicitly identifies cyclical synchronization as a key prerequisite for the long-term sustainability of a monetary union and as a central criterion in assessing a country's readiness to join such an integrated economic area. This line of research has been adopted, for example, by Filis, Floros, Leon and Beneki , Benčík , Gouveia , and Pentecôte, Poutineau and Rondeau . With respect to studies focusing on the synchronization of business cycles between Western Balkan/ Southeastern European countries and the euro area, Hildebrandt and Moder as well as Kovačić and Vilotić have conducted analyses that also include Bosnia and Herzegovina, a monetarily dependent economy in which the effectiveness of domestic monetary policy is largely determined by the policy actions of the EMU itself. Given that Bosnia and Herzegovina, due to its specific monetary regime, imports a significant share

of foreign monetary policy effects, it becomes evident that the synchronization of its business cycles with those of euro area member states warrants considerably greater research attention than it has received thus far.

DATA AND METHODOLOGY

The dating of business cycles in Bosnia and Herzegovina, following the previously described "classical" approach, represents the first step toward addressing the research questions outlined in the introductory section of the paper. For the purposes of analyzing volatility and synchronization, business cycles of the country's principal trading partners (EU27, EMU, Germany, Italy, Croatia, Slovenia, Austria, Poland, Hungary, Serbia, North Macedonia, and Turkey) are dated using the same methodological framework.[3]

Real gross domestic product (GDP), expressed as a chain-linked volume index (2010= 100), is employed as the primary indicator of aggregate economic activity for all economies included in the scope of the analysis. The study covers the period from 2000Q1 to 2025Q1.[4] The seasonal component of the time series is removed using the X13-ARIMA statistical method. The resulting seasonally adjusted quarterly observations are subsequently transformed into logarithmic form.

In the process of extracting the cyclical component from the seasonally adjusted series, a non-parametric approach is applied. It is important to emphasize that the use of different detrending methods for time series implies different estimates of the cyclical component, which in practice often leads to substantial discrepancies in the assessment of an economy's state at a given point in time. Taking this into account, two filtering techniques are employed to isolate the cyclical component from the selected reference series: the Hodrick-Prescott (HP) filter and the Corbae-Ouliaris (FD) filter. To identify the set of turning points indicating changes in the dynamics of real gross domestic product across the selected economies, and consequently to determine expansionary and recessionary phases of their business cycles, the Bry-Boschan Quarterly (BBQ) algorithm is applied. The algorithm detects turning points in aggregate economic activity, namely peaks and troughs, by identifying local maxima and minima in the selected reference series, subject to a set of predefined constraints (OECD, 2012):

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[3] According to the most recently available official statistical data on Bosnia and Herzegovina's foreign trade in goods, the EU economy represents the country's largest trading partner, followed by the EMU and CEFTA economies. Due to statistical limitations, CEFTA as a distinct economic system is not included within the spatial scope of this study. When observing bilateral trade relations, Bosnia and Herzegovina has developed the most extensive trade linkages with Germany, Italy, Croatia, Slovenia, Austria, Poland, and Hungary among EU member states, as well as with Serbia, Montenegro, and North Macedonia among CEFTA countries. Montenegro, despite being an important trading partner within the CEFTA framework, is also excluded from the analysis due to similar statistical constraints. Among the five leading EU27 trading partners, four countries have adopted the euro as their common currency (Germany, Italy, Slovenia, and Austria), which constitutes the basis for their inclusion in the empirical analysis. In addition, outside the aforementioned regional economic integrations, Bosnia and Herzegovina conducts a significant volume of trade with Turkey, which is therefore also included in the analysis.

[4] Quarterly, seasonally unadjusted data for the selected reference series are obtained from the Eurostat database, the official statistical office of the EU.

- peaks and troughs must alternate and in cases where peaks and troughs do not appear in an alternating sequence, the algorithm selects the most prominent extreme within the set of potential turning points;
- the first and last turning points must be, in absolute terms, greater/smaller than the first and last observations of the time series;
- each of the two phases of the business cycle (from peak to trough and from trough to peak) must have a minimum duration of at least 2 quarters; and
- a complete cycle (from peak to peak or from trough to trough) cannot be shorter than 5 quarters.

With regard to the second part of the study, which examines business-cycle volatility and synchronization, volatility is measured using the standard deviation, while cyclical synchronization is assessed using the Harding–Pagan Concordance Index and cross-correlation analysis.

The standard deviation is the most commonly used measure of data dispersion. Its value, obtained as the positive square root of variance, indicates the extent to which the values of a data series are concentrated around the arithmetic mean . This statistical indicator also represents the most widely used measure of macroeconomic volatility, which, in the context of business cycles, serves as an indicator of deviations of the cyclical component, obtained through filtering techniques, from its "equilibrium value," i.e., the trend. A low standard deviation suggests that the values of the cyclical component tend to remain close to the trend, whereas higher values of this indicator signal more pronounced oscillations and fluctuations in the dynamics of aggregate economic activity.

The Harding-Pagan Concordance Index was developed by the Australian econometricians Harding and Pagan with the aim of providing the scientific community with a simple yet effective tool for measuring the degree of synchronization of economic cycles, whether in the form of national business cycles across countries or sectoral cycles within a single economy. The Index takes values in the range from 0 to +1. Although the authors did not propose a universal scale for interpreting the results, unlike the correlation coefficient, empirical research commonly relies on certain interpretative conventions. In particular, values of the Index closer to unity indicate a higher degree of cyclical synchronization, implying that both cycles are in the same phase, either expansion or recession. Conversely, lower values point to a weak degree of co-movement, suggesting that the cycles tend to move in opposite directions. The traditional approach to measuring business cycle synchronization is grounded in the application of *cross-correlation analysis*. The magnitude and direction of the relationship between business cycles are captured by the correlation coefficient, computed for each lag using the Pearson correlation coefficient (r). The assessment of synchronization between the business cycle of a target economy and those of reference economies is commonly based on the sign and statistical significance of the correlation coefficient at zero lag (t= 0). A positive and statistically significant coefficient indicates procyclical behavior, implying that the business cycles co-move in the same direction. In contrast, a negative and statistically significant coefficient points to countercyclical behavior, whereby the cycles move in opposite directions. If the coefficient at zero lag is statistically insignificant, this is interpreted as evidence of acyclical behavior, suggesting the absence of a systematic relationship between the cyclical dynamics of the

economies under consideration. Furthermore, the determination of whether a business cycle is leading, lagging, or coincident relative to reference economies is based on the examination of the maximum absolute value of the cross-correlation function. This extremum may occur at positive, negative, or zero lags and provides the empirical basis for drawing final inferences regarding the nature of synchronization between the observed business cycles.

RESULTS

In order to obtain a clearer insight into the cyclical nature of the development of the Bosnia and Herzegovina's economy over the period 2000Q1-2025Q1, the results of the extraction of the cyclical component using the HP and FD filtering methods are presented graphically, along with the deviations of the isolated cyclical components from the long-run trend (Figure 1).

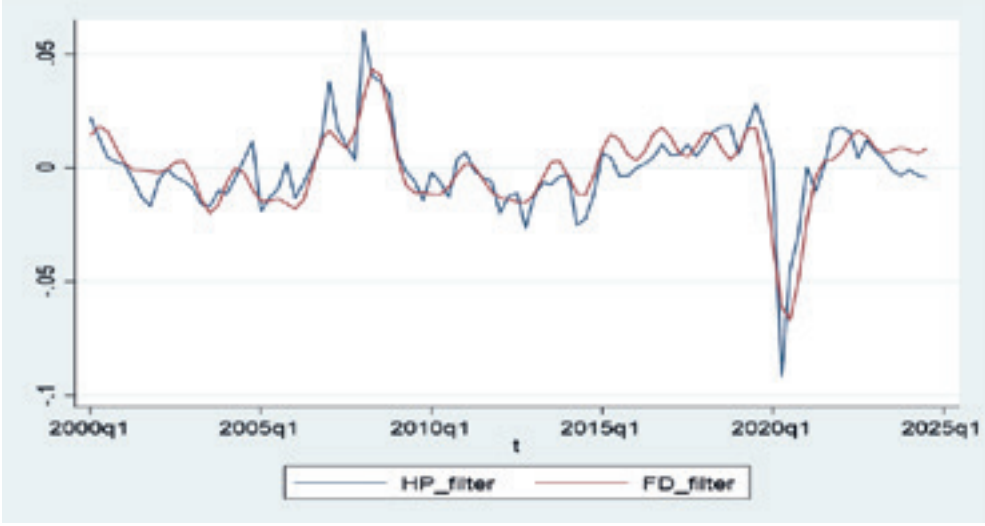


Figure 1. Cyclical Component of Seasonally Adjusted Real GDP of Bosnia and Herzegovina over the Period 2000Q1-2025Q1
Note: Long-run trend= 0
Source: Author's illustration; Stata

The graphical representation clearly indicates that the HP and FD filtering methods yield largely convergent, albeit not fully identical, results. These subtle differences in trend deviations reflect the sensitivity of the cyclical component to alternative methodological approaches, which is particularly evident during periods of more pronounced fluctuations in economic activity. Observing periods of significant deviations of the cyclical component of aggregate economic activity from its long-run trend, it is evident that they coincide with episodes of severe disruptions in the global economy, driven by various destabilizing economic and/or non-economic factors. These are "disruptive" periods that have been recorded in modern economic history under the following labels:

- *the global financial crisis*, which began in late 2007 and reached its peak intensity during 2008-2009;

- *the European sovereign debt crisis* (2010-2012), as a secondary wave of financial instability which, following the *Great Recession*, primarily affected euro area countries and further intensified recessionary pressures in the broader regional context; and
- *the COVID-19 pandemic*, as a global public health emergency and an unprecedented economic shock in the modern era.

The National Bureau of Economic Research (2010) officially dated the end of the Great Recession to June 2009, at least with respect to the economy of the United States, from which this global financial crisis originated. Although the recession formally ended in mid-2009 in a technical sense, its economic and broader social consequences persisted considerably longer. This was particularly evident in European countries and emerging economies, including Bosnia and Herzegovina. The graphs also clearly illustrate the depth and persistence of the global financial crisis's impact on the economy of Bosnia and Herzegovina, as well as the slow recovery that followed. The European sovereign debt crisis, which primarily affected EMU member states, also generated negative spillover effects on Bosnia and Herzegovina, further slowing its already fragile post-crisis recovery. In addition, the domestic economy was affected by an internal economic shock in the form of the "centennial floods" of May 2014, which caused severe damage and significantly reduced the country's prospects for faster short- and medium-term economic expansion. The largest recorded percentage deviation from the long-run trend over the observed period is associated with the COVID-19 pandemic. Following the World Health Organization's declaration of COVID-19 as a global pandemic in March 2020, a crisis initially perceived as "China's problem" and subsequently as "Italy's problem" rapidly evolved into a truly global shock . In parallel with the spread of the virus, an acute "economic infection" unfolded, leading to a pronounced deterioration in Bosnia and Herzegovina's macroeconomic performance in the second quarter of 2020. Although a gradual recovery followed during 2021 and 2022, the losses incurred during the "pandemic year" left long-lasting negative effects on the country's growth and development dynamics.

The observed differences in the variations of the cyclical components extracted using the HP and FD filters corroborate previous empirical findings that the choice of the smoothing parameter λ in the HP filtering procedure has important implications for the smoothness and volatility of the identified cyclical fluctuations. In this case, a smoother cyclical component, albeit with more pronounced oscillations, is obtained using the HP filter, whereas the FD filter yields a less volatile cyclical component with attenuated extremes.[5] In the subsequent step of business cycle dating for Bosnia and Herzegovina, these methodological differences result in distinct sets of turning points in aggregate economic activity.

The BBQ algorithm applied to HP-filtered data identifies 15 turning points over a sufficiently long sample, capturing 7 recessionary and 8 expansionary phases. Recessions last on average just under 5 quarters, with the longest (7 quarters) occurring

[5] A high correlation between the observed cyclical components (r= 0.8222) indicates that the HP and FD filters yield similar cyclical patterns. In contrast, the double application of the HP filter (λ= 10), as in Kovačić and Vilotić (2017), substantially reduces the correlation (r= 0.4320) and produces markedly different macroeconomic signals, with notable changes in the shape, amplitude, and dynamics of the identified cycles.

in 2008Q1-2009Q4 and 2011Q1-2012Q4, while expansions average six quarters. At the beginning of 2023, the economy of Bosnia and Herzegovina reached an upper turning point (peak), marking the onset of a new phase of stagnation. Due to methodological limitations, it is difficult to determine whether the economy is still in a recessionary phase or has already entered a recovery and renewed expansionary trajectory. According to the most recent economic forecasts of the World Bank and the International Monetary Fund, Bosnia and Herzegovina is expected to experience moderate economic growth. However, numerous internal and external challenges should not be overlooked, as they may significantly threaten the sustainability and stability of this growth. Using the FD filter, the BBQ algorithm detects more frequent turning points (12 peaks and 11 troughs), implying a greater number of shorter cycles. Recession phases are slightly shorter, while expansion phases are notably reduced, lasting about half as long on average. The longest contraction (mid-2008 to mid-2010) and the longest expansion (2020Q3-2022Q3) both span two years. Differences in the duration of recessionary and expansionary phases indicate that business cycles in Bosnia and Herzegovina are irregular in their occurrence and non-uniform in length (Table 2).

Table 2. Chronology of Business Cycles in Bosnia and Herzegovina, 2000Q1-2025Q1

HP		FD	
(from peak to peak)	**(from tough to trough)**	**(from peak to peak)**	**(from tough to trough)**
2002q2-2004q2 (8**q**)* 2004q4-2008q1 (12**q**)	2001q4-2003q3 (**7q**) 2003q3-2006q1 (**10q**)	2002q4-2004q2 (**6q**) 2004q2-2007q1 (1**1q**)	2002q1-2003q3 (**6q**) 2003q3-2006q1 (**10q**)
2008q1-2011q1 (12**q**) 2011q1-2015q1 (**16q**)	2006q1-2009q4 (**15q**) 2009q4-2012q4 (**11q**)	2007q1-2008q2 (**5q**) 2008q2-2011q1 (**11q**)	2006q1-2007q3 (**6q**) 2007q3-2010q2 (**11q**)
2015q1-2016q4 (**7q**) 2016q4-2019q3 (**11q**) 2019q3-2022q1 (**10q**) 2022q1-	2012q4-2015q3 (**11q**) 2015q3-2017q4 (**9q**) 2017q4-2020q2 **(10q)** 2020q2-	2011q1-2013q4 (**11q**) 2013q4-2015q2 (**6q**) 2016q4-2018q1 (**5q**) 2018q1-2019q3 (**6q**) 2019q3-2022q3 (**12q**) 2022q3-2023q4 (**5q**) 2023q4-	2010q2-2012q4 (**10q**) 2014q3-2016q1 (**9q**) 2016q1-2017q3 (**6q**) 2017q3-2018q4 (**5q**) 2018q4-2020q3 (**7q**) 2020q3-2023q2 **(11q)** 2023q2-

Note: (tq)= cycle duration in quarters
Source: Author's calculations; Stata

When business cycles are conceptualized as sequences of declines in aggregate economic activity followed by subsequent recoveries, their duration in Bosnia and Herzegovina varies between 7 and 16 quarters under the HP filtering approach, and between 5 and 12 quarters under the FD filtering approach. A comparable temporal

pattern is also observed when cycles are defined as the interval between two consecutive troughs, i.e., between the endpoints of successive contraction phases. On average, the economy of Bosnia and Herzegovina takes approximately 2 years and 9 months to move from one peak to the next under the HP filter, and about 2 years under the FD specification. Similarly, the average duration of cycles measured as the distance between two consecutive troughs amounts to 2 years and 2 quarters using the HP method, and approximately 2 years under the FD filtering approach.

Comparing the estimated cyclical component with the business-cycle chronology shows that cycles in Bosnia and Herzegovina vary not only in duration, but also in amplitude and shape.[6] Under the HP filter, the most pronounced contraction occurs during 2008Q4-2009Q3, with an amplitude above one, reflecting the global financial crisis, while the strongest overall cycle is observed in 2019Q3-2020Q2, driven by the COVID-19 shock and associated volatility. A further notable downturn appears in mid-2003, linked to structural transition processes, privatization, institutional instability, regional tensions, and weaker global conditions following the dot-com crisis. The FD filter produces highly consistent results, particularly regarding the timing and magnitude of the most severe recessionary phases, confirming the robustness of the findings across different filtering methods and highlighting the multi-dimensional and heterogeneous nature of business-cycle dynamics in Bosnia and Herzegovina.

With regard to the shape of business cycles, there is an increasing number of researches that support the thesis that modern business cycles do not always have a pure sinusoidal wave pattern, as commonly assumed in theoretical frameworks. This is also confirmed for Bosnia and Herzegovina, where cycles identified using both HP and FD filters exhibit asymmetry, abrupt turning points, and irregular dynamics in both recessionary and expansionary phases. Notable examples include:

- the COVID-19 cycle, characterized by a sharp "V-shaped" shock with a deep recession followed by a rapid recovery from the trough;
- the global financial crisis cycle, marked by a severe contraction and a more gradual recovery, resulting in a flatter, "L-shaped" expansion; and
- the 2003-2004 cycle, which exhibits an irregular, flattened structure with no clearly defined peak and a prolonged trough, indicating weak and non-standard recovery dynamics.

In the second part of the research, which includes a comparative analysis of the volatility and synchronization of business cycles in Bosnia and Herzegovina and those of its key trading partners, due to the limited scope of the paper, the results of business cycle dating for the other countries included within the spatial framework of the study are available from the author upon request.

Based on the calculated values of the standard deviation, it can be concluded that business cycles in Bosnia and Herzegovina are moderately volatile, indicating a relatively stable macroeconomic environment despite persistent structural challenges (Table 3).[7]

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[6] The amplitude of the business cycle, defined as the vertical distance between its peak and trough within a given cycle, represents a key indicator of the intensity of cyclical fluctuations. A more pronounced amplitude implies a more intense cycle.

[7] The above conclusion holds for both filtering methods.

Table 3. Volatility of Business Cycles in Bosnia and Herzegovina and Its Major Trading Partners, 2000Q1-2025Q1

HP		FD	
Country	**Standard deviation**	**Country**	**Standard deviation**
Bosnia and Hercegovina	0.0179754	Bosnia and Hercegovina	0.0166755
EU27	0.0188867	EU27	0.0182216
EMU19	0.0194762	EMU19	0.0187824
Germany	0.0179531	Germany	0.0174731
Italy	0.0245996	Italy	0.0240797
Croatia	0.0279234	Croatia	0.0276056
Slovenia	0.0238338	Slovenia	0.0223085
Austria	0.0213665	Austria	0.0195057
Poland	0.0170460	Poland	0.0146606
Hungary	0.0225979	Hungary	0.0188697
Serbia	0.0203218	Serbia	0.0190820
N. Macedonia	0.0272113	N. Macedonia	0.0237923
Turkey	0.0370946	Turkey	0.0401012

Source: Author's calculations; Stata

There are no substantial differences in the volatility of business cycles between Bosnia and Herzegovina and the EU27 and EMU19 economies, suggesting a degree of synchronization in terms of the intensity of cyclical fluctuations, though not necessarily in the timing of shocks. Within bilateral trade relations, Poland and Germany exhibit the lowest volatility, consistent with their high macroeconomic stability and institutional resilience. With regard to other trading partners within the EU and EMU frameworks, their business cycles can be characterized as moderately to highly volatile, displaying more pronounced deviations from trend compared to those of Bosnia and Herzegovina. Serbia, as the most important trading partner of Bosnia and Herzegovina within the CEFTA framework, exhibits moderately elevated cyclical volatility over the observed period, which is nevertheless higher than that of Bosnia and Herzegovina. Among the ten comparator economies, the largest differences in standard deviations are observed for Turkey, which exhibits more than twice the cyclical volatility. Significant differences are also evident for North Macedonia, further confirming the heterogeneity of cyclical dynamics in the region and highlighting the role of country-specific macroeconomic and institutional factors in shaping business cycles. Finally, the results of this study partially diverge from those reported by Kovačić and Vilotić , whose analysis suggests nearly twice as high volatility of business cycles in Bosnia and Herzegovina relative to both EU and EMU economies (under both filtering methods), as well as higher volatility compared to all EU member states and CEFTA signatories included in their sample.

Due to the limited availability of research on the synchronization of business cycles in Bosnia and Herzegovina with those of its trading partners, and in order to ensure comparability of results within this field of study, this research adopts the meth-

odology developed by Kovačić and Vilotić . The analysis, based on the Harding-Pagan Concordance Index, reveals a relatively high degree of synchronization in the case of the EU and EMU supranational economies. This finding is particularly relevant in the context of Bosnia and Herzegovina's potential accession to European integration structures (Table 4).

Table 4. Business Cycle Synchronization between Bosnia and Herzegovina and Its Major Trading Partners, Based on the Harding–Pagan Concordance Index (2000Q1-2025Q1)

HP		FD	
Country	**Harding-Pagan Concordance Index**	**Country**	**Harding-Pagan Concordance Index**
EU27	0.78787879	*EU27*	0.78787879
EMU19	0.78787879	*EMU19*	0.78787879
Germany	0.75757576	*Germany*	0.6969697
Italy	0.72727273	*Italy*	0.78787879
Croatia	0.76767677	*Croatia*	0.85858586
Slovenia	0.80808081	*Slovenia*	0.82828283
Austria	0.77777778	*Austria*	0.6969697
Poland	0.74747475	*Poland*	0.74545455
Hungary	0.66666667	*Hungary*	0.63636364
Serbia	0.66666667	*Serbia*	0.62626263
N. Macedonia	0.64646465	*N. Macedonia*	0.70707071
Turkey	0.65656566	*Turkey*	0.63636364

Source: Author's calculations; Stata

With the exception of Hungary, the study indicates a relatively high degree of synchronization between the business cycles of Bosnia and Herzegovina and those of most Western European trading partners included in the analysis Despite stable trade relations with Hungary, cyclical alignment remains only moderate, which may reflect structural and institutional differences between the two economies. Among individual EU/EMU member states, the highest degree of synchronization is recorded with Slovenia, where the index values suggest that the two economies were in the same phase of the business cycle, either expansion or recession, for approximately 80% of the observed period. Outside the "bloc" economies, the indices for Serbia, North Macedonia, and Turkey range between 0.62 and 0.67, indicating a moderate degree of cyclical synchronization. Overall, the results suggest that the economy of Bosnia and Herzegovina is more exposed to the transmission of shocks originating within the common European economic space than to those emanating from outside it.

Following Kovačić and Vilotić , cross-correlations between Bosnia and Herzegovina's business cycles and those of its main trading partners were computed for leads and lags from t-6 to t+6.[8] Positive coefficients at zero lag indicate procyclicality, showing that cycles generally move in the same direction as those of key partners. In

[8] Results are available from the author upon reasonable request.

most cases, the strongest correlations also occur at zero lag, suggesting a high degree of synchronization. Exceptions are found for Germany and Turkey under the FD filter, where the maximum correlation appears at a one-quarter lead, implying that Bosnia and Herzegovina lags behind these economies by one quarter. Overall, results are consistent across filtering methods and align with those obtained using the Harding-Pagan Concordance Index.

The results of the synchronization analysis differ considerably from the findings of Kovačić and Vilotić, both in the segment based on the application of the Harding-Pagan Concordance Index and in the analysis of cross-correlation dynamics between time series. Their study, which relies on the Concordance Index, reports a lack of synchronization between domestic business cycles and those of the EMU and EU economies over the period 2000-2016. At the bilateral level, their analysis similarly identifies weak cyclical co-movement with the business cycles of each member state within these two supranational groupings, with the exception of Austria. The same authors obtain comparable results when examining synchronization with CEFTA member states (Serbia and North Macedonia) as well as Turkey. Furthermore, their cross-correlation analysis confirms the absence of cyclical alignment and identifies a lag of up to six quarters in the business cycles of Bosnia and Herzegovina relative to those of the EU. The divergences between the findings of the present study and those reported by Kovačić and Vilotić may be attributed to several factors: (i) differences in the sample period (after 2016, Bosnia and Herzegovina underwent notable structural transformations, including changes in production structure and trade patterns); (ii) differences in the choice of proxy for aggregate economic activity (Kovačić and Vilotić use the industrial production index for Bosnia and Herzegovina, unlike for other countries in their sample, where broader measures are applied); and (iii) differences in the extraction of the cyclical component (their approach employs a double application of the HP filter with alternative values of the parameter λ).

CONCLUSION

This study had two primary objectives: (i) to identify turning points in economic activity in Bosnia and Herzegovina and construct a chronology of recessionary and expansionary phases over the past 25 years, and (ii) to examine the volatility and synchronization of its business cycles with key trading partners. The business-cycle database for 2000Q1-2025Q1 is constructed using a classical dating framework. Using the Hodrick-Prescott filter, the Bry-Boschan Quarterly algorithm identifies 15 turning points, corresponding to seven recessionary and eight expansionary phases. A peak in early 2023 marks the onset of stagnation, which is further supported by results from the Corbae-Ouliaris filter, where more frequent turning points (12 peaks and 11 troughs) indicate shorter cycles and predominantly adverse macroeconomic developments since late 2023.

Over the past twenty-five years, business cycles in Bosnia and Herzegovina have exhibited substantial variation in duration, intensity, and shape. Periods of pronounced cyclical deviations are closely associated with major global shocks, including the global financial crisis, the European sovereign debt crisis, and the COVID-19 pandemic.

Regarding volatility and synchronization, results indicate that Bosnian and Her-

zegovinian cycles are moderately volatile and broadly comparable to those of EU and EMU economies. In most cases, major trading partners exhibit higher volatility. The findings also reveal a relatively strong degree of cyclical synchronization with EU/EMU economies, particularly Slovenia, while Hungary represents an exception. Outside these blocs, a moderate degree of comovement is still observed.

Overall, Bosnia and Herzegovina's economy appears more strongly influenced by shocks originating within the European economic area than by external sources. These results contribute to a more nuanced understanding of business-cycle dynamics in this transition economy and provide a basis for further research on shock transmission and macroeconomic policy effectiveness across the cycle. They also carry important policy implications for strengthening economic resilience to both external and internal shocks.

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ORIGINALNI NAUČNI RAD / ORIGINAL SCIENTIFIC PAPER

THE GREEN PURCHASE AWARENESS OF CROATIAN YOUNG ADULTS' CONSUMERS

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Abstract: *The environmental problems of today both in world and in Croatia leads to the challenge of how to purchase products in order to listen to environmental rules. The goal of this research is to analyze the impact of factors that affect the young adults' consumers awareness on green purchase. This research examines the green purchase awareness of Croatian young adults' consumers and its influence on purchase intention of eco-friendly products. Survey research has been conducted on a sample of 653 respondents in Croatia. The theory of planned behavior was used in this research. The model examines the influence of several independent variables on the intention to purchase eco-friendly products using correlation and multiple regression. The research results show that attitudes about eco-friendly products, subjective norms, perceived behavioral control, knowledge about eco-friendly products and feelings of guilt are statistically significantly related to intentions to purchase eco-friendly products. By considering the demographic characteristics it was determined that the level of education significantly affects the intention to buy eco-friendly products, in contrast to all other demographic variables, which have no significant influence. The results of this research contribute in way that increase the knowledge of researchers about the theory and results that occur in the field related to sustainable development and environment and especially purchase intention toward the eco-friendly product in Croatia. The results of this research are expected to be a reference for further research in the field of eco-friendly products.*

Keywords: *purchase, eco-friendly product, consumer behavior, young adult's*

JEL Classification: *Q50*

INTRODUCTION

The negative impact of climate change, industrialization and the expansion of technology on the environment has become a major issue of concern worldwide. It started in June 1992, at the Earth Summit in Rio de Janeiro, Brazil, where more than 178 countries adopted Agenda 21, a comprehensive plan of action to build a global partnership for sustainable development to improve human lives and protect the envi-

ronment . The 2030 Agenda for Sustainable Development is currently relevant. Agenda is a plan of action for people, planet and prosperity which consists of 17 Sustainable Development Goals with 169 associated targets which are integrated and indivisible. European Union (EU) also made a positive and constructive contribution to the development of the 2030 Agenda and EU is committed to implementing the SDGs in all policies and encourage EU countries to do the same . Besides that, EU has taken a particular approach to circular economy, with high expectations to increase competitiveness, promote economic growth and create jobs while reducing environmental impacts and resource dependency . Making the EU a more resource-efficient, climate neutral, and pollution-free circular economy calls for more sustainable products .

As consumers' interest in protecting the environment and their own health increases, so does the demand for eco-friendly products, which further leads to the development of the market for eco-friendly products. Consequently, organizations are turning to the production of eco-friendly products. Eco-friendly products are one of the major ways of acting in harmony with the environment. Defining a sustainable/green/eco-friendly product is very complex because a completely eco product does not exist.

An eco-friendly product could be defined as "one constituted of materials and associated with production practices along its entire life cycle recognized for being socially and environmentally responsible" . Eco-friendly products are products with the goal of minimizing their impact on the environment. They are often known as biodegradable, recyclable, natural, organic, non-toxic, green, or sustainable products. It can also refer to them as environmentally friendly products that cause minimal harm to the environment. They are usually made from recycled paper, metal, plastic, and glass, or obtained from bamboo or cotton. On the eco-friendly product there must be a label that confirms it credibility. Eco-friendly products have a lower impact on the environment throughout their life cycle, i.e., from the raw materials used in their manufacturing, to their design, transport to the end-user, their length of use and their capacity to be recycled . There is no set standard in Europe of what makes an eco-friendly product, but here are some criteria which can help identify products that, though sometimes more expensive, are likely to be more sustainable and will save you money in the long run . The EU Ecolabel is recognized in all member states of the European Union and was introduced by an EU regulation in 1992 (Regulation EEC 880/92), has gradually become a reference point for consumers who want to help reduce pollution by purchasing more environmentally-friendly products and services (EU ecolabel, undated). In 2022, the vast majority of consumers across the globe saw their purchasing behavior become at least a little more environmentally friendly compared to five years earlier . Becoming eco-friendlier means many benefits like environmental protection (water consumption, waste production, etc.), health benefits, lower energy bills, reduced energy consumption etc. On the other hand, eco-friendly products can be more expensive and not as high-quality as conventional product. One of the major disadvantages is the high price, "75% of global consumers feel that eco-friendly products have become more expensive over the last year" . Most consumers are willing to pay a premium price if they perceive an additional value from the product . However, consumers are becoming more aware of the impact that their purchasing decisions have on the environment, so many are willing to pay more for products that are eco-friendly.

Sustainability marketed products have grown every year since 2015 with a significant share increase during the pandemic . However, the share of consumers who buy eco-friendly products is relatively small in Croatia, and it can be concluded that a positive attitude towards eco-friendly products does not necessarily lead to a purchase. Precisely because of all the above, this paper determines the factors that influence the purchase of eco-friendly products. Although factors such as environmental attitude, subjective norms, perceived behavior control, environmental knowledge, appeared to be the most studied variables impacting intention to buy eco-friendly products the more recently research of shows that green consumer behavior is affected also by cultural, personal, political, psychographic, and ethical values. The purpose of this research is to gain new knowledge about young adults' consumer behavior in purchasing eco-friendly products. In research aimed at predicting young adults' consumer behavior, the theory of planned behavior is the most well-known. The results of this research can be used to understand the young adults' consumers awareness on eco-friendly purchase.

LITERATURE REVIEW

Constant interest in ecological and eco-friendly products is growing, both among the producers of such products, so among customers as well as academics researchers. It is precisely for this reason that there is a large number of researches on this topic.

Most research both in Croatia and in the world has revealed that the extended theory of planned behavior explains much more variation for green purchase behavior. For this reason, most research on eco products applies the extended TPB for its predictive ability.

Most of the papers in the field of environmental studies include attitudes towards eco products, subjective norms and perceived behavioral control. The extended model adds most frequently used variables such as environmental concerns , environmental knowledge , awareness Empirical consumer studies have supported that those variables are important attributes in the purchase of eco-friendly products.

The links between green purchase intention and ethical behavior and willingness to pay the higher price have also been examined in various research . The results showed that consumers in Croatia commonly behave ethically and they are willing to pay a higher price for eco-friendly products. Emotions are important in consumer decision making and many researchers have agreed that TPB model is more significant when it includes emotional factors. However only a few authors used the additional variable feeling of guilt. Other variables worth mentioning are green label variables, green social influence, health consciousness, perceived higher quality of green products, availability of green products which are the subject of research by different authors. Technological competence can be cited as the main characteristic of today's time and precisely the variable digital communication was found to have significant influence on green purchase intention .

Some previous research in Croatia have contributed to the research of eco products using the theory of planned behavior in their studies . The results identified variables (attitudes towards eco products, knowledge and awareness) as the best predictors of intention to purchase ecological products. However, most papers in Croatia are oriented towards the specific area of eco products like which investigated consumers' intentions towards purchasing natural cosmetics or which investigated organic food.

Both studies showed a strong positive correlation between purchase intentions towards eco products and confidence in the certification of eco production and eco-labels or references. According to this, most important factors that influence eco consumer purchase behavior are confidence and quality.

Research often deals with young consumers and environmental issues. Factors influencing the green purchase intention among young people (especially students) have been provided by numerous authors and their recent research who used the (extended) theory of planned behavior and various factors oriented to eco-friendly purchase intention. Understanding the perspective of young people towards green purchase intention is very important because they are the force that drives our societies forward and contributes to positive social change. and emphasized the importance of willingness to pay as the key factor that affect the green purchase behavior and authors above have demonstrated that green attitudes, subjective norms, environmental concern and environmental knowledge are the most influencing factors. Regardless of the inconsistencies in some research, it can still be seen that these are the most important researched variables. On the other hand, factors influencing the green purchase intention among all age groups showed the approximately equal results. Subjective norms, environmental knowledge and green label variables are the main factors that affect the green purchase intention.

Numerous studies in which the theory of planned behavior was used in the context of the behavior of consumers of ecological products, confirmed significant the influence of independent on dependent variables of the TPB model. To examine green purchase intention, variables such as attitudes, subjective norms, behavioral perceived control, knowledge, environmental awareness, willingness to pay a higher price are more reliable than demographics characters however there are also studies that have tried to investigate whether is there correlation between demographics characteristics in the purchase behavior of eco-friendly products . In most research there were no significant relationships between demographic characteristics and purchasing behavior of environmentally friendly products, while in some cases they are significant. Researches were conducted in different countries with different development (special emphasis on income) and therefore different results were obtained. However, it implies that consumers are influenced more by other variables which proved above-mentioned research that the respondents have positive response towards the eco-friendly products.

Additionally, there is only a few studies that have focused on the intention to purchase eco-friendly products based on the theory of planned behavior in Croatia. According to the available research, none of the studies in Croatia have measured the young consumer's intention towards purchasing eco-friendly products (with special emphasis on additional variables - knowledge about eco-friendly products and feeling of guilt).

A MODEL OF PLANNED CONSUMER BEHAVIOR

Consumer behavior is important to study because it is a dynamic process that is constantly changing and is influenced by a large number of factors such as personal, social and psychological factors. Consumers are becoming more aware of a healthy lifestyle, but also sometimes a busy lifestyle leads to the purchase of products that are not eco-friendly. The eco-friendly consumption behavior is the consumption behavior that consumers strive to protect the ecological environment and minimize the negative impact of consumption on the environment during the purchase, use and post-treatment of products.

One of the most commonly used models for the purpose of understanding consumption behavior is the theory of planned behavior according to Ajzen, and the research framework of this research will be based on this model. According to ,consumer behavior is determined by various motivational factors, and according to the theory of planned behavior, motivational factors include attitude, subjective norms and perceived control of behavior, which together influence the intention to behave . The application of the theory of planned behavior is visible in a large number of researches on eco-friendly products. Although some authors like pointed out to go beyond Ajzen's theoretical explanations of consumer purchasing behaviors. Attitudes have a very important place in consumer behavior because they are the central component of the thought structure of each individual . A more positive attitude towards a certain behavior increases the intention to perform a certain behavior , . Subjective norms are the perceived social pressure to perform or not to perform a behavior . Perceived behavioral control is a measure of how easy or difficult it is to engage in certain behavior, that is, how much control a person has over whether or not he will behave in a certain way . People are motivated to perform certain behaviors if they feel they can control the success. According to , apart from attitude, subjective norm and perceived behavioral control, this theory is open to the inclusion of additional variables in certain contexts and for certain behaviors, provided that the variables are well represented and as such improve the predictive power ability. The proposed research model in this paper, in addition to the three previously mentioned indicators of behavioral intention (attitudes, subjective norms, perceived behavioral control), two additional variables are included, knowledge about eco-friendly products and feeling of guilt. Young adults' consumers gain knowledge through advertisements such as printed media or social media which is widely spread today. Advertising is vital to reach prospective young adults to influence their intention . According to the emotion of guilt was identified as a stimulus factor for the purchase of green products.



Figure 1. Model of research
Source: author modified according to Ajzen

Figure 1 shows the theoretical model of research. By including additional variables in the basic model of the theory of planned behavior, this research should lead to additional knowledge about young adults' consumer behavior regarding the purchase of eco-friendly products.

Therefore, in accordance with the aim of the research, the following hypotheses were defined:

H1: The better young consumer's green purchase awareness will lead to increased green purchase intention.

H1a Attitudes about eco-friendly products have a significant positive effect on intentions to purchase eco-friendly products.

H1b Attitudes of close people (subjective norms) have a significant positive effect on the intentions to buy eco-friendly products.

H 1 c Favorable perceived control of behavior has a significant positive effect on intentions to purchase eco-friendly products.

H1 d Better perceived knowledge about eco-friendly products significantly positively affects the purchase of eco-friendly products.

H1 e A greater sense of guilt significantly positively affects the purchase of eco-friendly products.

H2: Demographic variables (gender, education, income, marital status, working status) have a positive and significant impact on green consumption awareness.

METHODOLOGY

This research analyses 653 survey responses in Croatia about their purchase intention of eco- friendly products.

Sample of respondents

The target population of this research consist of 653 respondents in Croatia. For the purpose of data collection, an online survey method was used on the Google Forms platform. The survey was conducted between April 1th, 2024 and August 1th, 2024 in Croatia shared by shared by e-mail and social circles. The survey contains a total of 23 questions. Except for the age limit (young adults from 18-34 years old), there were no other restrictions. The research survey consists of first part, where respondents filled in basic information about themselves (demographic variables) - 7 questions. Demographic variables - refer to population characteristics such as age, gender, size and stage in the family life cycle, income, education, occupation, social class, nationality and religion . These variables are most often used for market segmentation and consumer behavior prediction so certain were selected and used in this research. The second part of question consists of 1 filter question about familiarity with eco-friendly products. All those who answered that they were not familiar with eco-friendly products were excluded from research. The third part of question consists of 15 questions. The respondents had several statements at their disposal and all measurements were taken using 5-point Likert scales (ranging from 1 = strongly disagree to 5 = strongly agree).

Data processing methods

Statistical data processing was done using the methods of descriptive and analytical statistics in the software package SPSS and STATISTICA. The reliability of

the measurement scales was checked using Cronbach's α-coefficient. A Pearson correlation analysis and multiple regression analysis were performed to verify the relationship between the set hypotheses. An independent sample t-test and ANOVA have been conducted in order to check whether there is a statistically significant difference in demographic characteristics.

RESULTS

The results of the research are based on the survey "The influence of ecological awareness on the purchase of eco-friendly products".

Table 1. Socio-demographic characteristics of the survey participants

Characteristics		Total (N)	%
Gender	Male	258	39,50
	Female	395	60,50
Level of education	High school	278	42,57
	Undergraduate study	168	25,73
	Graduate study	192	29,40
	Postgraduate study	15	2,30
Household income	< 700 €	48	7,45
	700–1000 €	101	15,47
	1001–1500 €	170	26,03
	1500–2500 €	219	33,54
	>2500 €	115	17,61
Marriage status	Unmarried	368	56,35
	Married	285	43,65
Working status	Unemployed	47	7,19
	Student	213	32,62
	Employed in the profession	265	40,58
	Employed, but not in the profession	128	19,61

Source: authors

Table 1 shows that 60,50% are female and 39,50% are male respondents. The majority, i.e. 278 respondents (42,57%) finished high school, 29,40% of respondents finished graduate study, 25,73% finished undergraduate study and only a small percentage of 2,30% finished postgraduate study. The largest share of respondents (33,54%) has household income between 1500–2500 €, 26,03% has between 1001–1500 €, 17,61% has more than 2500 €, and only 7,45% has less than 700 €. The percentage of unmarried people is slightly bigger (56,35%). The majority of respondents are employed, 40,58% in the profession and 19,61% not in profession, 32,62% are students and only 7,19% are unemployed. Respondents come from all Croatian counties.

Table 2. Reliability of measurement scales measured by Cronbach's α-coefficient

Variable	Number of states	Cronbach's Alpha
Attitudes towards eco-friendly products	3	,702
Subjective norms	3	,847
Perceived control of behavior	3	,708
Knowledge of eco-friendly products	3	,833
A feeling of guilt	3	,878
Intention to buy eco-friendly products	3	,864

Source: authors

From the reliability analysis, it is evident that the value of the Cronbach coefficient for attitude and perceived behavioral control has acceptable level of reliability (alpha > 0.7). The coefficients for the other variables are around the 0.85 level, which indicates that the measurements of these variables are very reliable.[1] In order to verify the set hypotheses, a Pearson correlation analysis was performed.

Table 3. Correlation matrix of observed variables

Variable	1	2	3	4	5	6
Attitudes towards eco-friendly products	1					
Subjective norms	,462**	1				
Perceived control of behavior	,441**	,461**	1			
Knowledge of eco-friendly products	,433**	,497**	,453**	1		
A feeling of guilt	,443**	,563**	,494**	,502**	1	
Intention to buy eco-friendly products	,530**	,538**	,544**	,519**	,593**	1

** Correlation is significant at the 0.01 level (2-tailed)

Source: authors

The table shows the results of the correlation analysis in which it can be seen that the intention to buy eco-friendly products is significantly correlated (moderate to good correlation) with all variables. The highest correlation is the feeling of guilt about eco-friendly products and the intention to buy them (r=0.593), followed by perceived control of behavior (r= 0.544), then subjective norms (r= 0.538), attitudes (r=0.530) and knowledge (r=0.519). The reliability of the regression result requires the data to be normally distributed shown in the following table.

Table 4. The normality of the distribution of variables in the regression model

Variable	M	SD	Skewness	Kurtosis
Attitudes towards eco-friendly products	3,482	0,701	-0,493	0,864
Subjective norms	2,776	0,853	0,058	-0,242
Perceived control of behavior	3,135	0,802	-0,244	-0,023
Knowledge of eco-friendly products	2,996	0,854	-0,007	-0,471
A feeling of guilt	2,371	0,863	0,442	-0,072
Intention to buy eco-friendly products	3,322	0,844	-0,327	-0,095

Source: authors

[1] Cronbach's coefficient values should be above 0.70. (Leech, Barett, & Morgan, 2005.)

Table shows results that skewness ranged between -0,49 and +0,44, whereas kurtosis ranged between -0,47 and +0,86, thus ensuring that the data used in the research is normally distributed.[2] In this research, multiple regression analysis was conducted to identify the relationship between the dependent variable and the independent variables and to test the hypotheses.

Table 5. Correlation coefficients in the regression model (summary of the model)

R	R^2	Adjusted R^2	Std. Error of the estimate
,718	,515	,512	,589

Source: authors

Table shows that the multiple correlation coefficient R, with the simultaneous presence of all independent variables (predictors) is 0.718, so it can be concluded that there is a very high level of association between the independent and dependent variables. According to the coefficient of determination ($R^2 = 0.51$), the variables in the model share 51% of common factors. This means that 51% of the variance (information) of the intention to buy eco-friendly products can be predicted (explained) by independent variables.

Table 6. Analysis of variance (ANOVA) for the regression model

Model	Sums of Squares	df	Mean Squares	F	Sig
Regression	239,846	5	47,969	137,826	0,00
Residual	225,182	647	0,348		
total	465,028				

Source: authors

The table shows that the results are statistically significant, $F(5, 647) = 137.83$ $p < 0.01$. This means that attitudes, subjective norms, perceived control, knowledge and feeling of guilt significantly predict intentions to purchase eco-friendly products. Next table contains the regression coefficients and their significance in the regression model.

Table 7. Regression coefficients and collinearity indicators in the regression model

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sg
	B	Std. Error	Beta		
Constant	0,417	0,127		3,272	0,001
Attitudes towards eco-friendly products	0,244	0,039	0,203	6,125	0,000
Subjective norms	0,134	0,035	0,136	3,785	0,000
Perceived control of behavior	0,210	0,035	0,199	5,891	0,000
Knowledge of eco-friendly products	0,143	0,033	0,144	4,208	0,000
A feeling of guilt	0,249	0,035	0,254	7,020	0,000
Intention to buy eco-friendly products	0,417	0,127	0,203	3,272	0,001

Source: authors

[2] As closer as it gets to -1 or 1, the better a variable can be defined by precisely knowing the value of the other variable (Pallant, 2005.)

Table shows results that the increase in the score for all variables by one point increases the average score on the scale of intentions to buy eco-friendly products by 0.24; 0.13; 0.21; 0.14 and 0.24 points. It follows that the independent variables significantly and positively affect the purchase of eco-friendly products, since the t-test values are significantly different from zero and are significant at $p<0.01$. A feeling of guilt is the most significant predictor ($\beta = .254$, $p < .000$) This is followed by attitudes ($\beta = .203$, $p < .000$), followed by perceived control of behavior ($\beta = .199$, $p < .000$), followed by knowledge ($\beta = .144$, $p < .000$) and subjective norms ($\beta = .136$, $p < .000$).

The relationship between demographic characteristics and the intention to purchase eco-friendly products

In the research, the relationship between demographic variables and the intention to buy eco-friendly products was additionally examined using a t-test and one-way analysis of variance (ANOVA). Using the t-test, no statistically significant difference was found in the intention to purchase eco-friendly products with regard to gender and marital status. Using ANOVA, no statistically significant difference was found with regard to income and working status, but a statistically significant difference was found with regard to education, which is shown in the following table.

Table 8. One-way ANOVA for independent samples as opposed to variable level of education

Variable	Education	M	F	df	p value (p ≤ 0,05)
Intention of purchase of eco-friendly products	High school	3,158	6,6940	649	0,00019
	Undergraduate study	3,424			
	Graduate study	3,440			
	Postgraduate study	3,688			

Source: authors

Table shows that there is a statistically significant difference in purchase of eco-friendly products considering to the level of education. ($F (3, 649) =6,6940$, $p=,00019$) Tukey's post hoc test indicated that there are significant differences between groups, high school and undergraduate and graduate study.

DISCUSSION

The predictors chosen for the research were attitudes towards eco-friendly products, subjective norms, perceived control of behavior and additional variables: knowledge and feeling of guilt. The findings of the research revealed that according to Pearson correlation and multiple regression hypotheses H1, H1a, H1b, H1c, H1d and H1e are confirmed. That means that all variables have significant roles in predicting the eco-friendly purchase intention of Croatian young adults' consumers.

The hypothesis H1 states that the better young adults' consumers green purchase awareness will lead to increased green purchase intention. This hypothesis is confirmed because all hypotheses H1a, H1b, H1c, H1d, and H1e are confirmed.

The results are mostly consistent with the majority of previously mentioned research such as where all variables significantly influence the intention to buy environmental food (attitudes, subjective norms, perceived control of behavior) or with the results of the research of where results showed a significant correlation among the

attitudes, subjective norms, perceived behavioral control, green purchase intention and green purchase behavior.

The additional variable knowledge about eco- friendly products positively affect the purchase of eco-friendly products which is consistent with research of which implies that consumers who are interested in eco-friendly products and are more knowledgeable on the matter are more likely to act eco-friendly. The more knowledge of environmental problems and issues, the more consumers intend to purchase eco-friendly products. It is also in line with research of . They added a new variable "knowledge" that has been showed to significantly influenced green purchase intention. The additional variable "feeling of guilt" was very rarely used in researches but these results are consistent with study of that examined green purchase intention and revealed that guilt positively influence the intention to purchase green products and study of which showed that the emotion of guilt was identified as a stimulus factor for the purchase of green products. A feeling of guilt is the most significant predictor ($\beta = .254$, $p < .000$). That means that higher level of guilt lead to significant purchase decision.

The hypothesis H2 states that demographic variables (gender, education, income, marital status, working status) have a positive and significant impact on green consumption awareness. There is a statistically significant difference in purchase of eco-friendly products considering to the level of education. No statistically significant difference was found with regard to gender, income, marital status, and working status. Hypothesis 2 is partially accepted. Most of the studies on customer-related elements that influence green product purchase intention and green product behavior have studied demographic characteristics and their effects, most regularly gender, age, income and education. Most of the research that examined these variables revealed a noteworthy influence on green purchase intention and green purchase behavior In research of there was no bias in terms of age, gender or qualification in the behavior of young students. Although most research doesn't show statistically significant difference, however the result is consistent with the research of whose research has proven that higher level of education of consumers buying more environmentally friendly products.

CONCLUSION

Environmental problems become increased in last decades, so society demands actions that can suppress or reduce the causes of these problems. Consumption is pointed as one of the main causes of environmental problems so green products, sustainably produced, can be a solution to environmental problems. Because of that this research investigated young adults' eco-friendly purchase intention.

The correlation and regression research results indicate that the main hypothesis H1 has been successfully confirmed. Namely, by applying the extended theory of planned behavior, it was determined that there is a statistically significant connection between attitudes, subjective norms, perceived behavioral control, knowledge and feelings of guilt. Based on the obtained results, the tested hypotheses (H1a, H1b, H1c, H1d and H1e) were accepted. These findings support the results of several studies conducted by authors referenced in this research. The model explained 51% of the variance of the intention to buy eco-friendly products, thus concluding that the intention is influenced also by some other variables that are not included in our model.

By analyzing demographic characteristics and their connection with the inten-

tion to buy eco-friendly products, it was determined that only the level of education significantly affects the intention to buy eco-friendly products. Considering that, other demographic characteristics have no significance, hypothesis H2 is partially accepted.

This research contributes in way that increase the knowledge of researchers about the theory and results that occur in the field related to sustainable development and environment and especially purchase intention toward the eco-friendly product in Croatia. The results of this research are expected to be a reference for further research in the field of eco-friendly products.

This research refers to the examination of the awareness of the intention to buy eco-friendly products as a whole, and not to specific types of products (food, etc.). Therefore, it is suggested that in the next researches, the attitudes and the intention to buy certain types of products are examined in more detail. In order to improve the model, it is suggested to include some other independent variables in the research like age groups and make a comparison with young people.

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HUMAN DEVELOPMENT IN THE WESTERN BALKANS: A PANEL ANALYSIS OF GROSS DOMESTIC PRODUCT, LIFE EXPECTANCY, AND SOCIOECONOMIC INEQUALITIES

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Abstract: *This study examines the statistical associations among gross domestic product per capita (GDP per capita), life expectancy at birth, income inequality, inequality in life expectancy, and human development across five Western Balkan countries. The analysis utilizes secondary data from the United Nations Development Programme's Human Development Reports and the United Nations Statistics Division.*

The results indicate that, in 2022, Montenegro and Serbia are classified within the very high human development category, while Albania, Bosnia and Herzegovina, and North Macedonia remain in the high human development category. Correlation analysis demonstrates a positive association between the Human Development Index (HDI) and GDP per capita, and negative associations between HDI and both income inequality and inequality in life expectancy. The association between HDI and life expectancy is relatively weak. Fixed-effects panel regression results show that GDP per capita, life expectancy, and income inequality are not statistically significantly associated with HDI. In contrast, inequality in life expectancy exhibits a negative association with HDI that approaches statistical significance. These results should be interpreted as statistical associations rather than causal relationships.

Keywords: *Human Development Index (HDI), GDP per capita, life expectancy, income inequality, life expectancy inequality*

JEL classification: *O15; I14; I18; D63; C23*

INTRODUCTION

The concept of development is inherently multidimensional, encompassing economic performance, quality of life, health outcomes, education, and overall social well-being. In recent decades, development has increasingly been framed within the paradigm of sustainable development, which integrates economic growth, environmental protection, and social equity. This approach seeks to reduce the negative effects of rapid population growth, industrialization, food insecurity, ecosystem degradation, urbanization, energy insecurity, and environmental deterioration on long-term development. Within this context, the Human Development Index (HDI) has emerged as a widely used composite indicator that provides an overview of human development across regions and countries (Abdussamad et al., 2024; Khan, Ju & Hassan, 2019; Singh & Kumar, 2022).

The HDI captures three core dimensions of human development. The health dimension is measured by life expectancy at birth, reflecting population well-being and access to healthcare services. Education is assessed through expected years of schooling and mean years of schooling, capturing both current and accumulated educational attainment. The standard of living dimension is measured using gross national income or gross regional domestic product per capita, adjusted for purchasing power parity and transformed logarithmically to account for diminishing marginal utility of income as income levels rise (Human Development Index, 2025; Kurian, 2011; Sasmita et al., 2024).

Government expenditure on social services represents an important investment in public goods such as healthcare, education, and infrastructure, all of which contribute directly to improvements in HDI outcomes (Abdussamad et al., 2024). Beyond its core components, the HDI is associated with broader aspects of development, including energy consumption, business activity, economic growth, disaster management capacity, and democratic quality (Ladi, Mahmoudpour & Sharifi, 2021; Sasmita et al., 2024). Social development is influenced by the old-age dependency ratio, education expenditure, female infant mortality, female labour force participation, gender ratios, and life expectancy at birth, while economic development depends on exports, consumption, foreign direct investment, capital formation, and GDP per capita (Singh & Kumar, 2022).

Over the past two decades, developing countries have experienced relatively strong economic growth, sometimes exceeding that of developed economies (Amponsah et al., 2023). However, this growth has not consistently reduced poverty or inequality, largely due to weak governance and ineffective domestic policies (World Bank, 2022). Although the HDI offers valuable insights, it remains a summary indicator that cannot fully capture income inequality, multidimensional poverty, and individual empowerment (Human Development Index, 2025). The assumption that economic growth automatically improves well-being has therefore been questioned.

Against this background, the present study addresses gaps in the literature on the relationships among GDP per capita, life expectancy, income inequality, and life expectancy inequality. While HDI research is extensive globally, studies focusing on Western Balkan countries remain limited. This study combines correlation and difference analysis to examine changes in HDI and its socioeconomic determinants in Western Balkan countries between 2010 and 2022, aiming to inform targeted development strategies and evidence-based policymaking to improve regional quality of life. The findings are intended to support policymakers in designing inclusive, equitable, and sustainable development interventions across diverse socioeconomic contexts and institutional settings.

LITERATURE REVIEW

The Human Development Index (HDI) is a key indicator encompassing multiple dimensions of human welfare, including health, education, and living standards, and provides a more comprehensive perspective on development than economic indicators alone (Akar et al., 2021). As a composite index, the HDI measures the average level of achievement in three fundamental dimensions of human development: a long and healthy life, access to knowledge, and an adequate standard of living (Cheng et al., 2022). By encapsulating these core dimensions, the HDI offers a holistic framework for assessing national development across countries and over time.

Each component of the HDI is measured using specific indicators. The health dimension is assessed through life expectancy at birth, reflecting the overall health status of the population and the effectiveness of healthcare systems. Education is measured using expected years of schooling and mean years of schooling, capturing both current educational opportunities and accumulated human capital. The standard of living dimension is measured by gross national income (GNI) per capita, adjusted for purchasing power parity (PPP), which allows for international comparability of real income levels. These indicators are normalized and aggregated into a single composite score, ensuring that no single dimension dominates the overall index (Human Development Index (HDI), 2021; Kurian, 2011; Ladi, Mahmoudpour & Sharifi, 2021). By integrating diverse measures, the HDI provides a more nuanced understanding of national well-being than reliance on income-based indicators alone.

Recent research has expanded the conceptual scope of the HDI by incorporating additional variables such as environmental health, income disparity, and satellite-observed night-time light intensity, further strengthening its ability to reflect real living conditions (Qiu et al., 2018). Developing reliable public infrastructure in transportation, education, and healthcare remains crucial for improving human capital quality and reducing poverty. Human resources play a central role in economic growth and poverty reduction, as workforce quality directly affects productivity and income generation. Consequently, low HDI levels may perpetuate cycles of low productivity, poor living standards, and persistent poverty (Nurjihan & Faizi, 2024).

Despite the positive and statistically significant relationship between GDP and HDI observed in many empirical studies, this relationship does not always accurately reflect the economic development realities of Western Balkan countries. Measuring economic performance solely through GDP per capita has been widely criticized, as it does not account for labor market participation or productivity distribution (Amponsah

et al., 2023). GDP per employed person has been proposed as a more accurate indicator of inclusive economic participation, as it reflects individuals' direct engagement in and benefit from economic activity (Campos-Vazquez et al., 2017; Koh et al., 2020). This measure is particularly relevant for assessing progress toward inclusive and sustainable economic development, where growth should translate into broader social benefits rather than concentrated gains (Ianchovichina & Lundstrom, 2009).

Economic growth, when accompanied by rising inequality, may fail to reduce poverty effectively. Empirical evidence suggests that inclusive growth measured by GDP per capita may be positively associated with higher inequality, indicating that economic expansion does not necessarily improve income distribution or expand opportunities for disadvantaged groups (Campos-Vazquez et al., 2017; Koh et al., 2020). These findings highlight the limitations of GDP-centric development models and reinforce the importance of human development indicators such as the HDI.

GROSS DOMESTIC PRODUCT (GDP) PER CAPITA

Gross domestic product (GDP) per capita remains one of the most commonly used indicators of economic development, measuring average economic output per person. When adjusted for PPP, GDP per capita enables more accurate comparisons of living standards across countries (Human Development Index, 2025). It is calculated by dividing total GDP by the mid-year population and can be measured using output, expenditure, or income approaches at current or constant prices. While GDP per capita is often interpreted as an indicator of economic growth and national prosperity, its relationship with poverty and inequality is complex. Although GDP growth has been shown to reduce poverty levels on average, its benefits are unevenly distributed across population groups (Cheng et al., 2022; Dahliah & Nur, 2021; Dritsaki & Dritsaki, 2023; Taqi et al., 2021). Therefore, equitable development policies are necessary to ensure that improvements in GDP translate into broad-based welfare gains.

Human development and economic growth are mutually reinforcing. Economic growth provides the resources necessary for investments in health, education, and social protection, while higher levels of human development enhance labor productivity and innovation, thereby supporting further growth. Numerous studies confirm a strong positive correlation between GDP per capita and HDI across countries (Islam, 1995; Hung, 2022; Taqi et al., 2021). However, the strength of this relationship varies across development levels, with the strongest correlation observed in countries with low human development, where marginal income gains generate substantial improvements in health and education outcomes (Deb, 2015).

Hypothesis 1: *Higher GDP per capita is associated with higher HDI.*

INEQUALITY IN INCOME

Income inequality represents another critical determinant of human development. The relationship between income inequality and HDI has gained increasing attention in development economics, as economic growth alone does not guarantee equitable improvements in well-being (Castells-Quintana et al., 2018). Rising GDP does not necessarily imply better health, education, or shared prosperity, particularly when growth benefits are concentrated among higher-income groups (Ladi et al., 2021). The World Inequality Report (WIR, 2019) emphasizes the importance of income distribu-

tion in shaping development outcomes. To understand multidimensional poverty, it is essential to examine how income inequality influences HDI performance (Günay & Topbaş, 2021).

Income inequality is commonly measured using the Gini coefficient, which reflects the degree of income concentration within a society (Cheng et al., 2022; Dahliah & Nur, 2021; Dritsaki & Dritsaki, 2023). Higher Gini values indicate greater inequality, while lower values signal more equitable income distribution (Triani & Sitorus, 2023). Empirical evidence consistently shows a negative relationship between income inequality and HDI, suggesting that unequal income distribution limits access to health, education, and economic opportunities (Faisal, 2022). Moreover, inequality negatively affects human capital accumulation and long-term economic growth. Studies such as Ghifara et al. (2022) demonstrate that higher HDI levels can significantly reduce income inequality in metropolitan regions.

Hypothesis 2: *Greater income inequality negatively affects HDI.*

LIFE EXPECTANCY

Life expectancy at birth is a core component of the HDI and a widely used indicator of healthcare system effectiveness. It measures the expected number of years a newborn would live under prevailing mortality conditions (Cheng et al., 2022). Life expectancy reflects cumulative health outcomes influenced by nutrition, sanitation, medical technology, and access to healthcare services (Kurian, 2011; Triani & Sitorus, 2023). Countries with high HDI scores typically exhibit higher life expectancy due to advanced healthcare systems, improved living standards, and better educational attainment. In contrast, low-HDI regions face constrained healthcare access, poor nutrition, and weaker public health infrastructure, resulting in lower life expectancy (Lind, 2021).

Empirical studies confirm strong positive correlations between life expectancy and HDI (Human Development Index, 2025). Research conducted in Indonesia shows that life expectancy, income per capita, education, and expenditure are all significantly correlated with HDI (Abdussamad et al., 2024; Sasmita et al., 2024). Improvements in healthcare infrastructure, sanitation, and clean water access are critical determinants of life expectancy and indirectly enhance HDI outcomes (Girum et al., 2018).

Hypothesis 3: *Higher life expectancy is positively associated with HDI.*

INEQUALITY IN LIFE EXPECTANCY

Inequality in life expectancy further deepens disparities in human development. Life expectancy inequality reflects differences in survival outcomes across income groups and regions and serves as an objective measure of social and health inequality (WHO, 2025). Although life expectancy has increased globally, disparities persist due to lifestyle differences, unequal healthcare access, and socioeconomic conditions (Lind, 2021). Countries with higher HDI values tend to exhibit narrower life expectancy gaps, while low-HDI countries display significant disparities driven by income inequality, gender gaps, and regional inequalities.

The HDI plays a crucial role in identifying and addressing life expectancy inequalities by linking health outcomes to education and income conditions. Enhancing HDI components contributes to more equitable health outcomes and reduced life

expectancy gaps. Empirical evidence indicates that rising HDI levels are associated with declining life expectancy inequality, supporting the role of human development in fostering more equitable and sustainable societies (Lind, 2021).

Hypothesis 4*: Greater life expectancy inequality negatively affects HDI.*

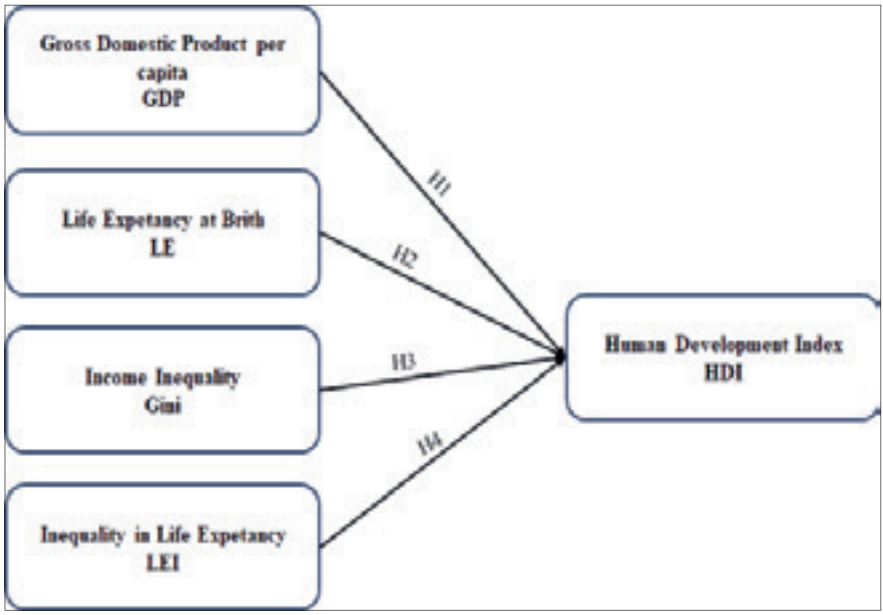


Figure 1: Conceptual framework
Source: Authors

Building on the theoretical insights and empirical evidence reviewed above, this study develops a conceptual framework that links key socioeconomic factors to human development outcomes Figure 1.

METHODOLOGY

Data description

Secondary data were obtained from the United Nations Development Programme's Human Development Reports (United Nations Development Programme, 2024) and the United Nations Data platform (United Nations Statistics Division, 2024). The analysis focuses on five Western Balkan countries: Albania, Bosnia and Herzegovina, Montenegro, North Macedonia, and Serbia. While the broader reference period spans 2010 to 2022, the regression analysis utilizes data from five specific years: 2010, 2015, 2020, 2021, and 2022. The resulting balanced panel comprises 25 country-year observations, representing five countries across five selected years. The dataset contains one dependent variable and four independent variables. Only observations with complete data for all variables included in the model were retained. No interpolation, imputation, or aggregation across missing years was performed. Table 1 provides descriptions of the variables and data sources.

Table 1. Variable definition

Variable	Type	Description	Unit	Source
HDI	DV	Human Development Index	Index (0-1)	Human Development Reports (UNDP) https://hdr.undp.org/data-center/documentation-and-downloads)
GDP	IV	Gross Domestic Products per capita	USD per capita (constant prices)	UN Data https://data.un.org/
LE	IV	Life Expectancy at Birth	Years	UN Data https://data.un.org/
Gini	IV	Income Inequality	Index (0-100)	UN Data https://data.un.org/
LEI	IV	Inequality in Life Expectancy	Years	UN Data https://data.un.org/

Note: DV is the dependent variable. IV is the independent variable
Source: Authors

GDP per capita serves as an indicator of economic performance and is reported in constant USD by the United Nations Data platform. While the Human Development Index (HDI) standard-of-living dimension relies on gross national income (GNI) per capita, GDP per capita was chosen for this analysis due to its consistency and availability across the selected Western Balkan countries and years. Consequently, GDP per capita is employed as an external proxy for economic performance rather than as the precise income component of the HDI. Income inequality is measured by the Gini coefficient, with higher values indicating greater income disparities. Inequality in life expectancy reflects differences in survival outcomes among population groups. As the variables were sourced from different United Nations-related data platforms, potential differences in indicator definitions, estimation procedures, and harmonisation methods are recognised. Nevertheless, these sources offer internationally comparable data suitable for cross-country analysis.

DIAGNOSTIC TESTING AND DATA SUSTAINABILITY

To ensure the reliability and robustness of the panel regression analysis, the dataset was subjected to a series of diagnostic tests assessing key statistical assumptions. These included Skewness and Kurtosis tests for normality, the Variance Inflation Factor (VIF) for multicollinearity, White's test for heteroskedasticity, Cameron and Trivedi's Information Matrix (IM) test, and the Hausman specification test.

The Skewness and Kurtosis tests indicate that none of the variables included in the model—HDI, GDP per capita, life expectancy at birth, income inequality, and inequality in life expectancy—exhibit statistically significant deviations from normality. These results confirm that the normality assumption is satisfied (see Appendix A, Table A1).

The VIF results reveal no evidence of problematic multicollinearity. All VIF values fall well below commonly accepted thresholds, with a mean VIF of 2.37, indicating only moderate correlations among the explanatory variables (see Appendix A, Table A2). Consequently, the assumption of no severe multicollinearity is met.

White's test for heteroskedasticity fails to reject the null hypothesis of homoskedasticity ($p = 0.2755$), suggesting that the error terms exhibit constant variance across

observations (see Appendix A, Table A3).

These findings are further supported by Cameron and Trivedi's IM test, which indicates no evidence of heteroskedasticity or non-normality. None of the test components is statistically significant, and the overall test fails to reject the null hypothesis. It confirms that the residuals satisfy the assumptions of homoskedasticity and normality, reinforcing the robustness of the estimated model (see Appendix A, Table A4).

Overall, the diagnostic results demonstrate that the assumptions of normality, homoskedasticity, and absence of multicollinearity are satisfied, supporting the validity of the panel regression framework. Finally, the Hausman specification test strongly rejects the null hypothesis of no systematic difference between the fixed- and random-effects estimators ($p = 0.0000$). It indicates that the fixed-effects model provides consistent estimates and is therefore the preferred specification for the analysis (see Appendix A, Table A5).

ECONOMETRIC MODEL AND ESTIMATION FRAMEWORK

This study examines the relationship between key socioeconomic and health-related indicators and the Human Development Index (HDI) in Western Balkan countries. Human development is conceptualized as a function of economic performance, health outcomes, and inequality dimensions, thereby reflecting its multidimensional character (Neumayer, 2001).

The explanatory variables selected for analysis are GDP per capita (GDP) as a proxy for economic prosperity, life expectancy at birth (LE) as an indicator of population health, income inequality measured by the Gini coefficient (Gini), and inequality in life expectancy (LEI), which captures disparities in survival outcomes. An important methodological consideration is the conceptual overlap between the dependent variable and certain explanatory variables. The Human Development Index (HDI) is a composite measure that includes a health dimension, assessed by life expectancy at birth, and a standard-of-living dimension, assessed by gross national income (GNI) per capita. Therefore, including life expectancy and GDP per capita in the model may introduce a partial mechanical association with HDI. In this analysis, GDP per capita is treated as an external indicator of economic performance rather than as a direct substitute for the GNI component of HDI. Life expectancy is included to assess the relationship between the health dimension and overall human development in the Western Balkan countries.

Accordingly, the regression results are interpreted as statistical associations rather than causal effects. The model is intended to explore associations between economic performance, average population health, income inequality, inequality in life expectancy, and HDI across countries and selected years, rather than to establish causality. As a result, the findings should be interpreted with caution due to potential conceptual overlap, simultaneity, and endogeneity.

The econometric model is specified as follows:

$$HDI_{it} = \beta_0 + \beta_1 GDP_{it} + \beta_2 LE_{it} + \beta_3 Gini_{it} + \beta_4 LEI_{it} + \mu i + \varepsilon_{it} \qquad (1)$$

Source: Authors' specification based on standard panel regression models from Baltagi (2021) and Wooldridge (2010).

In this context, I denotes the country, and t denotes the time. μ_i represents unobserved country-specific effects, while ε_it denotes the idiosyncratic error term.

The model is estimated under the standard assumption that the explanatory variables are not correlated with the contemporaneous error term. However, due to the composite structure of the Human Development Index (HDI) and the potential simultaneity among human development, health, and economic performance, this assumption requires careful interpretation. Consequently, the results are interpreted as associational rather than causal, consistent with the limitations inherent in the fixed-effects panel regression framework (Wooldridge, 2010; Baltagi, 2021).

Panel Data Structure

The analysis employs a balanced short panel dataset comprising five Western Balkan countries observed over the period 2010–2022. Panel data techniques are utilized to exploit both cross-sectional and time-series variation, thereby increasing estimation efficiency and controlling for unobserved heterogeneity across countries (Hsiao, 2014; Baltagi, 2021).

To ensure robustness, three competing econometric specifications are considered: the pooled regression model, the random-effects model, and the fixed-effects model.

Pooled Regression Model

The pooled regression model assumes homogeneity across countries and over time, implying a common intercept and slope coefficients for all cross-sectional units. Under this assumption, the estimation equation is expressed as:

$$HDI_{it} = \beta_0 + \beta_1 GDP_{it} + \beta_2 LE_{it} + \beta_3 Gini_{it} + \beta_4 LEI_{it} + \varepsilon_{it} \qquad (2)$$

Source: Adapted from Baltagi (2021) and Wooldridge (2010).

This specification is appropriate only if cross-sectional units are sufficiently similar and unobserved country-specific effects do not systematically influence human development outcomes. In comparative analyses involving heterogeneous institutional, historical, and socioeconomic contexts, this assumption is rarely satisfied, rendering pooled regression estimates potentially biased and inconsistent (Greene, 2018; Baltagi, 2021). Consequently, unobserved heterogeneity must be explicitly accounted for using appropriate panel-data estimators, such as fixed-effects or random-effects models. Failure to control for country-specific characteristics may lead to misleading inferences regarding the determinants of human development and well-being (Frey & Stutzer, 2000).

Random Effects Model

In the context of panel data, variation arises both **between countries** and **within countries over time**. To account for this structure, the random effects model decomposes the error term as:

$$\varepsilon_{it} = \mu_i + u_{it} \qquad (3)$$

Source: Random-effects error decomposition adapted from Baltagi (2021) and Wooldridge (2010).

where μ_i represents unobserved country-specific effects assumed to be uncorrelated with the explanatory variables, and u_{it} is the idiosyncratic disturbance term. The corresponding random effects specification is given by:

$$HDI_{it} = \beta_0 + \beta_1 GDP_{it} + \beta_2 LE_{it} + \beta_3 Gini_{it} + \beta_4 LEI_{it} + \mu_i + u_{it} \quad (4)$$

Source: Random-effects panel regression specification based on Baltagi (2021) and Wooldridge (2010).

The random-effects estimator is consistent and efficient under the assumption that unobserved country-specific effects are uncorrelated with the explanatory variables, formally expressed as $E(X_{it}\mu_i) = 0$ (Baltagi, 2021; Wooldridge, 2010). If this assumption is violated, the estimates become biased and inconsistent. When it holds, the random-effects model is more efficient than the fixed-effects specification, as it exploits both within- and between-country variation and preserves degrees of freedom, which is particularly advantageous in short panel settings (Schunck, 2013).

Fixed Effects Model

Alternatively, the fixed effects model allows for correlation between unobserved country-specific effects and the explanatory variables. This approach is particularly appropriate when institutional, historical, or structural country characteristics influence both human development outcomes and their determinants, as is often the case in regional development studies (Mundlak, 1978; Hsiao, 2014).

The fixed effects specification is expressed as:

$$HDI_{it} = (\beta_0 + \mu_i) + \beta_1 GDP_{it} + \beta_2 LE_{it} + \beta_3 Gini_{it} + \beta_4 LEI_{it} + u_{it} \quad (5)$$

Source: Fixed-effects panel regression specification adapted from Hsiao (2014), Baltagi (2021), and Wooldridge (2010).

By allowing the intercept to vary across countries, the fixed-effects estimator controls for time-invariant unobserved heterogeneity that could otherwise bias coefficient estimates. This approach is particularly suitable in cross-country development analyses, where latent national characteristics—such as governance quality, cultural norms, or differences in health-care systems—may simultaneously affect the dependent variable and the regressors. Empirical evidence indicates that accounting for such country-specific effects yields more reliable and policy-relevant insights into the relationships between GDP, inequality, and human development (Jaumotte et al., 2013; Jauch & Watzka, 2015; Silva, 2020).

Model Selection Tests

To ensure consistent estimator terminology, three panel-data specifications were considered conceptually: pooled ordinary least squares (OLS), random-effects, and fixed-effects models. The pooled OLS model serves as the baseline, while random- and fixed-effects models account for unobserved country-specific heterogeneity.

The Hausman specification test was used to choose between the random-effects and fixed-effects estimators. The test rejects the null hypothesis of no systematic difference between the estimators, indicating that the fixed-effects model is more appropriate for the data. Consequently, the final regression results reported in Table 4 are based on the fixed-effects specification.

EMPIRICAL RESULTS

According to the HDI 2022 rankings, countries in the Western Balkans exhibit notable differences in human development. Montenegro (HDI = 0.844) and Serbia (HDI = 0.805) are classified in the very high human development category, while Albania (HDI = 0.789), Bosnia and Herzegovina (HDI = 0.779), and North Macedonia (HDI = 0.765) fall in the high human development category (Human Development Reports, 2024).

Table 2 presents the mean values of HDI and the explanatory variables for the period 2010–2022, highlighting substantial socioeconomic and demographic heterogeneity across the region. Average HDI values range from 0.761 in Bosnia and Herzegovina to 0.830 in Montenegro, indicating persistent differences in overall development outcomes among Western Balkan countries.

Table 2. Mean values of the Human Development Index and socioeconomic indicators in Western Balkan countries, 2010–2022

Country	HDI	GDP	LE	Gini	LEI	HDI Rank 2022
Albania	0.784	5253,8	77,97	20,352	6,88	74
Bosnia and Herzegovina	0.761	6012,6	76,01	26,447	4,32	80
Montenegro	0.830	7964,2	76,47	20,694	3,32	50
North Macedonia	0.764	5665,6	74,80	22,712	4,94	83
Serbia	0.795	7087,2	74,79	16,962	4,46	65

Source: Authors

Economic performance, measured by GDP per capita, varies considerably. Montenegro records the highest average GDP per capita (USD 7,964.2), reflecting relatively stronger economic conditions, while Albania exhibits the lowest average value (USD 5,253.8). These disparities suggest unequal economic capacities that may influence long-term trajectories of human development.

In terms of health outcomes, life expectancy at birth also differs across countries. Albania achieves the highest average life expectancy (77.97 years), whereas Serbia records the lowest (74.79 years), indicating uneven progress in population health despite similar regional contexts.

Measures of inequality further reveal structural challenges. Income inequality is most pronounced in Bosnia and Herzegovina (26.447), while Serbia exhibits the lowest inequality (16.962). Additionally, inequality in life expectancy, a critical dimension of health equity, is highest in Albania (6.88 years) and lowest in Montenegro (3.32 years), suggesting substantial differences in the distribution of health outcomes across countries.

Figure 2 illustrates the evolution of HDI across Western Balkan countries from 2010 to 2022, revealing an overall upward trend in human development despite occasional fluctuations. Montenegro consistently outperforms other countries, with HDI increasing steadily from 0.806 in 2010 to 0.844 in 2022, reinforcing its position in the very high human development category.

Serbia follows a similar but more moderate trajectory, showing steady improvements and reaching an HDI of 0.805 in 2022. Albania and Bosnia and Herzegovina show

notable progress over time, although Bosnia and Herzegovina remains at the lower end of the regional HDI distribution, improving from 0.718 in 2010 to 0.779 in 2022.

North Macedonia exhibits a more uneven pattern, with HDI growth slowing after 2015 and a slight decline in recent years, ultimately reaching 0.765 in 2022. This divergence suggests that improvements in human development are not uniform across the region and may be influenced by country-specific economic, institutional, and social factors.

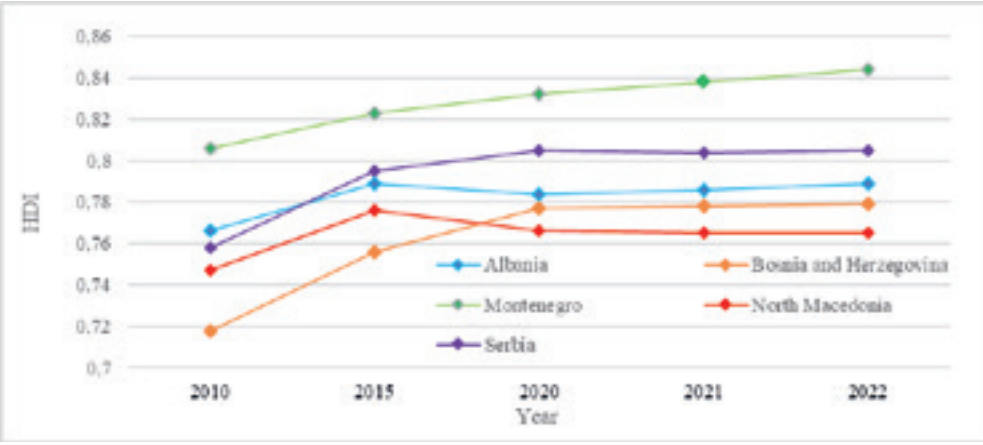


Figure 2. Trends in the Human Development Index (HDI) in Western Balkan countries, 2010–2022.
Source: Authors

Overall, the observed trends indicate gradual convergence in human development levels, yet persistent disparities remain. These findings underscore the importance of targeted policy interventions, particularly those aimed at reducing inequalities in health outcomes and strengthening inclusive economic growth, to sustain and accelerate human development across the Western Balkans.

Panel Regression Analysis

Table 3 reports the correlation matrix among the selected variables. Most correlation coefficients are below the threshold of 0.60, indicating relatively weak linear relationships among the explanatory variables and suggesting that multicollinearity is not a serious concern.

Table 3. Correlation matrix among HDI and selected socioeconomic indicators

Variable	HDI	GDP	LE	Gini	LEI
HDI	1				
GDP	0.6970***	1			
LE	0.1478	-0.3599	1		
Gini	-0.4951**	-0.4994**	0.2189	1	
LEI	-0.5132***	-0.7217***	0.3498	0.0657	1

Source: Authors; Note: ***p< .01; **p< .05

A strong, statistically significant positive correlation is observed between HDI and GDP per capita (r = 0.697, p< 0.01), suggesting that higher income levels are generally associated with greater human development. In contrast, the correlation between HDI and life expectancy is weak (r = 0.148), indicating a limited direct association between average longevity and HDI in the sample.

Table 4. Fixed-effects panel regression results for HDI

HDI	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval	Sig
GDP	5.81e-06	3.82e-06	1.52	.148	-2.30e-06	.0000139	
LE	.0052605	.0046882	1.12	.278	-.0046781	.0151991	
Gini	.000372	.0011309	0.33	.746	-.0020254	.0027696	
LEI	-.0100689	.0047459	-2.12	.050	-.0201297	-8.06e-06	**
Constant	.3905894	.3842916	1.02	.325	-.4240723	1.205251	
Mean dependent var	0.787		**SD dependent var**		0.030		
R-squared	0.614		**Number of obs**		25		
F-test	6.358		**Prob > F**		0.001		
Akaike crit. (AIC)	-153.066		**Bayesian crit. (BIC)**		-146.972		

Source: Authors; **Note:** **p < .05. Conventional model-based standard errors were used. Robust or country-clustered standard errors were not applied. Given the limited number of countries in the panel, statistical inference should be interpreted with caution.

The estimated fixed-effects regression equation is expressed as follows:

$$HDI_{it} = 0.3906 + 5.81 \times 10^{-6} GDP_{it} + 0.00526 LE_{it} + 0.00037 Gini_{it} - 0.01007 LEI_{it} + \varepsilon_{it} \quad (8)$$

Furthermore, HDI is negatively correlated with both income inequality (r = −0.495, p < 0.05) and inequality in life expectancy (r = −0.513, p< 0.01). These negative relationships suggest that higher levels of inequality—particularly in health outcomes—are associated with lower levels of human development.

The fixed-effects regression results presented in Table 4 demonstrate that the selected model explains a substantial proportion of the variation in HDI, as evidenced by an R-squared value of 0.614. The F-test is statistically significant at the 1% level (p = 0.001), which indicates that the explanatory variables are jointly associated with HDI in this model.

Analysis of individual coefficients reveals that inequality in life expectancy (LEI) exhibits a negative association with HDI, which is borderline statistically significant at the 5% level (p = .050). The confidence interval is close to zero, suggesting that this finding should be interpreted with caution. These results imply that greater disparities in survival outcomes may correspond to lower levels of human development in the selected Western Balkan countries. In contrast, GDP per capita, life expectancy at birth, and income inequality do not demonstrate statistically significant associations with HDI after accounting for country-specific effects.

The positive coefficient for GDP per capita indicates a positive association with HDI; however, this relationship is not statistically significant in the fixed-effects model.

Similarly, life expectancy at birth demonstrates a positive but statistically insignificant association with HDI. Income inequality also does not exhibit a statistically significant relationship with HDI in the regression analysis. Therefore, these findings should be interpreted as evidence of statistical associations rather than causal relationships.

DISCUSSION

A substantial body of literature links GDP per capita with the Human Development Index (HDI); however, relatively few studies base these relationships on panel-based empirical evidence. The results indicate that GDP per capita is positively and significantly correlated with the Human Development Index (HDI), suggesting that higher income levels are generally associated with greater human development. However, in the fixed-effects panel regression model, GDP per capita is not significantly associated with HDI. This outcome suggests that, within the selected sample and model specification, economic performance alone is not strongly associated with differences in human development after accounting for country-specific effects.

Inequality in life expectancy appears to be the most relevant statistical correlate of HDI in the selected model, although the evidence is borderline rather than unequivocally robust. The negative coefficient and p-value of .050 suggest a possible negative association between disparities in survival outcomes and human development. This result underscores the importance of health equity in understanding human development patterns in Western Balkan countries. Nevertheless, given the composite nature of HDI and potential endogeneity, this relationship should not be interpreted as causal.

As in other developing regions, GDP per capita in the Western Balkan countries has risen over the observed period. The results of this study indicate that GDP per capita is positively and significantly correlated with HDI, thereby partially confirming the hypothesis that higher income levels are associated with higher human development. However, when examined in a fixed-effects panel regression framework, GDP per capita does not show a statistically significant independent association with HDI, although it retains a positive coefficient.

This finding suggests that economic growth alone does not automatically translate into improvements in human development, even after controlling for country-specific characteristics. In this respect, the results are consistent with studies suggesting that economic growth may not have a direct or statistically significant association with HDI (Heriasman, 2020). Fluctuations in economic growth and the uneven distribution of income gains may limit the extent to which increases in GDP per capita improve broader living standards (Baseri & Farhadi Kia, 2008). Conversely, other studies report a statistically significant relationship between economic growth and HDI (Asmara et al., 2024), while research in Latin America indicates only a weak relationship between economic development and human development (Ranis et al., 2002). These mixed findings highlight the context-dependent nature of the growth–development nexus.

GDP per capita is often correlated with other components and associated factors of HDI, such as education and life expectancy, which may partially explain its lack of independent significance in multivariate models (Shah, 2016). When GDP per capita is held constant, inequality-related factors become more influential in shaping human development outcomes. This observation is particularly relevant for the Western Balkan countries, which exhibit relatively similar average GDP per capita levels but substan-

tial disparities in income distribution and health outcomes.

The results of this study show that income inequality and life expectancy inequality are negatively and significantly correlated with GDP per capita, suggesting that higher average income does not necessarily imply more equitable development. Countries with comparable income levels may still experience pronounced inequalities, which can offset the potential benefits of economic growth. This aligns with the broader literature, which emphasizes that economic growth without inclusiveness often disproportionately benefits higher-income groups, leading to persistent inequality and limited improvements in human development (Amponsah et al., 2023).

Regarding income inequality, the correlation analysis reveals a negative, statistically significant association with HDI. However, in the fixed-effects panel regression model, income inequality does not show a statistically significant independent association with HDI, despite a positive coefficient. These results provide partial support for the expected negative relationship between income inequality and HDI in the correlation analysis, but they do not support a statistically significant independent association in the fixed-effects regression model. It suggests that income inequality influences human development primarily through indirect channels, such as access to health care, education, and other social services. Unequal income distribution may therefore weaken the translation of economic growth into improvements in overall well-being.

The literature offers differing perspectives on the causal relationship between inequality and population health. Some scholars argue that the observed association is driven by the diminishing marginal returns of income on health at the individual level, rather than inequality itself (Deaton, 2003; Gravelle, 1998). Nevertheless, the findings of this study suggest the relevance of inequality in life expectancy as an associated factor in human development, although the regression evidence is borderline and should be interpreted with caution.

Inequality in life expectancy shows a negative correlation with HDI and a negative association in the fixed-effects regression model. However, the regression coefficient is borderline statistically significant ($p = .050$), and the confidence interval is very close to zero. Therefore, this finding should be interpreted cautiously. The estimated coefficient (−0.0100689) suggests that lower inequality in life expectancy may be associated with higher levels of human development, but the result should not be interpreted as a robust or causal effect. This finding provides cautious support for the expected negative relationship between life expectancy inequality and HDI and highlights the potential relevance of health equity in understanding human development patterns.

The causal impact of inequality on population health remains a subject of debate (Luo & Xie, 2020). Two dominant theoretical frameworks—the absolute income hypothesis and the contextual (Wilkinson) hypothesis—seek to explain the link between inequality and health outcomes. Recent research also emphasizes the importance of accounting for income mobility when assessing inequality in life expectancy (Kreiner et al., 2018). Despite ongoing debates, this study suggests that disparities in health outcomes may be relevant for understanding human development patterns in the Western Balkans.

Life expectancy at birth shows a positive but statistically insignificant correlation with HDI, and it is not statistically significantly associated with HDI in the fixed-ef-

fects regression model. Consequently, the hypothesis that life expectancy is positively and statistically significantly associated with HDI is not supported by the fixed-effects regression results. This finding suggests that improvements in average longevity alone are insufficient unless accompanied by reductions in health inequalities.

Socioeconomic factors such as health behaviors, access to healthcare, relative deprivation, and institutional trust vary across countries and over time, contributing to differences in life expectancy inequality. Identifying these factors is important for policymakers, particularly in developing regions where data limitations and measurement challenges persist. Evidence from countries with lower income inequality, such as the Nordic states and Spain, indicates that educational and socioeconomic disparities remain central drivers of life expectancy inequality (Silva-Illanes, 2024).

Finally, the HDI framework itself accounts for diminishing returns to income by incorporating the logarithm of income (Kurian, 2011). Empirical evidence from other contexts further illustrates that rising HDI does not always coincide with reductions in poverty or inequality (Nurjihan & Faizi, 2024; Walujadi, Indupurnahayu & Endri, 2022). Consistent with these findings, the results of this study support the argument that a more equitable distribution of health and income gains is important for sustainable human development.

STRENGTHS AND LIMITATIONS OF THE STUDY AND FUTURE STUDIES

The Human Development Index (HDI) is one of the most widely used composite indicators in development research. Despite its broad acceptance, the HDI has well-documented limitations, including a restricted set of indicators, potential weaknesses in indicator selection and weighting, methodological challenges, and trade-offs among its components (Sever, 2013). Nevertheless, the HDI remains a valuable analytical tool, as it captures the multidimensional nature of human development in a relatively comparable and accessible manner and continues to provide important insights into cross-country development patterns.

Another limitation involves potential conceptual overlap and endogeneity. Because the Human Development Index (HDI) directly includes life expectancy as its health dimension and income as its standard-of-living dimension, regressions that use HDI as the dependent variable and life expectancy or GDP per capita as explanatory variables may capture mechanical relationships rather than independent causal effects. Simultaneity may also arise, as higher human development can contribute to improved health outcomes and stronger economic performance. Therefore, the estimated coefficients should not be interpreted as causal effects. Future research should consider alternative model specifications, such as excluding variables that overlap with HDI components, analyzing changes in HDI, focusing on inequality-adjusted HDI or separate HDI dimension indices, or employing dynamic panel or instrumental-variable methods when appropriate data are available.

From a methodological perspective, empirical analyses based on HDI face several challenges. Multicollinearity may arise due to strong correlations among socioeconomic variables such as GDP, life expectancy, and education indicators, complicating coefficient interpretation. Moreover, while panel regression techniques are effective in controlling for unobserved heterogeneity and exploiting both cross-sectional and tem-

poral variation, they primarily identify associations rather than causal relationships. As a result, future studies could benefit from complementary econometric approaches, such as instrumental variable methods or dynamic panel models, to strengthen causal inference. Data quality and consistency also remain critical concerns, as variations in measurement and reporting across countries and time periods may affect the robustness of empirical findings.

The analysis is constrained by the limited number of country-year observations, which restricts the potential for additional robustness checks. With a short balanced panel comprising five countries across five selected years, incorporating further year-fixed effects, COVID-19 dummy variables, or alternative inequality indicators would significantly reduce degrees of freedom and could result in unstable estimates. The years 2020 and 2021 may nonetheless capture the impact of the COVID-19 shock on GDP, life expectancy, and human development outcomes. Furthermore, a comprehensive assessment of serial correlation and cross-sectional dependence was not feasible due to the small sample size. Future research utilizing longer annual panels should evaluate the robustness of these findings by including year fixed effects, omitting COVID-19 years, testing for serial correlation and cross-sectional dependence, and employing alternative measures of inequality.

Despite these limitations, the panel regression framework employed in this study represents a robust approach for analysing the relationship between economic, health-related, and inequality dimensions of human development. By accounting for country-specific effects and temporal dynamics, panel models enhance the reliability of estimated relationships and offer valuable policy-relevant insights.

Existing empirical evidence highlights the importance of education, human capital, and labour market factors in shaping HDI outcomes (Abdussamad et al., 2024; Teixeira & Queirós, 2016; Nurjihan & Faizi, 2024). Other studies emphasise the role of economic openness, technological development, and information and communication technologies (Faisal, 2022; Khan et al., 2019; Güz et al., 2025), as well as health, environmental, and resource-related factors (Dritsaki & Dritsaki, 2023; Ladi et al., 2021; Tian & Zhang, 2023). Incorporating these additional dimensions in future research would provide a more comprehensive understanding of human development dynamics.

CONCLUSION

This study provides empirical evidence on the statistical correlates of human development in the Western Balkan countries, with a particular focus on the role of inequality. The findings indicate that higher levels of income inequality and life expectancy inequality are associated with lower levels of human development, underscoring the detrimental effects of unequal distributions on overall development outcomes. Among the countries analysed, Montenegro records the highest HDI value in 2022, while both Montenegro and Serbia are classified in the very high human development category.

The fixed-effects panel regression results indicate that inequality in life expectancy is negatively associated with the Human Development Index (HDI) in the selected model. However, this association is only marginally statistically significant and should be interpreted with caution. This result suggests that disparities in survival

outcomes may be associated with differences in human development across Western Balkan countries. In contrast, GDP per capita, life expectancy at birth, and income inequality do not exhibit statistically significant associations with HDI within the fixed-effects specification. Due to the small sample size, conceptual overlap between HDI and certain explanatory variables, and potential endogeneity, these results should be regarded as statistical associations rather than evidence of causal relationships.

Overall, the results emphasize the need for a more inclusive and equitable approach to development in the Western Balkans—one that prioritizes reducing health and social disparities alongside economic growth. A more accurate reflection of human development must capture the lived experiences of all segments of society, particularly vulnerable and disadvantaged groups. Addressing inequalities in their various forms remains a central challenge for achieving sustainable and equitable human development, not only in the Western Balkans but globally.

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APPENDIX A

Table A1. Skewness and kurtosis tests of normality

Variable	Observations (Obs)	Pr(skewness)	Pr (kurtosis)	Adj chi2(2)	Prob>chi2
HDI	25	0.8483	0.6255	0.27	0.8716
GDP	25	0.2902	0.7594	1.31	0.5186
LE	25	0.8410	0.9916	0.04	0.9800
Gini	25	0.6133	0.6313	0.50	0.7773
LEI	25	0.3023	0.6321	1.40	0.4955

Source: Authors

Table A2. Variance inflation factor values

Variable	VIF	1/VIF
GDP	3.66	0.273552
LE	2.85	0.350609
Gini	1.79	0.558863
LEI	1.19	0.837822
Mean VIF	2.37	

Source: Authors

Table A3. White's test for heteroskedasticity

Test Statistic	chi2(14) = 16.65	Prob > chi2 = 0.2755
Null Hypothesis (H_0)	Homoskedasticity	
Alternative Hypothesis (H_1)	Unrestricted heteroskedasticity	

Source: Authors

Table A4. Cameron and Trivedi's information matrix (IM) test decomposition

Source	chi2	df	p-value
Heteroskedasticity	16.65	14	0.2755
Skewness	4.72	4	0.3172
Kurtosis	1.35	1	0.2461
Total	22.71	19	0.2502

Source: Authors

Table A5. Hausman specification test for fixed and random effects models

Variable	Fixed Coeff. (b)	Random Coeff. (B)	Difference (b-B)	sqrt(diag(V_b-V_B)) Std. Err. (s)
GDP	5.81e-06	8.38e-06	-2.58e-06	-
LE	0.0052605	0.012276	-0.0070155	0.0036155
Gini	0.0003721	-0.0025183	0.0028904	0.000343
LEI	-0.0100689	-0.007086	-0.0029829	0.002476

Source: Authors

b = Consistent under H_0 and H_a; obtained from xtreg.
B = Inconsistent under H_a, efficient under H_0; obtained from xtreg.
Test of H_0: Difference in coefficients not systematic
chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 248.09 ; Prob > chi2 = 0.0000

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ORIGINALNI NAUČNI RAD / ORIGINAL SCIENTIFIC PAPER

THE INTERPLAY OF MANDATORY CORPORATE SOCIAL RESPONSIBILITY EXPENDITURE AND CREDIT RATINGS

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Abstract: *This study explores the effect of mandatory Corporate Social Responsibility (CSR) expenditure on the credit ratings of Indian-listed firms. The sample for the study is 259 Indian listed firms evaluated by using panel regression. The study uncovers a positive connection between mandatory CSR spending and long-term credit scores, indicating that firms adhering to CSR requirements tend to enjoy elevated credit ratings. While overspending negatively impact the credit rating of the firm. India is only country where CSR expenditure as per percentage of profit is mandatory by law. This study contributes the growing literature on mandatory CSR focusing on its impact on credit ratings. The finding can help the corporate leaders to make strategic financial planning related to CSR expenditure and credit rating optimisation. With the help of this study, we provide empirical evidence that mandatory CSR expenditure significantly improves a firm's Credit ratings in an emerging economy such as India. This study is helpful for policy makers to mandate the corporate social responsibility and implementing CSR related laws.*

Keywords: *CSR, Credit rating, India, Mandatory CSR spending*

Jel classification: *G3, M14, G24*

INTRODUCTION

Corporates are regarded as entities to fulfil the demands of the market by availing required products and rendering the desired services, they are also entrusted with the social responsibility for their stakeholders. According to Bowen H , It is the responsibility of corporates to give back to the society in which they operate and corporate has responsibility beyond profit maximization. However, Friedman says expenditure

incurred on CSR is taken as a non-fruitful use of shareholder's income and it hinders in value maximization of shareholder's wealth . Moreover, Bhalotia & Wagh points out that in times of economic uncertainties, corporates strategic realign CSR investments indicating corporate resilience.

The differentiated views on the topic have triggered a vast amount of research on CSR, and its effect on the company's varied financials. Though unidirectional results have not been achieved in this regard. Few studies like Orlitzky and Cho, et.al concluded a positive link between the financial performance of firms and CSR while Han et al. does not find any significant relationship between CSR and the Financial performance of the firms. At the same time, Sekhon & Kathuria find a neutral or negative association between CSR and financial performance, taking different variables.

In India, CSR disclosure has been made mandatory with the Companies Act 2013, which came into effect in April 2014. Thereby making corporates compulsorily spend on CSR activities. Firms with a net worth of 500 crores or turnover of 1000 crores or a net profit of 5 crores are obliged to spend at least 2% of their average annual profit of the last 3 years on CSR activities . To bridge the gap between society's expectations and firms' investment in CSR, Indian Government has passed this regulation and has set a precedent in the world. It would ensure sustainable development and a fair legal platform in the country . The current study explores the effect of Mandatory CSR expenditure on Credit ratings of the firm in India.

THEORETICAL BACKGROUND AND HYPOTHESIS FRAMING

Credit ratings depict the financial obligations of a firm. It might differ if the non-financial disclosures made by the firm vary. The credit ratings can be enhanced or subgrade based on the disclosures made by the companies. Devalle & Fiandrino studied the credit ratings of the firm in association with ESG scores for Italian and Spanish companies. Barnea & Rubin discovered that managers may overspend on CSR for personal advantages leading to inefficient resource allocation of shareholders' money. Further, the link between these two variables has hardly been tested in the context of a developing economy except for a few , while most studies focus on developed nations, such as evidence from emerging markets remains relatively limited. To cover this gap, we have attempted to study the variables in the emerging economy of India. Moreover, most of the studies have been conducted on a voluntary aspect of CSR like Bannier et al. and Attig et al.. The effect of voluntary CSR on credit ratings may differ from that of the mandated aspect of CSR, Bhattacharya & Rahman . Lys et al. state that voluntary CSR does not bring profits to the firm in the future rather it indicates the profits for the time to come. Hence, for this study, we have taken the mandated CSR expenditure as per the regulation as our independent variable. Different studies have proxied CSR for different parameters such as Environment, social, and governance (ESG) scores, Bhattacharya & Sharma , Devalle et al. and Attig et al.. while some others have computed CSR scores based on a scale developed by them, Muttakin & Subramaniam and Sindhu et al.

CSR score describes the arena of CSR performance, but it does not show the quantum of CSR expense incurred, Bhattacharya & Rahman (2019). Therefore, for this study CSR is taken as the CSR expenditure as mandated by the law.

To fill in the above gaps we study the mandated CSR expenditure and its effect on credit ratings in the developing economy of India.

CSR policies across the world differ from country to country.

Hypotheses

The conclusions drawn differ greatly in this regard, which paved the way for research, further into the study of mandatory CSR in India about financial aspects and obligations of the firms. Here, we study, The effect of mandatory CSR expenditure on the Credit ratings of the firm, in Indian context.

The proposed alternative hypotheses are as follows.

H_1: Mandatory Corporate Social Responsibility expenditure has a positive influence on the Credit ratings of the companies in India.

DATA AND METHODOLOGY

The study considers companies which are listed on National Stock Exchange (NSE) and part of Nifty 500 Index. Out of a population of 500 companies around 259 companies were taken to study the relationship between mandatory CSR expenditure and Credit Ratings using panel regression. Credit ratings are inherently ordinal, and the cardinal "distance" between adjacent notches is not strictly equal. We nonetheless adopt panel OLS as our primary specification on three grounds: first, with a sufficiently fine-grained ordinal scale, OLS provides a defensible linear approximation that has been widely used in the rating-determinants literature; second, OLS coefficients are directly interpretable in the units of the dependent variable; and third, panel OLS readily accommodates firm-level heterogeneity. As a robustness check, we re-estimate the model using random-effects ordered probit and report marginal effects at the means; the sign and significance of all key variables are preserved, indicating that our conclusions are not driven by the linear-model assumption. The sample is selected as per the availability of data. The data then further clean for data analysis. The research period covers of years between 2016-2017 to 2021-2022, spanning the mandatory CSR regime in India till the time of this research study, leaving aside the initial settling years. The data has been collected for a 6-year period from the CMIE prowess database. The independent variable Mandatory CSR expenditure (MCSRE) as per the Companies Act, 2013, and actual CSR expenditure incurred by the firm (ACSRE) is taken as a measure of CSR. The dependent variable here is Credit ratings issued by credit rating agencies like Crisil, ICRA, or CARE. Ordinal values are assigned to the ratings given and mean credit rating is taken for the purpose of analysis. Control variables taken for the study are Market capitalization, Leverage ratio, Size of the firm, Age of the firm, and Profitability.

The scope of the study is limited to the firms listed on NSE500, which have been given ratings by Credit rating agencies such as Crisil, ICRA, or CARE, and data related to CSR is available for the years 2016-17 to 2021-22 FY.

Dependent variables

Credit ratings issued by third-party agencies are taken as the dependent variable. The Dependent variable Credit ratings are taken as long-term issuer credit ratings .

Credit ratings given on long-term loans by Crisil, Care, or ICRA are taken for this study. If ratings by Crisil are not available for some reason then we take the ratings by Care or ICRA, as the pattern of assigning ratings is on the same fundamentals by the

agencies . Ordinal values are assigned to the alphabetical ratings issued by the agencies in line with previous literature.

Independent variable

The measure for CSR is taken as the actual expenditure incurred on CSR activities by the firm and the mandatory CSR expenditure required to be incurred by the companies as per the law. Here two independent variables are taken; the mandated Expenditure on Corporate social responsibility (MCSRE)as per the Companies Act, 2013, and the amount of actual expenditure incurred by the firm on CSR activities in compliance with the regulation. (ACSRE).

Control Variables

Firm age: It can impact both CSR commitments and financial soundness of the firm hence an essential control in the study. Taken as years since the incorporation of the firm Leverage: Directly affects the financial distress of the firm, hence it is important to control for firms' debt structure. Taken here as Total liabilities/ Total assets.Firm size: Acts as a critical control to account for scale effects ensuring robust analysis for size related effects. Here we have taken it as a log of total assets. Market Cap is the market value of firm's outstanding shares.Firms with higher market capitalization are perceived to be more stable, hence it is taken here to control the market perception of the company's value and stability.

Profitability: Taken as profit before interest and taxes scaled by total assets. Higher earnings would mean better financial health hence this variable controls for firm's earning capacity and its influence on credit ratings.

METHODOLOGY

To estimate the impact of the credit rating on the companies taken, we have used panel regression model to capture the impact of the independent variables on the dependent variable used in the study. The estimated equation is as follows:

$$\textbf{Credit Rating}_{n,t} = \alpha_0 + \beta 1\ \textbf{ACSRE} + \beta 2\ \textbf{MCSRE} + \beta 3\ \textbf{Firm age} + \beta 4\ \textbf{Firm size} + \beta 5\ \textbf{Leverage} + \beta 6\ \textbf{Market cap} + \beta 7\ \textbf{profitability} + \in \textbf{n, t}$$

Table 1. Description of the variables

Description of the variables		
Nature of the variable	Name of the variables	Description of the variables
Dependent variable	Credit rating	Ratings provided by the agencies in Letter grade
Independent variable	ACSRE β1	Actual CSR amount being spent by the company
	MCSRE β2	The mandate notified amount for the companies
Control variable	Firm age β3	Age of the firm since its incorporation
	Firm size β4	Natural log of total assets
	Leverage β5	Total borrowings to total assets
	Market Cap β6	Market capitalization of the company
	Profitability β7	PBIT to total assets

Source: Author calculation

Table 1 represents the description of the dependent, independent as well as control variables taken for the study. Credit rating has been considered as the dependent variable by way of converting the letter grade to numeric coding for convenience in the analysis. CSR spent (ACSRE) has been considered the actual amount being spent by the companies towards CSR activities. CSR to be spent (MCSRE) is the amount which is mandated to the companies through the Companies Act, of 2013. In addition to that, firm age has been considered as the control variable which presents the age of the firm from the date of incorporation to till date. The firm size is considered by calculating the log of total assets. In addition to that, leverage and market cap are also being considered by taking borrowings to total assets for the calculation in the study. Finally, the profitability by way of considering PBIT to total assets has been included among the control variables to proceed with the analysis.

EMPIRICAL ANALYSIS & DISCUSSION

Summary Statistics

Table 2. Descriptive statistics

Descriptive statistics						
Variables	**No. of Obs.**	**Mean**	**Median**	**Std. Deviation**	**Minimum**	**Maximum**
Credit rating	1213	2.9736	3.1750	3.4887	0.0000	8.0000
ACSRE	1213	290.41	61.800	832.8433	0.100	9220.00
MCSRE	1213	276.31	63.000	777.0907	0.100	8840.00
Firm age	1213	38.092	32.000	22.03664	2.000	119.00
Firm size	1213	11.164	10.982	1.542903	7.342	16.47
Leverage	1213	0.2197	0.171	0.207789	0.000	0.90
Market Cap	1213	3294.2	818.667	9312.227	0.000	178184.10
Profitability	1213	0.0012	0.001	0.000754	-0.001	0.01

Source: Author calculation

Table 2 presents the descriptive statistics of the variables considered for the study. Among the variables taken for study, Market capitalization (Market cap) has a mean of 3294.2, which is the highest among the variables followed by ACSRE, and MCSRE which are 290.41 and 276.31 respectively. Whereas among the ACSRE and MCSRE, the maximum spent is 9220, followed by 8840.0, which indicates the leverage has shown the lowest volatility among the variables i.e., 0.2077 followed by 1.542 in the case of firm size. Credit rating, which is considered a significant factor is showing an average of 2.97 and a maximum of 8 (ordinal scale) across the years.

Regression results

Table 3. Cross-Correlation Matrix

Cross-Correlation Matrix							
	ACSRE	**MCSRE**	**Firm age**	**Firm size**	**Leverage**	**Market Cap**	**Profitability**
ACSRE	1	0.776	0.170	0.568	-0.008	0.773	0.003
MCSRE	0.776	1	0.143	0.572	0.006	0.794	-0.001

Firm age	0.170	0.143	1	0.168	-0.161	0.126	-0.010
Firm size	0.568	0.572	0.168	1	0.326	0.473	-0.281
Leverage	-0.008	0.006	-0.161	0.326	1	-0.031	-0.301
Market Cap	0.773	0.794	0.126	0.473	-0.031	1	0.049
profitability	0.003	-0.001	-0.010	-0.281	-0.301	0.049	1

Source: Author calculation

Table 3 presents the cross-correlation matrix of the study. Among the variables considered, the result reports the absence of multicollinearity among the variables. However, ACSRE with MCSRE is highly correlated with each other, as both variables are coming under the same cluster. Apart from that, no other variables are having the issue of multicollinearity persisting in the dataset. Which provides the signal to proceed further in the analysis.

Table 4: Regression results of the variables

Variable	Pooled OLS (1)	Ordered Logit (2)	Ordered Probit (3)
ACSRE	-0.0011	-5.33e-04*	-3.09e-04**
	(4.21e-04)	(2.76e-04)	(1.51e-04)
MCSRE	0.0019***	0.0014***	7.12e-04***
	(4.66e-04)	(3.20e-04)	(1.73e-04)
Firm age	0.0162***	0.0153***	0.0089***
	(0.0040)	(0.0024)	(0.0014)
Firm size	-0.0316	0.0691	0.0707***
	(0.0747)	(0.0436)	(0.0261)
Leverage	4.7999***	2.5203***	1.3860***
	(0.4565)	(0.2678)	(0.1573)
Market Cap	-3.95e-05**	-3.22e-05***	-1.45e-05**
	(1.62e-05)	(1.08e-05)	(5.88e-06)
Profitability	367.998**	296.96***	196.87***
	(119.25)	(71.97)	(41.71)
Constant	1.1047**	–	–
	(0.8254)		
Cut 1	–	2.4179***	1.7631***
Cut 2	–	2.4755***	1.7984***
Cut 3	–	2.9852***	2.1100***
Cut 4	–	4.7317***	3.1152***
Observations	1213	1213	1213
R^2	0.0941	–	–
Adj. R^2	0.0856	–	–
Pseudo R^2	–	0.0575	0.0598
Log-likelihood	–	-1815.46	-1811.04
F / LR $\chi^2(7)$	21.80***	221.45***	230.28***

Notes: Std errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10.
Source: Author calculation

Table 4 presents the regression results of the study. Across all three models, Mandatory CSR Expenditure (MCSRE) is consistently positive and highly significant ($p < 0.01$), confirming that firms with higher statutory CSR obligations attract better credit ratings, while Actual CSR Expenditure (ACSRE) is negative across all models and significant in the Ordered Logit ($p < 0.10$) and Ordered Probit ($p < 0.05$) specifications, supporting the overinvestment hypothesis that spending beyond the mandated threshold signals inefficient capital allocation to rating agencies. However, ACSRE is significant but is negatively influencing credit rating. Which defines, rating is inversely related to the actual CSR spending. Among the control variables, firm age, leverage, and profitability are showing a positive influence at a 5% level of significance. In addition to that, R-square shows 9.41 percent, and is highly significant. That indicates keeping other variables constant, and independent variables together is explaining 9.41 percent of the dependent variables. The model fit is adequate with an R^2 of 9.41% for Pooled OLS and Pseudo R^2 of approximately 0.058–0.060 for the ordered models, with all three specifications jointly significant ($p < 0.01$), collectively affirming that mandatory CSR compliance not discretionary overspending is the key driver of credit rating improvement among Indian listed firms.

CONCLUSION, IMPLICATIONS & SUGGESTIONS

We study the impact of mandatory CSR expenditure on the Credit ratings of the firms. The regulation implementing mandatory CSR came into effect with Section 135 of The Indian Companies Act, 2013, it was the first of its kind in the world to be implemented and make CSR expenditure mandatory, . We find that the mandatory CSR expenditures are positively related to long-term credit ratings issued by the Rating agencies. The study also finds that MCSRE has a considerable effect on Credit ratings, but the actual expenditure incurred on CSR activities by the firms is not only determined by the mandate issued by the government. Other factors such as firm size and market capitalization also influence the firm's decision to invest in CSR activities as we find that the actual amount spent on CSR differs from the mandated amount. This supports the Hypotheses.

The strong negative influence seen between Actual CSR expenditure (ACSRE) and Credit ratings adds weightage to the overinvestment view suggested by Jiraporn, and Barnea a & Rubin which finds that overspending in CSR activities leads to low credit ratings. The study observed 47% of observations witnessed over spent in CSR i.e. the companies are spending beyond the mandated 2% of the average profits, while 25% of observations depicted exact compliance with the law. This builds on the overinvestment theory talked about in previous research by Bhattacharyya & Rahman and Lys et al.

We provide a significant positive association between Mandatory CSR expenditure and Credit ratings. Our results add to the debate on the association between CSR and its effect on Credit ratings. Earlier studies provide different results, as positive , and negative association between CSR and Credit ratings . While most of these studies have taken the Environmental, social, and Governance (ESG) score for the study while we have taken the CSR expenditure instead of any proxy, thereby establishing a closer relationship with the variable. Prior studies in the Indian context have examined ESG disclosures as a moderating mechanism linking non-financial reporting to firm

financial performance , and the present study extends this line of inquiry by specifically examining mandatory CSR expenditure as a determinant of credit ratings.

With the help of this study, we provide empirical evidence that mandatory CSR expenditure significantly improves a firm's Credit ratings in an emerging economy such as India. This would further assist the regulatory bodies in developing countries in framing and implementing the law. It would throw light on decision making by credit rating agencies, firms and investors and their perception towards CSR.

Further studies can incorporate broader samples entailing cross country and cross industry comparison. Qualitative measures of CSR can also be tested with credit ratings to give deeper insight into the association.

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ORIGINALNI NAUČNI RAD / ORIGINAL SCIENTIFIC PAPER

AI- DRIVEN TRANSFORMATION IN PUBLIC ADMINISTRATION: GOVERNANCE CHALLENGES AND INSTITUTIONAL CAPACITY IN BOSNIA AND HERZEGOVINA

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Abstract: *This study examines the effects and benefits, as well as broader governance challenges related to Artificial Intelligence (AI), including systematical measurement of overall digital reshaping process in digital transformation and capacity building of public administration in Bosnia and Herzegovina. Grounded in contemporary theories of adaptive governance and digital-era public administration, the research conceptualizes AI as a key determinant of transformational capacity in public institutions. The multi-level empirical analysis operationalizes key constructs, including digital maturity degree and the extent of AI use, so as multidimensional impacts in administrative efficiency, service quality, transparency, institutional integrity and strategic decision-making capacity in public administration bodies in Bosnia and Herzegovina. The findings tend to demonstrate a statistically significant correlation between AI use and efficiency improvements, reduction of administrative burden, enhanced integrity mechanisms, but at the same time to highlight structural and organizational constraints, limited technical capacities, regulatory gaps and ethical concerns related to algorithmic bias, accountability and governance. By empirically assessing the transformational capacity of AI in public administration, this study contributes to the growing basis of digital governance, provides policy-relevant insights for the effective integration of AI in line with European administrative standards and principles of trustworthy AI in Bosnia and Herzegovina.*

Keywords*: Artificial intelligence, public administration, digital transformation,institutional capacity*

JEL classification*: O33, H11, D73*

INTRODUCTION

In the digital decade, the application of AI significantly affects the quality of governance, which is further conditioned by the digital maturity of institutions and the digital skills of employees. Furthermore, AI brings certain ethical challenges, but also enables human intellectual capital to operationally move beyond what was previously considered impossible. This implies the automation of processes in public administration, improved and faster decision-making, greater accessibility and responsiveness of institutions, as well as the better detection and management of corruption risks.

In this context, the integration of AI into public administration in Bosnia and Herzegovina must be understood not only as a tool for technological innovation, but as a strategic and structural component of ongoing public administration reform and European integration processes. Recent assessments by SIGMA indicate that, despite certain progress, public administration in Bosnia and Herzegovina continues to face systemic challenges, including weak coordination, fragmented governance structures, limited accountability, and insufficient institutional capacity for implementing complex reforms. These structural constraints directly affect the ability of public institutions to adopt and effectively utilize advanced digital technologies such as AI. Similarly, the latest European Commission Report highlights that Bosnia and Herzegovina remains at an early stage of preparation in key areas of digital transformation, with the absence of a coherent legislative and strategic framework aligned with the EU acquis, particularly in domains related to digital governance, interoperability, and data-driven public services. The report further emphasizes persistent weaknesses in transparency, coordination, and institutional capacity, all of which are critical preconditions for the successful deployment of AI-based systems. At the same time, the European Union has established a comprehensive regulatory approach to AI through the AI Act, which introduces a risk-based governance model emphasizing transparency, accountability, human oversight, and the protection of fundamental rights. This regulatory framework sets clear expectations for candidate countries, including Bosnia and Herzegovina, to align their institutional and legal systems with the principles of trustworthy AI as part of the broader EU *acquis.*

Current research on AI in public administration is predominantly focused on highly developed and digitally mature governance systems, with limited empirical evidence from complex, multi-level, and transitional administrative environments. The research problem is addressing these gaps, followed by providing an integrated empirical analysis of artificial intelligence in the public administration of Bosnia and Herzegovina. It contributes to the literature by (a) extending empirical research to a fragmented and transitional governance context, (b) developing a multidimensional analytical framework that links AI use, digital maturity, and measurable institutional outcomes, and (c) incorporating ethical risk perception as a key governance variable influencing the realization of AI benefits.

LITERATURE REVIEW

The integration of AI into public administration has gained significant scholarly attention over the past decade, particularly within the broader context of digital governance and public sector innovation, leaving behind traditional governance as insufficient for meeting the contemporary demands and needs of citizens. AI is increasingly

conceptualized not only as a technological tool but as a transformative force for institutional capacity and public good, enabling public organizations to enhance efficiency, service delivery, and decision-making processes .

A growing body of empirical research demonstrates that AI adoption contributes to improved administrative efficiency by adaptive, hybrid governance and reducing bureaucratic workload. Studies indicate that AI-supported systems can significantly accelerate processing times and enhance productivity within public institutions . Autonomous mode of AI significantly enhances quality, speed and citizen engagement in simple, complex or time-sensitive inquiries . Its cumulative benefits further encompass automated document generation, advanced analytical techniques and targeted service provision , thereby reinforcing institutional capacity and supporting evidence-based national strategic planning.

Practical implementations further illustrate that AI facilitates innovative governance solutions, including intelligent automation of routine administrative tasks, predictive allocation of public resources, and scalable digital interaction with citizens through tools such as chatbots and algorithmic classification systems, thereby expanding the functional capacity of public institutions. Beyond efficiency gains, AI has been shown to improve the quality of public services through enhanced accuracy, personalization, and responsiveness. AI-driven analytics enable governments to better understand citizen needs and tailor services accordingly, leading to higher levels of service effectiveness . Moreover, the use of AI in decision-support systems contributes to more evidence-based policymaking, strengthening the strategic capacity of public administration.

Also, AI plays a critical role in optimizing administrative performance , but with uncertainties and attendant risks concerning human autonomy and control loss over decision-making .

Transparency and accountability represent another critical dimension of AI implementation in the public sector. Research suggests that AI can enhance transparency by enabling real-time monitoring, traceability of decisions, and improved detection of irregularities . At the same time, however, scholars caution that increased reliance on algorithmic systems may introduce new forms of opacity, particularly in cases where decision-making processes are not fully explainable.

The concept of digital maturity has emerged as a key explanatory factor in understanding the successful adoption and impact of AI in public institutions. Digital maturity encompasses technological infrastructure, organizational readiness, and human capital capabilities, all of which are essential for effective AI implementation . Empirical findings consistently show that institutions with higher levels of digital maturity are more likely to adopt AI and derive greater benefits from its use, supporting the structural linkage between digital capacity and AI-driven transformation.

At the same time, the literature emphasizes that AI adoption introduces significant ethical and governance challenges. Issues such as algorithmic bias, lack of transparency, and risks to accountability have become central concerns in the deployment of AI systems in the public sector . Recent research further highlights that the perception of these risks may influence the extent to which AI benefits are realized, suggesting a complex interaction between technological adoption and governance frameworks .

Importantly, scholars increasingly point to a “double-edged effect” of AI in public administration: while AI can strengthen institutional integrity through improved

monitoring and detection mechanisms, it can also create new vulnerabilities if not properly governed . This perspective is particularly relevant for transitional governance systems, where institutional capacities and regulatory frameworks may still be evolving.

METHODOLOGY

Research Design

This study adopts a quantitative research design aimed at examining the correlation between AI adoption and institutional performance in public administration.

Primary data were collected in March and April 2026 on all administrative levels in Bosnia and Herzegovina using a structured questionnaire, designed to capture perceptions of public administration employees regarding the use of AI, its benefits, and associated challenges. The instrument is based on a five-point Likert scale (1–5), ranging from *"strongly disagree"* to *"strongly agree"*, allowing for the measurement of attitudes toward AI implementation and its perceived effects.

In accordance with the established hypotheses, the research is guided by the following research questions (RQ):

RQ1: To what extent do public institutions in Bosnia and Herzegovina exhibit digital maturity and readiness for AI adoption?

RQ2: What is the extent and scope of AI use in public administration processes?

RQ3: How does the use of AI affect operational efficiency, decision-making, service quality and transparency in public institutions?

RQ4: What are the key institutional, regulatory, and ethical challenges associated with AI adoption in public administration? The study operationalizes key constructs through multiple indicators derived from the questionnaire:

- Independent variable:
  - Extent of AI use in public administration
- Dependent variables:
  - Operational efficiency (e.g., process monitoring, administrative burden reduction)
  - Decision-making quality
  - Strategic planning improvement
  - Resource management
  - Transparency
  - Detection of irregularities and corruption risk reduction
- Control variables:
  - Institutional type
  - Level of government
  - Position
  - Work experience
  - Age and gender
- Barriers (moderating factors):
  - Lack of knowledge
  - Regulatory constraints
  - Employee resistance
  - Ethical concerns

The collected data were analyzed using statistical software (SPSS), which includes: descriptive statistics (frequencies, percentages, mean values), reliability analysis (Cronbach's alpha for internal consistency), correlation analysis and regression analysis.

Within the theoretical framework, guided by comparative practices and the contemporary use of AI in public administration, this study tests the following hypotheses:

H1: Digital maturity and digital literacy are positively associated with the extent of AI use in public institutions.

H2: The extent of AI use is positively associated with improvements in operational efficiency, including reduced administrative burden and faster processing of cases.

H3: The use of AI is positively associated with enhanced transparency and improved detection of irregularities and corruption risks.

H4: Institutional barriers, including lack of knowledge, regulatory constraints, and employee resistance, are negatively associated with the extent of AI use.

The research conceptualizes transformational capacity of AI as an underlying mechanism shaping multiple dimensions of institutional performance.

RESULTS AND DISCUSSION

Sample characteristics

The empirical analysis was conducted on a sample of 210 respondents employed across public administration institutions in Bosnia and Herzegovina, including ministries, administrations, administrative organizations, and other public bodies at state, entity/Brčko District, cantonal, and local levels.

Table 1. Sample structure of respondents

Variable	Category	n	%
Institution type	Administration	72	34.3
	Other institutions/public bodies	51	24.3
	Administrative organisation	45	21.4
	Ministry	42	20.0
Level of government	Entity/Brcko district	102	48.6
	State	41	19.5
	Cantonal	39	18.6
	Local	27	12.9
Position category	Senior/managerial staff	89	42.4
	Other civil servants	87	41.4
	Employees/support staff	23	11.0
	IT sector	9	4.3
Years of experience in public service	10 years and longer	133	63.3
	5-10 years	39	18.6
	0-5 years	38	18.1

Variable	Category	n	%
Age group	36-45 years	92	43.8
	46-55 years	68	32.4
	25-35 years	28	13.3
	56- 65 years	21	10.0
Gender	M	109	51.9
	F	100	47.6

Source: Author's

The sample is institutionally heterogeneous. The largest proportion of respondents comes from administrations (34.3%), followed by other public institutions (24.3%), administrative organizations (21.4%), and ministries (20.0%). Entity and Brčko District institutions dominate the sample (48.6%), while managerial staff (42.4%) and other civil servants (41.4%) represent the majority of respondents. In terms of experience, 63.3% of respondents have more than ten years of service, indicating a highly experienced sample capable of assessing institutional processes. The age structure is concentrated in the 36–55 range, and gender distribution is balanced. This structure ensures a comprehensive institutional perspective on AI adoption and its organizational implications.

Reliability and descriptive statistics

Internal consistency of the constructs was assessed using Cronbach's alpha. The results indicate satisfactory to excellent reliability for all principal constructs. Digital readiness ($\alpha = 0.830$) and extent of AI use ($\alpha = 0.895$) indicate strong internal consistency, while benefit-related constructs show very high reliability: operational efficiency ($\alpha = 0.923$), transparency and integrity ($\alpha = 0.904$), and strategic benefits ($\alpha = 0.930$). Institutional barriers also reach acceptable reliability ($\alpha = 0.711$).

Table 2. Reliability and descriptive statistics of the composite constructs

Construct	Items	Cronbach alpha	Mean	SD	Min	Max
Digital readiness	5	0.83	2.905	0.883	1.0	5.0
Extent of AI use	4	0.895	1.83	0.853	1.0	5.0
Operational efficiency	3	0.923	3.484	1.183	1.0	5.0
Service quality and decision-making	3	0.891	3.219	1.065	1.0	5.0
Transparency and integrity	3	0.904	3.124	1.102	1.0	5.0
Strategic benefits	3	0.93	3.421	1.086	1.0	5.0
Institutional barriers	4	0.711	3.529	0.868	1.0	5.0

Source: Author's

Descriptive statistics reveal several important patterns. The highest mean value is recorded for institutional barriers ($M = 3.529$), followed by operational efficiency ($M = 3.484$) and strategic benefits ($M = 3.421$). In contrast, the extent of AI use remains notably low ($M = 1.830$), while digital readiness is moderate ($M = 2.905$), which suggests that respondents perceive AI as potentially beneficial even though its

institutional deployment is still limited and uneven. Moderate level of digital readiness is indicating a transitional stage between early digitalization and broader AI-enabled transformation.

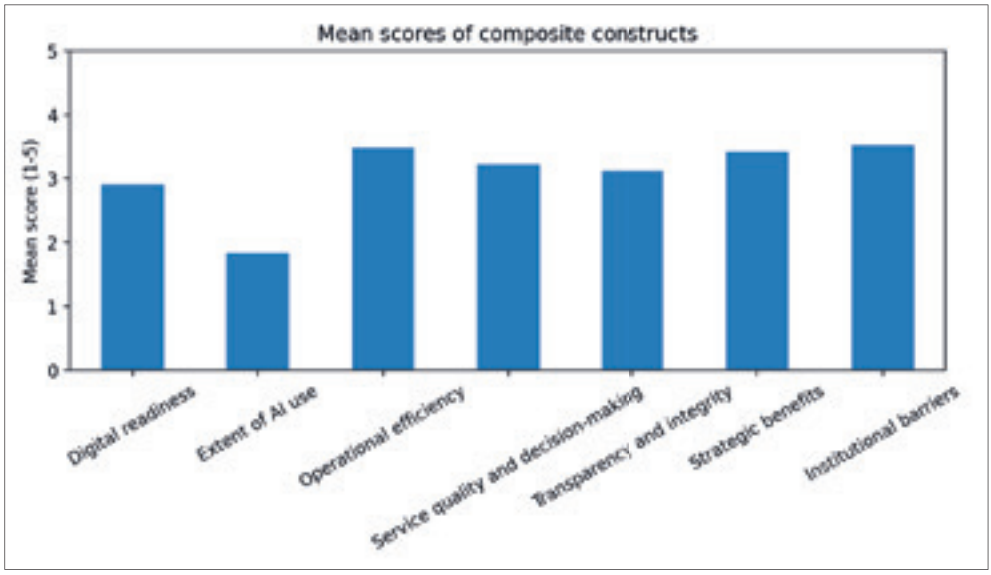


Figure 1. Mean scores of the composite constructs
Source: Author's

Correlation analysis

Pearson correlation analysis shows that digital readiness is strongly and positively associated with the extent of AI use ($r = 0.495$, $p < 0.001$), confirming that digital maturity represents a key enabling factor for AI adoption. A positive and statistically significant relationship is also observed between AI use and operational efficiency ($r = 0.199$, $p = 0.004$). However, the relationship between AI use and transparency and integrity is weaker and does not reach conventional significance levels ($r = 0.128$, $p = 0.065$). Institutional barriers show a negative but statistically insignificant association with AI use ($r = -0.080$, $p = 0.249$), suggesting that barriers are recognized but not yet decisive in limiting AI implementation.

Table 3. Pearson correlations among the key constructs

Variable	Digital readiness	Extent of AI use	Operational efficiency	Transparency and integrity	Institutional barriers
Digital readiness	1	0.495**	0.189**	0.046	-0.028
Extent of AI use	0.495**	1	0.199**	0.128	-0.080
Operational efficiency	0.189**	0.199**	1	0.708**	0.398**
Transparency and integrity	0.046	0.128	0.708**	1	0.377**
Institutional barriers	-0.028	-0.080	0.398**	0.377**	1

Source: Author's

Regression analysis

To further examine causal relationships, three regression models were estimated.

The Model 1 explains 24.9% of the variance in AI use ($R^2 = 0.249$, $p < 0.001$). Digital readiness emerges as a strong and statistically significant predictor ($\beta = 0.493$, $p < 0.001$), while institutional barriers do not have a significant effect ($\beta = -0.066$, $p = 0.275$).

Further, Model 2 examined whether AI use has a positive and statistically significant effect on operational efficiency ($\beta = 0.199$, $p = 0.004$), although the explained variance is modest ($R^2 = 0.039$).

Model 3 explained that the effect of AI use on transparency and integrity is positive but only marginally significant ($\beta = 0.128$, $p = 0.065$), indicating that this relationship is not yet fully established.

No multicollinearity issues were detected (VIF ≈ 1.00), and residuals follow an approximately normal distribution, confirming model validity.

Table 4. Model summary for the regression analyses

Model	Dependent variable	Predictors	R^2	Adj. R^2	F	Sig.
Model 1	Extent of AI use	Digital readiness; Institutional barriers	0.249	0.242	34.361	< .001
Model 2	Operational efficiency	Extent of AI use	0.039	0.035	8.550	0.004
Model 3	Transparency and integrity	Extent of AI use	0.016	0.012	3.451	0.065

Source: Author's

Table 5. Regression coefficients

Model	Predictor	B	Beta	t	Sig.	VIF
Model 1	Digital readiness	0.476	0.493	8.183	< .001	1.001
Model 1	Institutional barriers	-0.065	-0.066	-1.094	0.275	1.001
Model 2	Extent of AI use	0.276	0.199	2.924	0.004	-
Model 3	Extent of AI use	0.165	0.128	1.858	0.065	-

Source: Author's

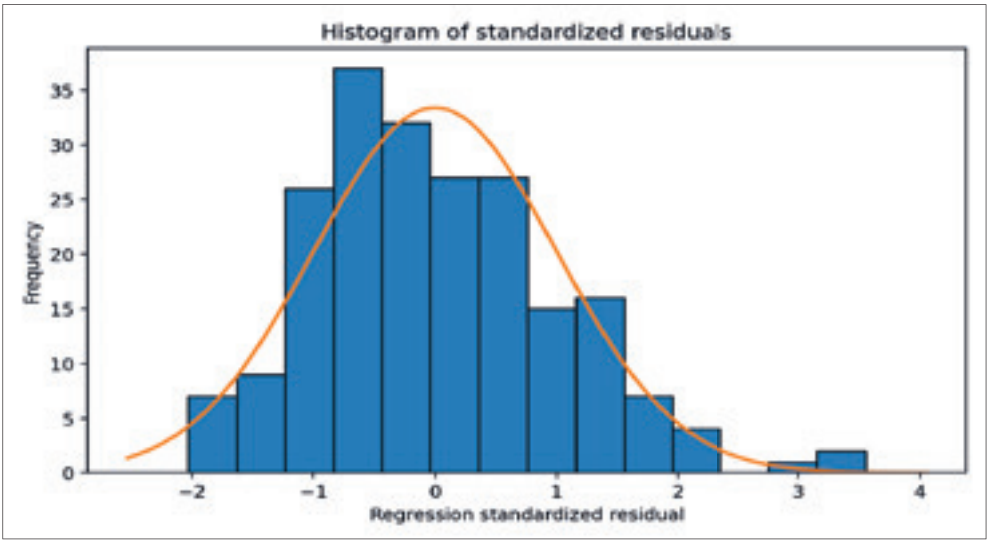


Figure 2. Histogram of standardized residuals for Model 1
Source: Author's

The histogram indicates approximately normal distribution of residuals, confirming the assumption of normality.

Table 6. Summary of hypothesis testing

Hypothesis testing summary

Hypothesis	Path tested	Empirical result	Conclusion
H1	Digital readiness → Extent of AI use	r = 0.495, p < .001; β = 0.493, p < .001	Supported
H2	Extent of AI use → Operational efficiency	r = 0.199, p = .004; β = 0.199, p = .004	Supported
H3	Extent of AI use → Transparency and integrity	r = 0.128, p = .065; β = 0.128, p = .065	Partially supported / marginal
H4	Institutional barriers → Extent of AI use	r = -0.080, p = .249; β = -0.066, p = .275	Not supported

Source: Author's

The empirical pattern indicates that the strongest support is found for the enabling role of digital readiness in stimulating AI adoption. The effect of AI use on operational efficiency is also confirmed, which aligns with the theoretical expectation that AI contributes primarily through time savings, productivity gains, and administrative simplification. The transparency-related effects move in the expected positive direction but are not yet sufficiently consolidated to produce strong statistical confirmation. This is plausible in a context where institutional AI use is still in an early phase and may not yet be deeply integrated into control, supervision, and integrity systems. Finally, the fourth hypothesis is not supported, suggesting that barriers are recognized by respondents, but they do not presently operate as a decisive statistical inhibitor of AI use once digital readiness is taken into account.

Supplementary qualitative insights

Qualitative responses reinforce quantitative findings. The most frequently identified benefits of AI include time savings, increased work speed, improved data analysis, and support for decision-making and strategic planning. The most frequently mentioned application areas are IT and analytics, administrative processes, finance and HR, legal and inspection activities, and citizen services. These insights confirm that AI is primarily perceived as a tool for efficiency and procedural modernization rather than a fully institutionalized decision-making mechanism.

Table 7.

Most frequent benefit themes: Time saving / speed (102), Data analysis / information retrieval (59), Strategic planning / decision support (25), Administrative burden reduction (12), Transparency / corruption risk reduction (10)
Most frequent sector themes: IT / analytics (85), Administration / protocol (45), Finance / planning / HR (28), Legal / inspection / control (21), Citizen-facing services (8)

Source: Author's

The findings contribute to the literature on digital governance by demonstrating that organizational readiness, rather than resistance, represents the primary determinant of AI adoption in public administration.

The strong effect of digital readiness supports existing theoretical frameworks which position digital maturity as a prerequisite for advanced technological integration. In the context of Bosnia and Herzegovina, this suggests that AI adoption is less constrained by institutional opposition and more by structural and capacity-related limitations.

The confirmed relationship between AI use and operational efficiency aligns with prior empirical studies, indicating that the earliest and most visible impact of AI emerges in routine administrative processes, including automation, data handling, and workflow optimization.

However, the relatively weak and statistically marginal relationship between AI use and transparency highlights an important nuance. While AI is often normatively linked to improved accountability and reduced corruption risks, these benefits appear to require deeper institutional embedding, regulatory frameworks, and governance mechanisms before they can materialize in measurable outcomes.

Furthermore, the non-significant effect of institutional barriers challenges common assumptions in the literature. Rather than acting as direct inhibitors, barriers may operate indirectly, shaping the broader context of digital readiness rather than directly suppressing AI use. This finding suggests that policy efforts should focus less on removing resistance and more on building digital infrastructure, skills, and organizational capacity.

A particularly important insight is the observed implementation gap: respondents recognize the benefits of AI (high mean values for efficiency and strategic gains), yet actual use remains low. This indicates a latent reform potential, where public institutions are cognitively prepared for AI adoption but lack the operational conditions to implement it effectively.

From a policy perspective, this implies that Bosnia and Herzegovina is currently in a transitional phase of AI adoption, where strategic alignment and capacity build-

ing could rapidly accelerate implementation if supported by appropriate governance frameworks.

CONCLUSION

The rapid intensification of AI use is reshaping the foundations of public administration worldwide, introducing new possibilities for efficiency, responsiveness, and data-driven governance. In contemporary public sector contexts, AI is increasingly perceived not merely as a technological innovation but as a strategic instrument of institutional transformation, capable of enhancing public value creation and improving administrative performance.

This study did the empirical observation of the AI use in the public administration of Bosnia and Herzegovina through the lens of transformational capacity, focusing on its measurable effects, benefits, and associated challenges. The findings confirmed correlation between AI adoption and significant efficiency improvements, service quality, and transparency, thereby reinforcing its role as a key enabler of public value creation and better administrative practices in Bosnia and Herzegovina.

At the same time, the study demonstrates that the realization of these benefits is not automatic but contingent upon the level of institutional readiness, particularly digital maturity. The results highlight that public institutions with more developed digital infrastructures, strategic orientation, and organizational capacities are better positioned to leverage AI technologies effectively. This underscores the importance of viewing AI not merely as a technological tool, but as a systemic governance instrument embedded within broader processes of digital transformation.

This study provides empirical evidence on the determinants and effects of AI adoption in public administration in Bosnia and Herzegovina. The findings demonstrate that digital readiness represents the most significant predictor of AI use, confirming its role as a fundamental enabling condition for technological transformation. While AI use is shown to have a positive and statistically significant effect on operational efficiency, its overall explanatory power remains modest, indicating that AI is still at an early stage of institutional integration. At the same time, the relationship between AI use and transparency and integrity is positive but only marginally significant, suggesting that governance-related benefits require deeper institutional embedding. Notably, institutional barriers do not exhibit a statistically significant effect on AI use, implying that constraints to adoption are less related to resistance and more to structural and capacity-related limitations.

Importantly, the research also reveals that increased use of AI is accompanied by a heightened awareness of ethical risks and governance challenges. Issues related to transparency, accountability, and algorithmic fairness emerge as critical factors that may influence both the legitimacy and sustainability of AI deployment in the public sector. This finding aligns with contemporary debates on trustworthy AI and emphasizes the need for a balanced approach that integrates innovation with robust governance safeguards.

Taken together, the results reveal a clear implementation gap, where public administration institutions recognize the potential benefits of AI but have not yet translated this awareness into widespread practical application. This indicates that Bosnia and Herzegovina is currently in a transitional phase of AI adoption, situated between initial

digitalization and more advanced, AI-driven transformation. From a policy perspective, the findings highlight the need to prioritize the development of digital infrastructure, human capital, and institutional capabilities as key preconditions for effective AI integration. Future research should further explore sector-specific applications of AI and examine longitudinal effects as implementation progresses, particularly in relation to transparency, accountability, and governance outcomes.

According to research feedback and empirical findings, several normative and policy-oriented recommendations (de lege ferenda) can be proposed for Bosnia and Herzegovina, in order to accelerate and continuously evolve digital transformation path in public administration reform process, in terms of:

a) Establishing a comprehensive legal and strategic framework for AI in public administration

There is a clear need to develop a coherent regulatory framework governing the use of AI in the public sector. Such a framework should be aligned with European standards and incorporate key principles of lawful, ethical, and transparent AI use, including human oversight, accountability, and data protection.

b) Institutionalization of digital maturity as a governance standard

Public administration reform should explicitly integrate digital maturity as a core institutional benchmark. This includes the systematic development of digital infrastructures, interoperable data systems, and organizational capacities necessary for effective AI adoption.

c)Development of ethical governance mechanisms for AI

It is necessary to establish formal mechanisms for assessing and managing ethical risks associated with AI systems. This may include the introduction of algorithmic impact assessments, internal oversight structures, and clear accountability frameworks within public institutions.

d) Capacity building and professional training

The effective use of AI requires significant investment in human capital. Targeted training programs should be developed to enhance digital competencies, analytical skills, and understanding of AI-related risks among public servants.

e) Integration of AI into anti-corruption and integrity systems

AI technologies should be strategically integrated into existing mechanisms for monitoring, inspection, and anti-corruption efforts. By improving data analysis and risk detection capabilities, AI can strengthen institutional integrity and contribute to more effective enforcement of legal and administrative standards.

f) Multi-level governance and coordination

Given the complex administrative structure of Bosnia and Herzegovina, it is essential to ensure coordination across different levels of government. A harmonized approach to AI implementation would reduce fragmentation and enhance knowledge sharing and institutional learning.

Ultimately, AI represents a transformative force in public administration, offering significant opportunities for enhancing efficiency and fulfillment in deriving public good. However, its successful integration depends on the ability of institutions to simultaneously innovate and govern. In this sense, the future of AI in the public sector of Bosnia and Herzegovina will be determined not only by technological advancement, but by the development of coherent legal frameworks, institutional capacities, and ethical governance systems.

In doing so, the study positions AI as a central element of transformational capacity in public administration, while simultaneously aligning its analytical framework with European standards of digital governance, public administration reform principles, and the emerging regulatory paradigm of trustworthy AI.

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ORIGINALNI NAUČNI RAD / ORIGINAL SCIENTIFIC PAPER

MODEL FOR ENHANCING E-BUSINESS IN TOURISM ENTERPRISES BASED ON BRAND AND SOCIAL MEDIA: THE CASE OF THE REPUBLIC OF CROATIA

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***Abstract**: The aim of this research is to examine the impact of brand and social media on e-business of tourism enterprises, as well as to propose an optimal model for improving business performance in the digital environment. Methodology includes theoretical analysis of literature and empirical research conducted on a sample of 385 respondents, users of tourism products and services. An e-questionnaire was used for data collection, and data processing was performed using descriptive statistics, correlation and regression analysis in the JMP Pro 18 software package. The reliability of measurement scales was confirmed by Cronbach's alpha coefficient. Results show that the overall model explains 82% of the variance in e-business (R^2=0.821; F=874.16; p<0.0001). Both predictors have a statistically significant positive impact, with social media (β=0.690; p<0.0001) exerting twice as strong an influence compared to brand (β=0.338; p<0.0001). Conclusion confirms the main hypothesis that brand and social media significantly contribute to the development of e-business in tourism enterprises, emphasizing the crucial role of social media in contemporary tourism business operations in the Republic of Croatia.*

***Keywords**: brand, social media, e-business, tourism enterprises, regression analysis*

***JEL classification**: C52, C38, L81, L83, M31, M15*

INTRODUCTION

Contemporary tourism enterprises in the Republic of Croatia are confronted with the continuous challenge of improving their sales mechanisms in order to respond to the growing expectations of consumers. The development and modernization of sales activities directly determine the level of competitiveness and long-term market sustainability; whereby digital transformation is becoming an imperative rather than a choice.

Based on the foregoing, the subject of this research is the definition and proposal of an optimal model of e-business in tourism enterprises as the dependent variable (hereinafter abbreviated as eBTE), with particular emphasis on the synergistic effects of brand (hereinafter abbreviated as BD) and social media (hereinafter abbreviated as SM) as independent predictors in the function of promotion and sales.

Consumer loyalty toward a brand is profiled as a key predictor of sales performance, since customer satisfaction generates long-term relationships and repeat purchases. Within the digital ecosystem, tourism companies must allocate significant resources to the development of innovative services and products, as well as to more efficient promotion based on contemporary forms of online advertising and the application of information and communication technologies. Active presence on social media platforms emerges as a necessary prerequisite for visibility and competitiveness in the global market.

Starting from the aforementioned considerations, the focus of this research is directed toward the analysis of the impact of brand and social media on the evolution of electronic business operations in tourism enterprises, primarily in the context of improving sales performance.

The primary scientific objective of this study is the generation of relevant and reliable information intended for the professional and academic community regarding models of e-business in tourism enterprises, with particular emphasis on the development of products and services grounded in brand strategy and social media engagement.

The main research tasks relate to determining the degree of influence of brand and social media on the e-business activities of tourism companies. The research is also oriented toward examining consumer attitudes and perceptions regarding the significance and impact of social media on the decision-making process related to the purchase of tourism products.

The research is based on a systematic approach to data analysis, combining theoretical and empirical methods. The survey method was applied using an electronic questionnaire (e-questionnaire). Data were collected from a sample of 385 respondents (users of tourism products and services). A preliminary reliability assessment of the statements and attitudes was conducted using Cronbach's alpha coefficient.

The analysis of the results was performed using statistical techniques, including reliability analysis, correlation and regression analysis, as well as their multivariate forms. Data processing was carried out using the software package JMP Pro 18, and the results were presented in textual, tabular, and graphical formats. A five-point Likert scale was used to evaluate respondents' attitudes.

The research is based on relevant sources from domestic and international libraries, scientific journals, published papers, and available online resources.

LITERATURE REVIEW

Brand represents a complex conceptual framework that goes beyond mere visual identification, functioning as the living personality of an organization. According to "a brand embodies the reputation, values, and character of a company, shaping consumer perceptions and their interaction with the offered products and services, with the ultimate goal of building loyalty and increasing market share". Perspectives provide a comprehensive insight into the functional and emotional dimensions of a brand, which are essential for understanding its subsequent influence on the e-business activities of tourism agencies. Building on this idea, a brand may also be perceived as "an explicit promise that a company makes to its consumers," as emphasized by . Interpretation introduces a dynamic component into the definition of a brand and highlights its role in establishing relationships with consumers, particularly within the domain of communication through social media platforms.

A brand also functions as a "mechanism for risk reduction, serving as a guarantee of quality, origin, and performance of a product or service, thereby increasing its value in the eyes of consumers", as noted by. This aspect is particularly significant in tourism, where services are intangible and often purchased in advance, making the brand directly associated with the perception of purchase security. On the other hand, successful branding cannot substitute for a poor-quality product, as it presupposes that tangible quality underlies marketing communication. As emphasized by , "even the most effective promotion cannot compensate for a negative customer experience in the long term". Thus, the brand, both as a marketing instrument and as a reflection of actual quality, "constitutes a fundamental basis for the argument that success on social media must be accompanied by high-quality service provision", as highlighted by .

In contemporary business environments, social media have become an indispensable communication channel. They may be defined as "interactive, computer-mediated technologies that facilitate the creation and exchange of ideas, information, and other forms of expression within virtual communities", according to . Definition provides both a technological and sociological framework for analyzing their role in the promotion of tourism services. Furthermore, social media function as "web-based services that allow individuals to construct public or semi-public profiles, articulate a list of connections, and view and traverse their connections within the system", as described by . Perspective is essential for the operationalization of the concept of social media within research and for understanding the structural framework that supports interactions between brands and consumers.

"The application of social media for business purposes brings numerous advantages, such as speed, accessibility, and networking opportunities, but also notable disadvantages, including privacy risks, superficial relationships, and potential disruptions to other activities", as noted by . A comprehensive overview of both benefits and limitations provides a balanced foundation for research, enabling an analysis of how tourism enterprises can maximize the benefits while minimizing the risks associated with the use of social media. According to , "the contemporary business environment requires enterprises to be proactive and strategically flexible in order to create new opportunities within technologically demanding environments". Emphasis is therefore placed on the adoption of new technologies, including social media, as an essential component of a company's strategic orientation.

"The development of information and communication technologies (ICT) directly influences the dynamics of the business environment, becoming an integral component of strategies aimed at maintaining long-term competitiveness", as indicated by . The connection between the macro-level trend of ICT development and micro-level business strategy is essential for understanding why tourism enterprises must integrate social media into their operations. The influence of ICT is particularly evident in consumer behavior, where a considerable amount of time is spent on social media platforms, and where "the comments and opinions of other users become a decisive factor in purchase decision-making, influencing brand choice and the willingness to modify purchase plans", as emphasized by and the business platform .

"The ultimate objective of any enterprise is the achievement of business and economic success, which implies the optimal utilization of resources for the attainment of defined goals", as argued by . Definition of success is particularly important for the operationalization of the future dependent variable in research on e-business, as it establishes criteria for measuring the efficiency of tourism enterprises. "The relationship between consumers and companies has evolved from passive interaction toward active participation, whereby consumers can easily distribute their opinions to a wide audience through social media platforms", according to . Paradigm shift introduces the concept of the active consumer, "who, through engagement on digital networks, directly influences brand perception and participates in the dissemination of information via the internet", as suggested by .

"The e-business model brings numerous advantages, including faster delivery, increased sales, and improved quality of products and services", as noted by . However, in order to achieve these benefits, "it is necessary to establish a solid strategy that includes maintaining brand recognition, strategic positioning, the application of e-business technologies, improving operational efficiency, and ensuring system security", as emphasized by . Principles are directly applicable to tourism enterprises in their efforts to build strong brands through digital channels. "Furthermore, the key participants in the process include enterprises, clients, and public administration, and the forms of business operations are defined precisely on the basis of their interactions", as stated by . Perspective highlights the complexity of relational networks within modern e-business systems.

"For dynamic communication between consumers and service providers, the adoption of advanced technologies, the use of mobile platforms, and engagement through virtual social networks are of critical importance", as emphasized by . The adoption of contemporary technology is no longer merely an option but rather the most reliable foundation for survival in the market. Few communication channels are as accessible and cost-effective as direct and engaged interaction with consumers through platforms they use daily most notably, social media networks.

RESEARCH METHODOLOGY

Based on the defined research problem, subject, tasks, and objectives, the following theoretical model (Figure 1) was formulated, along with the corresponding hypotheses:

- H_0: Brand and social media do not have a significant impact on the e-business operations of tourism enterprises.

- H_a: Brand and social media have a significant impact on the e-business operations of tourism enterprises.

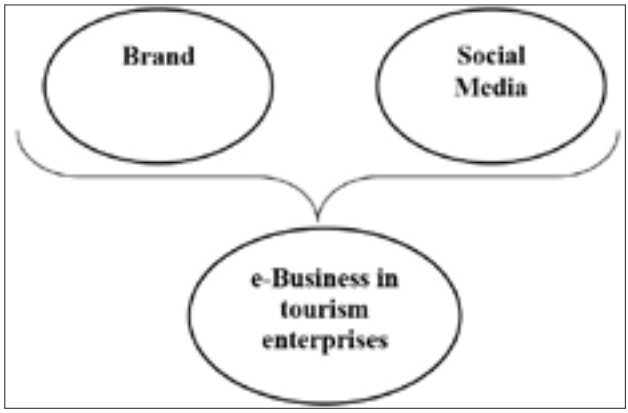


Figure 1. Theoretical model
Source: Author's calculation

The applied methodology is based on a systematic approach to data analysis that combines theoretical and empirical methods. For the purpose of collecting primary data, the survey method was employed, implemented through an electronic questionnaire using the Google Forms platform, which enabled efficient access to a broader population of respondents.

The sample consisted of 305 respondents in the Republic of Croatia who are users of tourism products and services, selected through a convenience sampling method. The sample size is adequate for the application of the planned statistical techniques and allows for the generalization of conclusions within the defined population framework.

Statistical data processing was conducted using the software package JMP Pro 18. The following analytical procedures were applied: reliability analysis using Cronbach's alpha coefficient to assess the internal consistency of the measurement scales, correlation analysis to examine the relationships among the observed variables, and regression analysis (both simple and multiple) to test the proposed hypotheses regarding the impact of brand and social media on e-business.

Respondents' attitudes were measured using a five-point Likert scale, which represents one of the most commonly used instruments for measuring attitudes in social science research. The results were presented in textual, tabular, and graphical forms in order to ensure clarity and transparency in the presentation of the research findings.

Secondary data were collected through content analysis of relevant sources, including domestic and international libraries, scientific journals, and published research papers, thereby ensuring the theoretical grounding and contemporary relevance of the study.

EMPIRICAL RESEARCH

The overall Cronbach's alpha coefficient for all six statements measuring respondents' attitudes toward the brand amounts to α=0.8683. This value falls within the category of good reliability (0.80-0.89) and approaches the level of excellent re-

liability. Therefore, it can be concluded that all statements collectively measure the same construct consistently and reliably namely, attitudes toward the brand in tourism business operations (Table 1).

Table 1. Reliability Analysis of the Brand Scale

Statement	Cronbach's Alpha if Item Deleted	Comparison with Total α=0.8683	Interpretation
BD_1 Online research of the offerings of different tourism brands is an activity that I enjoy.	0.8488	LOWER than total (0.8488<0.8683)	Removing this item would reduce the reliability of the scale. BD_1 contributes well to the measurement of the brand construct and is consistent with the other statements.
BD_2 In the process of online purchasing and booking tourism arrangements, I prefer products and services of well-known brands.	0.8786	HIGHER than total (0.8786>0.8683)	Removing this item would slightly increase reliability. BD_2 shows the weakest correlation with the other items and differs somewhat from what the other statements measure. However, the difference is minimal (0.0103), so the item can remain in the scale.
BD_3 Positive word-of-mouth recommendations from friends regarding a particular tourism brand motivate me to visit its website.	0.8315	LOWER than total (0.8315<0.8683)	BD_3 has the lowest value in the table. If removed, reliability would decrease the most. BD_3 contributes the most to the measurement of the brand construct and is most strongly associated with the other statements.
BD_4 I perceive internet advertisements promoting well-known tourism brands as a credible source of information.	0.8357	LOWER than total (0.8357<0.8683)	Removing this item would significantly reduce reliability. BD_4 strongly contributes to the measurement of the brand construct and shows a high correlation with the other items.
BD_5 Online advertising represents my primary channel for becoming familiar with the offerings of tourism brands.	0.8369	LOWER than total (0.8369<0.8683)	Removing BD_5 would significantly reduce reliability. BD_5 contributes strongly to the measurement of the brand construct.
BD_6 Internet advertising of tourism brands represents an important instrument for improving companies' understanding of the target market.	0.8395	LOWER than total (0.8395<0.8683)	Removing BD_6 would reduce reliability, although slightly less than in the case of BD_3, BD_4, and BD_5. BD_6 contributes well to the measurement of the brand construct.

Source: Author's calculation

The overall Cronbach's alpha coefficient for all six statements measuring respondents' attitudes toward social media is α=0.9281. This value falls within the category of excellent reliability (>0.90). All statements collectively measure the same construct attitudes toward social media in tourism business operations with a very high degree of consistency and reliability (Table 2).

Table 2. Reliability Analysis of the Social Media Scale

Statement	Cronbach's Alpha if Item Deleted	Comparison with Total α=0.9281	Interpretation
SM_1 Social media initiate revolutionary changes in the business models of contemporary tourism enterprises.	0.9128	LOWER than total (0.9128<0.9281)	Removing this item would reduce reliability. SM_1 contributes well to the measurement of social media and is consistent with the other items.
SM_2 Social media significantly facilitate potential tourists' access to information on a diverse range of tourism products and services.	0.9031	LOWER than total (0.9031<0.9281)	The second lowest value in the table. Removing SM_2 would significantly reduce reliability. SM_2 strongly contributes to the measurement of social media and is highly correlated with the other items.
SM_3 Social media simultaneously generate value for tourists and tourism enterprises.	0.9035	LOWER than total (0.9035<0.9281)	The lowest value in the table. Removing SM_3 would reduce reliability the most. SM_3 contributes the most to measuring social media and is most strongly associated with the other items.
SM_4 The intensity of tourism enterprises' activities on social media positively correlates with user base growth and financial performance.	0.95	HIGHER than total (0.9500>0.9281)	Removing SM_4 would increase reliability to 0.9500, as it is substantially higher than the total alpha. This indicates that SM_4 does not measure the same construct as the other items and is not consistent with the remaining five statements.
SM_5 Social media represent a significant factor in the positioning and image formation of tourism destinations.	0.9121	LOWER than total (0.9121<0.9281)	Removing SM_5 would reduce reliability. SM_5 contributes well to measuring social media, although slightly less than SM_2 and SM_3.
SM_6 User-generated content in the form of comments and reviews on social media functions as a key feedback mechanism for tourism enterprises.	0.9052	LOWER than total (0.9052<0.9281)	Removing SM_6 would significantly reduce reliability. SM_6 strongly contributes to measuring social media.

Source: Author's calculation

The overall Cronbach's alpha coefficient for all six statements measuring respondents' attitudes toward e-business in tourism enterprises is α=0.9137. This value falls within the category of excellent reliability (>0.90), confirming that all statements collectively measure the same construct attitudes toward e-business in tourism enterprises with a very high level of consistency and reliability (Table 3).

Table 3. Reliability Analysis of the E-Business in Tourism Enterprises Scale

Statement	Cronbach's Alpha if Item Deleted	Comparison with Total α=0.9137	Interpretation
$eBTE_1$ Promotional activities on social media positively correlate with the development, recognition, and sales performance of tourism products and services.	0.8514	LOWER than total (0.8514<0.9137)	Removing this item would significantly reduce reliability. $eBTE_1$ strongly contributes to the measurement of e-business and is highly correlated with the other items.
$eBTE_2$ Online promotion of tourism brands represents a significant predictor of enhancing brand image and increasing potential tourists' interest.	0.8362	LOWER than total (0.8362<0.9137)	The second lowest value in the table. Removing $eBTE_2$ would drastically reduce reliability. $eBTE_2$ contributes exceptionally well to measuring e-business.
$eBTE_3$ Internet advertising of tourism products and services has a statistically significant impact on consumers' final purchase or booking decisions.	0.9041	LOWER than total (0.9041<0.9137)	Removing $eBTE_3$ would slightly reduce reliability. This item has the highest individual alpha among all statements and is closest to the total alpha. $eBTE_3$ contributes to the construct, but slightly less than others.
$eBTE_4$ Social media, as a contemporary form of business communication, act as a catalyst for the development of electronic sales in the tourism sector.	0.85	LOWER than total (0.8500<0.9137)	Removing $eBTE_4$ would significantly reduce reliability. $eBTE_4$ strongly contributes to measuring e-business.
$eBTE_5$ E-business becomes a determinant for the improvement of marketing strategies and distribution models in tourism.	0.8331	LOWER than total (0.8331<0.9137)	The lowest value in the table. Removing $eBTE_5$ would reduce reliability the most. $eBTE_5$ contributes the most to measuring e-business and is strongly correlated with other items.
$eBTE_6$ The intensity of online sales development for tourism products and services largely depends on the digital competence and awareness of potential tourists.	0.8238	LOWER than total (0.8238<0.9137)	Removing $eBTE_6$ would drastically reduce reliability. The exceptionally low value indicates that $eBTE_6$ strongly contributes to the measurement of e-business.

Source: Author's calculation

High values of Cronbach's alpha across all three scales confirm that: the items within each scale are highly correlated, respondents answered related statements consistently, the constructs are clearly defined and operationalized, and the results are reliable for further statistical analyses (correlation, regression, and hypothesis testing). It can be concluded that there is a high degree of confidence in the approach to interpreting the results and drawing conclusions regarding the impact of brand and social media on e-business in tourism enterprises in this study.

Within the conducted research, the basic demographic characteristics of the respondents were analyzed, including gender, age, educational level, and years of work

experience. The total sample consisted of 385 respondents, all users of tourism products and services. The demographic structure of the sample is presented in (Table 4).

Table 4. Demographic Characteristics of Respondents

Demographic Variable	Category	Frequency	%
Gender	Male	192	49.87
	Female	193	50.13
	Total	385	100.00
Age	18–30	33	8.57
	31–40	105	27.27
	41–50	159	41.30
	>50	88	22.86
	Total	385	100.00
Educational Level	Secondary education (SE)	134	34.81
	Higher education (HE)	251	6519
	Total	385	100
Years of Work Experience	≤10	76	19.74
	11–20	134	34.81
	21–30	130	33.77
	>30	45	11.69
	Total	385	100.00

Source: Author's calculation

Based on gender distribution, the sample includes 192 male respondents (49.87%) and 193 female respondents (50.13%), indicating an approximately equal representation of both genders. Regarding age distribution, the largest group consists of respondents aged 41-50 years, totaling 159 individuals (41.30%). This is followed by the 31-40 age group with 105 respondents (27.27%), respondents over 50 years with 88 individuals (22.86%), and the smallest group being 18-30 years with 33 respondents (8.57%). Thus, the most represented age category is 41-50 years, while the youngest age group is the least represented.

In terms of educational level, respondents with higher or university education (VSS) dominate the sample, numbering 251 (65.19%), whereas respondents with secondary education (SSS) are 134 (34.81%). More than two-thirds of the respondents therefore hold higher education qualifications.

The analysis of years of work experience shows that the largest number of respondents falls into the 11-20 years (134 respondents; 34.81%) and 21-30 years (130 respondents; 33.77%) categories. This is followed by respondents with up to 10 years of experience (76 respondents; 19.74%), while the least represented group comprises respondents with over 30 years of experience (45 respondents; 11.69%). Thus, the most prevalent categories are those with medium work experience, while the least represented group includes those with over 30 years of experience.

Overall, the demographic structure of the sample provides representativeness in relation to the target population of users of tourism products and services. The balanced gender distribution, dominance of middle-age categories, and high level of education offer a solid basis for further statistical analysis and hypothesis testing.

Table 5 presents the values for each respondent's statement regarding Brand. The study indicates that well-known tourism brands and their online advertising constitute a significant and credible factor in the process of information acquisition, decision-making, and booking of tourism packages, with a strong influence of positive word-of-mouth recommendations. Digital marketing and brand strength play a crucial role in shaping consumer behavior in tourism.

Table 5. Respondents' Attitudes Toward Brand

Brand Statements	1	2	3	4	5
BD_1 Online research of the offerings of different tourism brands is an activity that I enjoy.	3	15	20	173	174
BD_2 In the process of online purchasing and booking tourism arrangements, I prefer products and services of well-known brands.	3	15	38	155	174
BD_3 Positive word-of-mouth recommendations from friends regarding a particular tourism brand motivate me to visit its website.	3	20	73	142	147
BD_4 I perceive internet advertisements promoting well-known tourism brands as a credible source of information.	2	21	36	146	180
BD_5 Online advertising represents my primary channel for becoming familiar with the offerings of tourism brands.	2	24	42	167	150
BD_6 Internet advertising of tourism brands represents an important instrument for improving companies' understanding of the target market.	8	14	61	131	171

Source: Author's calculation

Based on the values presented in (Table 5), an analysis of respondents' attitudes was conducted, highlighting the dominant factors and their corresponding descriptions regarding Brand (Table 6).

Table 6. Dominant Factors and Descriptions of Respondents' Attitudes Toward Brand

Statement	Dominant Factor	Description
BD_1	5 (174) & 4 (173) - 90.13%	Respondents enjoy exploring tourism brands online, indicating a positive affective attitude toward the brand. Brands have the potential to engage consumers beyond the act of purchase, extending interaction time and strengthening emotional connection.
BD_2	5 (174) & 4 (155) - 85.45%	Brand recognition represents a key criterion in purchase decisions. The brand functions as a mechanism for reducing perceived risk, which is especially important in tourism where services are purchased in advance without the possibility of physical verification.
BD_3	5 (147) & 4 (142) - 75.06%	Word-of-mouth acts as a strong action driver respondents do not stop at information alone but take concrete action by visiting the website. There is a high degree of trust in recommendations from personal networks.

BD_4	5 (180) & 4 (146) - 84.68%	Brand familiarity increases the credibility of marketing messages. Well-known brands enhance the weight and impact of advertisements, and investing in brand building has a multiplicative effect on marketing campaign effectiveness.
BD_5	4 (167) & 5 (150) - 82.34%	Online advertising has become the primary source of information about tourism brands. Respondents predominantly rely on digital channels, while traditional communication channels are losing significance.
BD_6	5 (171) & 4 (131) - 78.44%	Respondents recognize the two-way nature of online communication: it is not only a channel for sending messages to consumers but also a mechanism through which companies collect information about their customers and gain a better understanding of the market.

Source: Author's calculation

Table 7 presents the values for each respondent's statement regarding Social Media. It can be concluded that social media represent one of the key pillars of modern tourism marketing and business operations. Social media: transform business models, enhance information access and communication, contribute to destination branding, enable interactivity and two-way value exchange, and serve as an important indicator of market success.

Overall, the results indicate a high level of digital awareness among respondents and confirm that social media have become an indispensable factor for competitiveness and sustainable development of tourism enterprises and destinations.

Table 7. Respondents' Attitudes Toward Social Media

Statements for Social Media	1	2	3	4	5
SM_1 Social media initiate revolutionary changes in the business models of contemporary tourism enterprises.	3	16	41	122	203
SM_2 Social media significantly facilitate potential tourists' access to information on a diverse range of tourism products and services.	3	9	58	114	201
SM_3 Social media simultaneously generate value for tourists and tourism enterprises.	3	9	58	118	197
SM_4 The intensity of tourism enterprises' activities on social media positively correlates with user base growth and financial performance.	8	49	80	132	116
SM_5 Social media represent a significant factor in the positioning and image formation of tourism destinations.	14	4	46	133	188
SM_6 User-generated content in the form of comments and reviews on social media functions as a key feedback mechanism for tourism enterprises.	9	27	51	93	205

Source: Author's calculation

Based on the values presented in (Table 7), an analysis of respondents' attitudes was conducted, highlighting the dominant factors and their corresponding descriptions regarding Social Media (Table 8).

Table 8. Dominant Factors and Descriptions of Respondents' Attitudes Toward Social Media

Statement	Dominant Factor	Description
SM_1	5 (203) & 4 (122) - 84.42%	Respondents perceive social media as a transformative factor, not merely an additional communication channel. Social media fundamentally change the way tourism enterprises operate, justifying their treatment as a key independent variable.
SM_2	5 (201) & 4 (114) - 81.82%	Respondents recognize the informational function of social media as crucial. Social media are not only a space for entertainment but also a significant source of information that facilitates the decision-making process in tourism.
SM_3	5 (197) & 4 (118) - 81.82%	Respondents demonstrate a comprehensive understanding of the role of social media, as they simultaneously generate value for both parties. Social media function as an ecosystem in which all participants can benefit.
SM_4	4 (132) & 5 (116) - 64.42%	Respondents acknowledge the business value of social media and their potential to generate concrete, measurable results. Activity on social platforms is linked to the growth of the user base and financial outcomes.
SM_5	5 (188) & 4 (133) - 83.38%	Respondents believe that the image of destinations is built not only through traditional marketing campaigns but increasingly through content shared on social media, such as photos, videos, and travelers' experiences.
SM_6	5 (205) - 53.24%	Respondents place high importance on comments and reviews, not only for other consumers but also for enterprises. They understand that through their feedback, they actively participate in shaping offerings and service quality.

Source: Author's calculation

Table 9 presents the values for each respondent's statement regarding E-Business in Tourism Enterprises. The results confirm that respondents recognize e-business as a strategic determinant in the development of tourism enterprises, particularly in relation to brand strengthening, enhancement of marketing activities, and development of online sales.

Respondents perceive e-business in tourism enterprises as an indispensable component of modern tourism management. E-business in tourism: enhances market visibility and brand image, transforms marketing and distribution strategies, stimulates the development of electronic sales, but does not act in isolation in the consumer purchase decision-making process.

Overall, the results indicate that digital transformation in tourism is a systemic process, requiring the integration of: social media, online advertising, online presentation, and users' digital competence. E-business can therefore be defined as a key factor for the long-term competitiveness and sustainable development of tourism enterprises.

Table 9. Analysis of Respondents' Attitudes Toward E-Business in Tourism Enterprises

Statements for E-Business in Tourism Enterprises	1	2	3	4	5
$eBTE_1$ Promotional activities on social media positively correlate with the development, recognition, and sales performance of tourism products and services.	6	20	55	130	174
$eBTE_2$ Online promotion of tourism brands represents a significant predictor of enhancing brand image and increasing potential tourists' interest.	11	14	66	106	188
$eBTE_3$ Internet advertising of tourism products and services has a statistically significant impact on consumers' final purchase or booking decisions.	24	59	89	91	122
$eBTE_4$ Social media, as a contemporary form of business communication, act as a catalyst for the development of electronic sales in the tourism sector.	14	15	63	129	164
$eBTE_5$ E-business becomes a determinant for the improvement of marketing strategies and distribution models in tourism.	6	14	57	121	187
$eBTE_6$ The intensity of online sales development for tourism products and services largely depends on the digital competence and awareness of potential tourists.	6	22	59	135	163

Source: Author's calculation

Based on the values presented in (Table 9), an analysis of respondents' attitudes was conducted, highlighting the dominant factors and their corresponding descriptions regarding E-Business in Tourism Enterprises (Table 10).

Table 10. Dominant Factors and Descriptions of Respondents' Attitudes Toward E-Business in Tourism Enterprises

Statement	Dominant Factor	Description
$eBTE_1$	5 (174) & 4 (130) - 78.96%	Respondents recognize a direct link between promotional activities on social media and business performance. Social media are not merely a channel for raising awareness but also a channel that can directly influence sales.
$eBTE_2$	5 (188) & 4 (106) - 76.36%	Respondents believe that brands not present online risk remaining unnoticed and having a weaker image. Online presence is crucial for building brand image and generating consumer interest.
$eBTE_3$	5 (122) & 4 (91) - 55.32%	Respondents express divided opinions: while one-third consider that online advertising has a significant impact, a substantial portion remains skeptical. Purchase decisions are influenced by a combination of factors, not advertising alone.
$eBTE_4$	5 (164) & 4 (129) - 76.10%	Respondents recognize social media as a driving force for the development of electronic sales. Social media are not only a communication channel but also a mechanism that directly stimulates and accelerates online sales growth.
$eBTE_5$	5 (187) & 4 (121) - 80.00%	Respondents perceive e-business as a key factor shaping modern marketing and distribution. E-business is not merely an addition to traditional models but becomes a determinant that defines how marketing is conducted.
$eBTE_6$	5 (163) & 4 (135) - 77.40%	Respondents identify consumer digital literacy as a critical factor in the development of online sales. The growth of online sales depends not only on the enterprise but also on consumers' readiness to use digital channels.

Source: Author's calculation

RESULTS AND DISCUSSION

To examine the impact of Brand and Social Media on E-Business in Tourism Enterprises in the Republic of Croatia, a multiple regression analysis was conducted. The results indicate that the model is statistically significant as a whole ($F=874.16$; $p<0.0001$). The coefficient of determination value, $R^2=0.8206$, indicates that an exceptionally high 82.06% of the variance in e-business among tourism enterprises can be explained by the influence of Brand and Social Media. The adjusted $R^2=0.8197$ confirms the stability of the model and the absence of redundant predictors.

When considered individually, both predictors demonstrate a statistically significant positive effect on e-business in tourism enterprises. Brand has an impact of $\beta=0.338$ ($p<0.0001$), while Social Media exerts a stronger effect of $\beta=0.690$ ($p<0.0001$). The standardized Beta coefficients allow for comparison of the relative contribution of predictors, showing that Social Media has approximately twice the influence on e-business compared to Brand.

The Variance Inflation Factor (VIF)=2.97 for both predictors is below the threshold of 5, confirming the absence of multicollinearity, i.e., the predictors are not excessively correlated.

Based on the unstandardized coefficients, the regression equation can be expressed as follows (Formula 1):

$$eBTE = -0.130375 + 0.3984428 \cdot BD + 0.6001498 \cdot SM \quad (1)$$

Source: Author's calculation

All identified effects are positive, indicating that an increase in favorable attitudes toward Brand and Social Media leads to a corresponding increase in positive attitudes toward E-Business in Tourism Enterprises.

The results of the regression analysis support the alternative hypothesis (H_a) that Brand and social media have a significant impact on the e-business operations of tourism enterprises. Of particular note is the finding that Social Media exerts approximately twice the influence of Brand, highlighting its critical role in modern tourism business in the Republic of Croatia.

CONCLUSION

The theoretical contribution of this research lies in the formulation of conclusions and recommendations for future studies, thereby verifying the proposed hypotheses and advancing the existing body of knowledge in the field of e-business in tourism. By applying the proposed model, the study provides new insights into the influence of Brand and Social Media on the operations of tourism companies and the development of their services, thereby addressing a previously identified gap in the literature.

The practical contribution of the research is reflected in the fact that the obtained empirical results, combined with theoretical models, can serve as a relevant foundation for guiding marketing and managerial activities in the tourism sector. Particularly significant are the implications for enhancing digital promotion and developing brand-building strategies for tourism enterprises.

Given the current relevance and significance of the topic, the research outcomes are expected to have dual importance. The study opens avenues for future research in

the Republic of Croatia, which, through a longitudinal approach, could monitor the evolution of the analyzed factors within the dynamic tourism market, thus establishing a foundation for the continuous observation and development of the investigated issue.

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ORIGINALNI NAUČNI RAD / ORIGINAL SCIENTIFIC PAPER

AN EMPIRICAL ANALYSIS OF THE IMPORTANCE OF FARMERS' MOTIVATION AND AGRICULTURAL INNOVATION FOR THE DEVELOPMENT OF AGRICULTURAL HOLDINGS IN THE REPUBLIC OF NORTH MACEDONIA

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Abstract: *The aim of this study was to examine the impact of farmers' motivation and agricultural innovations on the development of agricultural holdings in the Republic of North Macedonia. The research was conducted on a sample of 426 farmers using a structured questionnaire and a five-point Likert scale, with data analyzed through descriptive statistics and regression analysis. The results indicate a high level of farmers' motivation and a significant presence of innovations in agricultural production. Additionally, the findings show that farms achieve stable business performance, maintain a good level of organization, and produce satisfactory-quality outputs. Regression analysis confirmed a statistically significant positive effect of both farmers' motivation and agricultural innovations on farm development, with innovations exerting a stronger influence, while motivation serves as an important supporting factor. These results demonstrate that the combination of human capital and the application of innovations form the foundation for improving efficiency, competitiveness, and sustainability in agricultural production. The findings carry important practical implications for the enhancement of agricultural development strategies in the Republic of North Macedonia.*

Keywords: *farmers' motivation, agricultural innovation, agricultural holding development*

JEL classification*: Q1, Q12, Q12, O30, O31*

INTRODUCTION

"Contemporary agriculture is undergoing intensive modernization and digital transformation aimed at increasing productivity, improving efficiency, and achieving sustainable development of agricultural holdings" . "In North Macedonia, the agricultural sector faces challenges such as lower productivity, limited investment in research and development, and slow adoption of innovations, negatively affecting sustainability and competitiveness" . The subject of this research is the factors influencing the development of agricultural holdings, with particular emphasis on farmers' motivation and innovation adoption. The objective of this research is to determine the extent to which farmers' motivation and innovation adoption contribute to the development of agricultural holdings in the Republic of North Macedonia. Research tasks include: analyzing farmers' motivation and its impact on business performance; examining the degree of innovation and modern technology adoption in agriculture; assessing the development level of holdings in terms of financial stability, organization, and sustainability; determining the relationship between motivation, innovation, and holding development; testing the hypotheses and quantifying the contribution of motivation and innovation to agricultural holding development. Research methods include a combination of quantitative and qualitative approaches. Data were collected through a structured survey of 426 farmers in North Macedonia, using a five-point Likert scale to measure attitudes. The analysis included descriptive statistics, regression analysis, and hypothesis testing to examine the role of motivation and innovation in agricultural holding development.

LITERATURE REVIEW

"When examining the sustainable development of agricultural holdings, it is essential to adopt a systemic perspective that integrates natural, economic, technological, and social factors shaping their overall functioning". "Natural conditions, including soil quality, availability of water resources, and the agroecological characteristics of a region, constitute the foundation of the production potential of each holding". "In addition, climatic characteristics - such as temperature regimes, precipitation distribution, and the frequency of extreme weather events - significantly affect the stability and productivity of agricultural production". "The demographic profile of the agricultural population, encompassing age structure, educational attainment, and labor engagement, is crucial for the adoption of new technologies and the improvement of production processes".

"The economic sustainability of agricultural holdings depends on ownership structure, technical equipment, and market access" . "Simultaneously, the institutional framework - including taxation policy, access to financial resources, educational initiatives, and support for innovation - exerts a strong influence on agricultural development and competitiveness" . Market stability, product price volatility, and credit availability further shape producers' investment decisions and the long-term sustainability of production.

"Beyond material and institutional determinants, psychological factors - particularly producers' motivation - play a pivotal role in achieving business performance in agricultural holdings" . "Motivation directly influences farmers' willingness to implement innovations, reorganize work processes, and expand production" . "Empirical studies indicate that education, resource availability, and the perceived benefits of innovation significantly determine farmers' readiness for modernization"

Producers' motivation also affects the development trajectory of holdings, their cooperation with other producers, and their integration into market systems. "Greater market concentration may facilitate the adoption of innovation due to improved access to capital and advanced technologies" . "Agricultural innovation encompasses improvements in production processes, work organization, and the application of new technologies, thereby enhancing efficiency and reducing production costs" .

"Technological development in agriculture represents a continuous process of transforming traditional methods into modern systems, including mechanization, irrigation, fertilizer application, and digital tools, leading to increased productivity and operational efficiency" . "Innovation contributes to economic growth, poverty reduction, and employment generation, particularly in developing countries"

In European countries, "agriculture has undergone intensive modernization processes aimed at improving productivity and efficiency, involving the adoption of advanced technologies, enlargement of farm size, and improved production organization" . However, "the degree of modernization varies across countries, with transition economies facing additional challenges related to investment capacity and technological advancement" .

"The agricultural sector of North Macedonia represents a significant component of the national economy, particularly in terms of employment and exports; however, productivity remains lower compared to developed countries due to limited investment in research and development and slower innovation adoption" . Although modernization trends are evident, further improvements in technological capacity and institutional support for innovation are necessary.

Contemporary agriculture is undergoing transformation driven by digital technologies. "The application of information systems, automation, and data analytics enables more precise resource management and greater production efficiency" . This process, commonly referred to as the digital transformation of agriculture, has become a key element of sustainable development.

"Environmental sustainability requires the rational use of resources, reduction of negative environmental impacts, and adaptation to climate change" . "Climate change constitutes one of the most significant challenges, as it directly affects yields, product quality, and production stability" .

"Small agricultural holdings play a substantial role in global food production and represent a critical component of food security, particularly in developing countries" . "Productivity disparities between developed and developing countries highlight the necessity of broader implementation of innovation and advanced technologies" .

"The concept of smart agriculture encompasses the use of digital technologies, sensors, artificial intelligence, and data analytics to optimize production and enhance decision-making processes" . "Precision agriculture enables more efficient resource utilization and yield enhancement while reducing environmental impacts" . "The implementation of advanced technologies, including artificial intelligence, robotics, and the Internet of Things, significantly contributes to agricultural efficiency and sustainability" . However, "digitalization also entails risks, such as data security concerns and dependence on technological infrastructure, thereby necessitating appropriate risk management strategies" .

METHODOLOGY

The research sample consisted of 426 respondents from the territory of the Republic of North Macedonia. The theoretical research model, including the presentation of the study variables, is shown in Figure 1. Data were collected using a structured survey questionnaire in which respondents expressed their attitudes toward the stated claims. Attitudes were measured using a five-point Likert scale (1 - strongly disagree, 2 - disagree, 3 - neutral, 4 - agree, 5 - strongly agree).

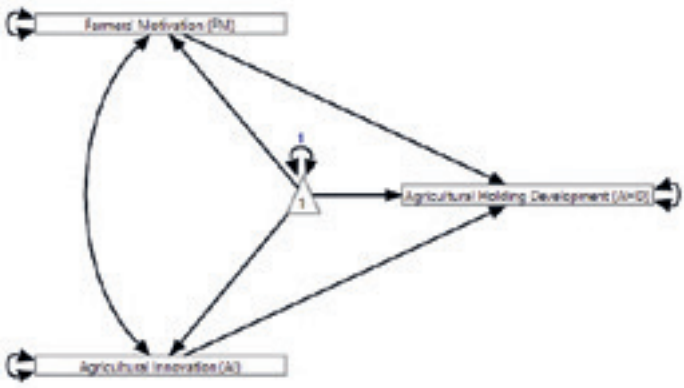
The study examines the mediating role of farmers' motivation and the implementation of innovation in agriculture, as well as their joint effect on the development of agricultural holdings. Through the analysis of quantitative and qualitative indicators, key factors that stimulate the sustainable growth of the sector were identified.

The independent variables in the study are: Farmers' Motivation (FM) and Agricultural Innovation (AI). The dependent variable is Agricultural Holding Development (AHD). The objective of the research is to determine whether farmers' motivation and the implementation of innovation significantly affect the development of agricultural holdings.

The general research hypotheses are formulated as follows:

- H_0: Farmers' motivation and agricultural innovation do not affect the development of agricultural holdings.
- H_1: Farmers' motivation and agricultural innovation affect the development of agricultural holdings.

Figure 1. Theoretical Research Model



Source: Authors' calculation

EMPIRICAL DATA

The majority of surveyed farmers are women (64.79%), while men account for (35.21%), indicating a significant role of women in agriculture within the observed sample. The most represented age group is 33 to 50 years (39.67%), suggesting that the majority of active producers are in their prime working age. Farmers aged 18 to 32 constitute (27.23%) of the sample, those between 51 and 65 years account for (29.34%), while respondents older than 65 represent only 3.76%.

Regarding educational attainment, most respondents possess primary or secondary education (59.39%), whereas (40.61%) have completed higher education (col-

lege or university degree). A higher level of education may facilitate the adoption of modern technologies and innovations, as more educated producers tend to accept new methods more readily and optimize production processes more effectively.

The analysis of work experience indicates that (35.45%) of farmers have up to 10 years of experience, (25.59%) between 11 and 20 years, (22.77%) between 21 and 30 years, and (16.20%) have more than 30 years of experience. These data suggest a balanced combination of young, moderately experienced, and highly experienced producers, which may influence both motivational dynamics and the readiness to implement innovations.

All information regarding the farmers' profile is presented in Table 1.

The demographic profile of the respondents suggests that farmers differ in terms of age and educational attainment, with relatively balanced levels of professional experience. This heterogeneity may represent a key factor in understanding their motivation for innovation and their capacity to improve and develop agricultural holdings.

Table 1. Farmers' Profile

Gender of the farmer	**N**	**Percentage**
man	150	35.21
woman	276	64.79
Age of farmers	**N**	**Percentage**
from 18 to 32 years old	116	27.23
from 33 to 50 years old	169	39.67
from 51 to 65 years old	125	29.34
over 65 years old	16	3.76
Level of education of farmers	**N**	**Percentage**
primary or secondary education	253	59.39
higher or higher education	173	40.61
Years of work experience in agriculture	**N**	**Percentage**
up to 10 years old	151	35.45
from 11 to 20 years old	109	25.59
from 21 to 30 years old	97	22.77
over 30 years old	69	16.20
Total	**426**	**100.00**

Source: Authors' calculation

Table 1 presents the statements and the distribution of respondents' attitudes regarding Farmers' Motivation (FM). The majority of respondents express a highly positive attitude toward agriculture, perceiving it as a source of pride, a stable source of income, and an opportunity for both personal and professional development. Farmers demonstrate a willingness to invest additional effort and financial resources into improving their holdings, while also benefiting from strong support from family and the local community. Although a certain degree of caution exists concerning the future of the sector, the overall trend indicates a high level of optimism, motivation, and commitment to agricultural activities.

Table 1. Statements for Farmers' Motivation (FM)

Farmers' Motivation (FM)	1	2	3	4	5
Agriculture gives me a sense of pride and satisfaction.	0	6	32	149	239
I believe he can provide enough money to live on.	3	1	44	145	233
I invest extra effort in successfully running the farm.	0	11	36	149	230
I plan to improve the farm through investments in the next three years.	3	4	26	176	217
I am convinced that agriculture in our country has a future.	1	7	62	165	191
I am motivated by the possibility of expanding the business to new markets.	0	4	37	158	227
I have strong support from my family and environment.	0	2	39	132	253

Source: Authors' calculation

The analysis of dominant values for Farmers' Motivation (FM) (Table 2) further illuminates respondents' attitudes. The findings indicate a high level of motivation and commitment to agriculture, a willingness to invest additional effort and financial resources, and a strong sense of support from family and the local community. These results suggest that farmers' motivation constitutes a key factor influencing their readiness to adopt innovations and improve agricultural holdings.

Table 2. Dominant Values for Farmers' Motivation (FM)

Statement	Dominant Values	Description
Agriculture gives me a sense of pride and satisfaction.	4=149, 5=293	Most respondents feel a strong sense of pride and satisfaction in engaging in agriculture, indicating a strong emotional connection to their work and farmer identity.
I believe he can provide enough money to live on.	4=145, 5=233	Most respondents believe agriculture can be a stable source of income, although a small number expressed some uncertainty (ratings 1–3).
I invest extra effort in successfully running the farm.	4=149, 5=230	Respondents show a very positive attitude toward extra engagement, demonstrating readiness to dedicate additional work to managing their holdings.
I plan to improve the farm through investments in the next three years.	4=176, 5=217	This statement records the highest level of commitment, highlighting respondents' strong willingness to plan and implement investments to enhance their agricultural holdings.
I am convinced that agriculture in our country has a future.	4=165, 5=191	Respondents show moderate yet positive optimism regarding the future of the agricultural sector; a slightly higher number of neutral responses (62 respondents rated 3) suggests some uncertainty regarding broader market and policy conditions.
I am motivated by the possibility of expanding the business to new markets.	4=158, 5=227	Respondents display a pronounced entrepreneurial spirit, recognizing opportunities for business growth and expansion.
I have strong support from my family and environment.	4=132, 5=253	This statement shows the strongest agreement, emphasizing the importance of family and community support in motivating farmers and fostering willingness for additional engagement.

Source: Authors' calculation

Table 3 presents the statements and the distribution of respondents' attitudes regarding Agricultural Innovation (AI). The results indicate that farmers actively implement modern technologies and methods across various segments of production, including mechanization, digital tools, agronomic practices, new crop varieties, marketing strategies, and collaboration with other stakeholders. The majority of respondents demonstrate a high level of willingness to improve production processes and effectively apply innovations.

Table 3. Statements for Agricultural Innovation (AI)

Agricultural Innovation (AI)	1	2	3	4	5
I use modern machinery and equipment in my daily work.	19	20	67	164	156
I implement digital tools for record keeping on the farm.	9	24	83	173	137
I am introducing modern agrotechnical measures into production.	33	38	72	228	55
I grow new cultures and varieties with better performance.	42	46	58	226	54
I use modern methods of marketing and selling agricultural products.	29	45	60	229	63
I regularly improve my skills in the field of new technologies and practices in agriculture.	16	31	50	261	68
In order to improve the business, I cooperate with other farms and institutions.	3	3	22	386	12

Source: Authors' calculation

The analysis of dominant values for Agricultural Innovation (AI) (Table 4) further clarifies farmers' attitudes. The results indicate that respondents in the studied sample actively implement innovations across various segments of production, ranging from technology and agronomic practices to marketing and collaboration. There is a high level of readiness to adopt modern methods, although some variability is observed in the implementation of specific measures, particularly regarding the introduction of new crops and agronomic practices. These data provide a basis for further linking farmers' motivation (FM) with the adoption of agricultural innovations (AI) in the context of agricultural holding development (AHD).

Table 4. Dominant Values for Agricultural Innovation (AI)

Statement	Dominant Values	Description
I use modern machinery and equipment in my daily work.	4=164, 5=156	Most respondents actively use modern mechanization, indicating a high level of technical innovation in daily work. A smaller number rated 1–3, which may reflect limited access to equipment or varying production scales.
I implement digital tools for record keeping on the farm.	4=173, 5=137	Respondents show a high level of adoption of modern agronomic practices, although a moderate number gave neutral or lower ratings, suggesting potential limitations in resources or knowledge.
I am introducing modern agrotechnical measures into production.	4=228, 5=55	Most respondents introduce new crops and varieties to increase yields and productivity, although a notable portion expressed neutral attitudes (ratings 1–3).

I grow new cultures and varieties with better performance.	4=226, 5=54	The majority of respondents employ modern marketing methods, demonstrating awareness of the importance of sales and market competitiveness.
I use modern methods of marketing and selling agricultural products.	4=229, 5=63	Respondents show a strong commitment to self-improvement and staying updated on new technologies and practices, enhancing their readiness to implement innovations.
I regularly improve my skills in the field of new technologies and practices in agriculture.	4=261, 5=68	Most respondents actively collaborate with other farms and relevant institutions, reflecting a well-developed network for knowledge exchange and innovation adoption.
In order to improve the business, I cooperate with other farms and institutions.	4=368, 5=12	Most respondents actively use modern mechanization, indicating a high level of technical innovation in daily work. A smaller number rated 1–3, which may reflect limited access to equipment or varying production scales.

Source: Authors' calculation

Table 5 presents the statements and the distribution of respondents' attitudes regarding Agricultural Holding Development (AHD). The results indicate that the majority of farmers achieve stable financial outcomes, utilize modern equipment, organize their operations systematically, and maintain attention to product quality and sustainable production practices.

Table 5. Statements for Agricultural Holding Development (AHD)

Agricultural Holding Development (AHD)	1	2	3	4	5
My farm generates stable and growing income year after year.	8	5	37	172	204
Production is competitive on the domestic and foreign markets.	28	31	71	210	86
The farm has modern equipment and infrastructure.	10	22	84	246	64
The operation of the farm is organized and planned.	10	22	74	214	106
The farm has access to financial resources for further development.	3	24	68	205	126
Product quality meets customer requirements.	2	19	71	212	122
The farm achieves good results in the conservation of natural resources and sustainable production.	11	26	89	219	81

Source: Authors' calculation

The analysis of dominant values regarding Agricultural Holding Development (AHD) (Table 6) indicates that the sampled farms achieve a high level of development in terms of financial sustainability, infrastructure, organizational practices, product quality, and environmental sustainability. Variability in competitiveness and access to resources may suggest the need for additional support and improvement in certain areas. These data provide a foundation for further analysis of the relationship between farmers' motivation (FM), the adoption of innovations (AI), and the development of agricultural holdings (AHD).

Table 6. Dominant Values for Agricultural Holding Development (AHD)

Statement	Dominant Values	Description
My farm generates stable and growing income year after year.	4=172, 5=204	The majority of respondents report stable and increasing income, indicating financial sustainability and effective farm management.
Production is competitive on the domestic and foreign markets.	4=210, 5=86	Respondents generally view their production as competitive, though greater variability in responses suggests differences in market position and product placement opportunities.
The farm has modern equipment and infrastructure.	4=246, 5=64	Most farms utilize modern machinery and infrastructure, contributing to more efficient operations and higher productivity.
The operation of the farm is organized and planned.	4=214, 5=106	Respondents demonstrate a high level of organization and planning, reflecting a systematic and professional approach to farm management.
The farm has access to financial resources for further development.	4=205, 5=126	The majority of respondents have access to financial resources, enabling additional investments and farm development, although a small portion reports lower scores.
Product quality meets customer requirements.	4=212, 5=122	Most farms deliver products of satisfactory quality, indicating good market adaptability and production standardization.
The farm achieves good results in the conservation of natural resources and sustainable production.	4=219, 5=81	Respondents show a strong commitment to environmental responsibility and sustainable practices, though a small group rated neutral or lower.

Source: Authors' calculation

Based on the data provided (tabel 7), the analysis of Farmer Motivation (FM) reveals a very high level of motivation, commitment, and positive attitude toward agricultural activities among the surveyed farmers. The mean values for the statements (range from 4.26 to 4.49 on a 1–5 scale), indicating that respondents generally strongly agree with the statements. The highest mean value is observed for "I have strong support from my family and environment" (M=4.493, SD=0.680, SE=0.033), highlighting the crucial role of family and community support in motivating farmers and sustaining their engagement in agricultural activities. Farmers also report a strong sense of pride and satisfaction from working in agriculture (M=4.458), as well as confidence that the sector can provide a stable income (M=4.418). High mean values are also recorded for statements related to personal effort and planning: "I invest extra effort in successfully running the farm" (M=4.404) and "I plan to improve the farm through investments in the next three years" (M=4.408), showing that farmers are willing to dedicate both time and resources to enhance the performance of their holdings.

Table 7. Descriptive Statistics for Farmers' Motivation (FM)

Statement	Mean	Stand. Deviation	Stand. Error
Agriculture gives me a sense of pride and satisfaction.	4.4577	0.6958	0.0337
I believe he can provide enough money to live on.	4.4178	0.7414	0.0359
I invest extra effort in successfully running the farm.	4.4038	0.7523	0.0365
I plan to improve the farm through investments in the next three years.	4.4084	0.7111	0.0345
I am convinced that agriculture in our country has a future.	4.2629	0.7830	0.0379
I am motivated by the possibility of expanding the business to new markets.	4.4272	0.6898	0.0334
I have strong support from my family and environment.	4.4930	0.6799	0.0329

Source: Authors' calculation

The relatively low standard deviations and standard errors suggest consistency in responses across the sample and the reliability of the data. These results confirm that farmer motivation is a strong driver for adopting innovations and achieving higher levels of agricultural holding development.

Based on the data presented in (taable 8), the analysis of Agricultural Innovation (AI) indicates a moderately high level of adoption of modern technologies and innovative practices among the surveyed farmers. The mean values for the statements (range from 3.48 to 3.98 on a 1-5 scale), reflecting active implementation of innovations, albeit with some variation across different areas of farm operations. The highest mean values are observed for the statements "I use modern machinery and equipment in my daily work" (M=3.98, SD=1.056, SE=0.051) and "In order to improve the business, I cooperate with other farms and institutions" (M=3.94, SD=0.410, SE=0.020), highlighting a significant level of technical capacity and a well-developed network of collaboration among farmers. High mean values are also recorded for "I implement digital tools for record keeping on the farm" (M=3.95) and "I regularly improve my skills in the field of new technologies and practices in agriculture" (M=3.78), indicating that farmers actively invest in enhancing both administrative and technical processes.

Table 8. Descriptive Statistics for Agricultural Innovation (AI)

Statement	Mean	Stand. deviation	Stand. error
I use modern machinery and equipment in my daily work.	3.9812	1.0559	0.0512
I implement digital tools for record keeping on the farm.	3.9507	0.9652	0.0468
I am introducing modern agrotechnical measures into production.	3.5493	1.0732	0.0520
I grow new cultures and varieties with better performance.	3.4789	1.1462	0.0555
I use modern methods of marketing and selling agricultural products.	3.5915	1.0767	0.0522
I regularly improve my skills in the field of new technologies and practices in agriculture.	3.7840	0.9281	0.0450
In order to improve the business, I cooperate with other farms and institutions.	3.9413	0.4103	0.0199

Source: Authors' calculation

The results show that farmers actively adopt innovations, particularly in mechanization, digitalization, and collaboration, while innovations related to new crops, agrotechnical measures, and marketing are less consistently applied. Relatively low standard errors across most statements confirm the stability of responses and the reliability of the data, while the standard deviations indicate some variability in the adoption of specific innovations among farmers.

Based on the data presented in (table 9), the analysis of Agricultural Holding Development (AHD) highlights several key insights regarding the performance and potential of farms in the sample. The mean values for all statements (range from 3.69 to 4.31 on a 1–5 scale), indicating generally high levels of development. The highest mean value is recorded for the statement "My farm generates stable and growing income year after year" (M=4.31, SD=0.828, SE=0.040), which emphasizes that financial sustainability and consistent income are fundamental drivers of farm development and long-term stability.

Table 9. Descriptive Statistics for Agricultural Holding Development (AHD)

Statement	Mean	Stand. deviation	Stand. error
My farm generates stable and growing income year after year.	4.3122	0.8281	0.0401
Production is competitive on the domestic and foreign markets.	3.6923	1.0767	0.0522
The farm has modern equipment and infrastructure.	3.7793	0.8475	0.0411
The operation of the farm is organized and planned.	3.9014	0.9125	0.0442
The farm has access to financial resources for further development.	4.0023	0.8636	0.0418
Product quality meets customer requirements.	4.0164	0.8216	0.0398
The farm achieves good results in the conservation of natural resources and sustainable production.	3.7817	0.9110	0.0441

Source: Authors' calculation

The data demonstrate that the sample farms achieve a high level of development, particularly in financial stability, organizational management, product quality, and access to resources. At the same time, the slightly lower performance in competitiveness and sustainability indicates the need for continued improvement to strengthen market positioning and long-term ecological resilience. The relatively low standard errors across the statements further confirm the stability of responses and the reliability of these observations.

RESULTS AND DISCUSSION

Table 10 presents the results of the regression analysis, including the ANOVA test, standardized coefficients, coefficient of determination, strength of relationships between variables, and hypothesis testing. The regression analysis demonstrates that the model is statistically significant, as confirmed by the ANOVA F-test value $F(2,423)=272.8808$, with a significance level of $p< 0.0001$. The model exhibits high statistical reliability, indicating that the independent variables-farmers' motivation (FM) and agricultural innovation (AI)-significantly contribute to explaining agricultural holding development (AHD). The coefficient of determination is $R^2=0.5636$, meaning that the model explains

56.36% of the variability in the dependent variable (AHD) based on farmers' motivation and innovation adoption. This value indicates a strong relationship between the observed variables and confirms the model's good predictive capacity. Standardized regression coefficients show that both independent variables have a positive and statistically significant impact on farm development. Agricultural Innovation (AI) has a greater effect (β=0.560) compared to Farmers' Motivation (FM) (β=0.294), highlighting that the application of modern technologies, new production methods, and collaboration with institutions represents a key factor in agricultural holding development. Farmers' motivation also exerts a significant positive effect by influencing their willingness to invest, improve production, and engage in long-term development planning.

Table 10. Regression Analysis

Variables	ANOVA	Standardized Beta Coefficient	Coefficient of Determination (%)	Strength of Relationship	Hypothesis
(FM), (AI) & (AHD)	[F(2,423)=272.8808, p<0.0001]	0.294157 0.560388	56.36	Strong	H_1: Accepted

Source: Authors' calculation

Based on the obtained results, the regression equation was formulated as follows (Equation 1):

$$(AHD) = 0.2047148 + 0.4031355 \cdot (FM) + 0.5178583 \cdot (AI) \quad (1)$$

Source: Authors' calculation

The equation indicates that increases in farmers' motivation and greater adoption of innovations lead to enhanced development of agricultural holdings, with innovations contributing more strongly.

The graphical representations of unstandardized and standardized coefficients (Figure 2, left and right) confirm that both independent variables (FM and AI) have a positive impact on the dependent variable (AHD), with innovations exhibiting the more dominant effect.

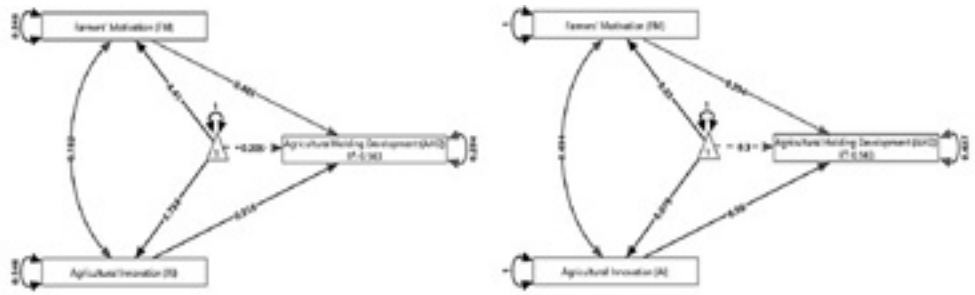


Figure 2. Unstandardized (left) and Standardized (right) Contribution Coefficients
Source: Authors' calculation

The scatter plot of actual versus predicted values (Figure 3) shows that most points are located close to the regression line, confirming the high accuracy of the model and the strong alignment between predicted and actual values.

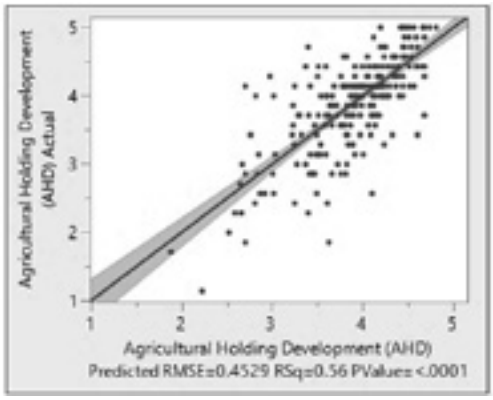


Figure 3. Multiple Linear Regression Equation Plot
Source: Authors' calculation

The graph (Figure 4) further confirms the positive relationship between farmers' motivation and agricultural holding development, as well as an even stronger relationship between innovation adoption and farm development. The results indicate that the implementation of agricultural innovations (Figure 4, right) exerts a more pronounced impact on development, while farmers' motivation (Figure 4, left) represents a crucial driving force that facilitates innovation adoption and overall business improvement.

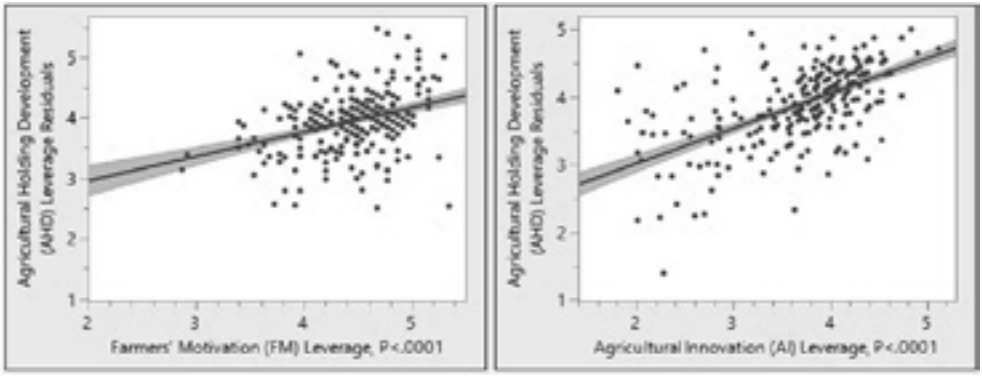


Figure 4. Regression Values Plot
Source*:* Authors' calculation

Based on the statistical and graphical results, the alternative hypothesis (H_1) is confirmed, indicating that farmers' motivation and agricultural innovations significantly influence the development of agricultural holdings. The model demonstrates a high level of reliability, and the results confirm that innovations are the key driver of development, while farmers' motivation serves as an essential foundation for their adoption and the long-term advancement of holdings.

CONCLUSION

Based on the results of the conducted research, it can be concluded that farmers' motivation, agricultural innovations, and the development of agricultural hold-

ings represent key determinants for improving business operations, competitiveness, and the sustainability of agricultural production. The findings indicate a high level of adoption of modern technologies and innovative practices among the surveyed farmers, as evidenced by the high mean values for most analyzed statements. Notably, the use of modern mechanization and equipment (M=3.98), application of digital tools (M=3.95), and collaboration with other farms and institutions (M=3.94) highlight a significant degree of technological and organizational modernization of holdings.

The results confirm that modern production and management approaches form a crucial foundation for enhancing efficiency and long-term development of agricultural holdings. Economic and development indicators are also high, with the highest mean recorded for the statement regarding stable and increasing farm income (M=4.31), reflecting a positive business trend and economic stability. High values were also observed for product quality (M=4.02), access to financial resources (M=4.00), and business organization (M=3.90), demonstrating that modern management and innovation practices strengthen market position and competitiveness. Relatively low standard errors across most statements indicate stability of responses and reliability of the results.

Regression analysis further confirms the importance of the analyzed factors for agricultural holding development. The model demonstrates high statistical significance and strong predictive power, with the coefficient of determination showing that a substantial portion of variability in farm development can be explained by the adoption of innovations and modern practices. Graphical representations, including contribution and scatter plots, confirm the positive relationship between innovation adoption and farm development, as well as a high level of alignment between predicted and actual values, reinforcing the validity and reliability of the model. The alternative hypothesis (H_1) is confirmed, indicating that farmers' motivation and agricultural innovations significantly influence the development of agricultural holdings.

The application of innovations, modern technologies, and improved organizational practices is a key factor in the development of agricultural holdings. Innovations enable increased productivity, more efficient resource use, enhanced product quality, and strengthened market competitiveness. Simultaneously, continuous farmer training, institutional collaboration, and access to financial resources further support business improvement and long-term farm development.

The results carry important practical and scientific implications for Republic of North Macedonia. They highlight the need to further promote the adoption of innovations, digitalization, and modernization in agriculture, as well as the importance of institutional support, education, and capacity building for farmers. Such measures can enhance sustainability, competitiveness, and overall agricultural sector development. Moreover, the findings provide a significant scientific basis for future research and the formulation of strategies aimed at advancing agricultural holdings through the integration of farmers' motivation, technological innovations, and modern management approaches.

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ORIGINALNI NAUČNI RAD / ORIGINAL SCIENTIFIC PAPER

THE IMPACT OF BUSINESS, ADMINISTRATIVE AND MACROECONOMIC FACTORS ON GDP GROWTH IN THE WESTERN BALKAN COUNTRIES: A PANEL DATA ANALYSIS

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***Abstract**: This study examines the impact of business, administrative, and macroeconomic factors on GDP growth in Western Balkan economies that are not members of the European Union. The analysis covers the period 2010–2024 and uses labor productivity, industrial value added, domestic credit to the private sector, and foreign direct investment as explanatory variables, while inflation and unemployment are included as control variables.*

The empirical analysis is based on a fixed-effects panel model that controls for unobserved country-specific heterogeneity. The results reported in Table 3 show that none of the explanatory or control variables reaches conventional levels of statistical significance in the estimated specification, although several coefficients display directions that are broadly comparable with selected theoretical expectations. These findings suggest that GDP growth in the observed countries may depend on a broader set of structural and institutional determinants beyond the variables included in the present model. Accordingly, the study points to the importance of cautious interpretation and of further model refinement in future research.

***Keywords:** GDP growth, business and administrative environment, foreign direct investment, macroeconomic stability, panel data analysis*

***JEL classification**: C1, C23, E2, E3, E6*

INTRODUCTION

The structure and value of GDP represent a key objective of every socio-economic community.

When GDP is promoted for the purpose of development, it is assumed that its optimal composition affects all aspects of the socio-economic life of the community we are observing. The complexity of the structure, shape and degree of influence of the factors that determine the economic outcome of activities in a given area requires a subtle but professional approach that can identify factors in terms of their size, shape and extent of influence on GDP growth in the Western Balkan countries that are not members of the European Union, among which Bosnia and Herzegovina and Serbia – of course – stand out as the central focus of the authors of this study.

The aim of the research was to examine and empirically verify the effects of a selected set of independent and control variables within a defined temporal and territorial framework on GDP as the dependent variable.

In this sense, a set of factors from the above-mentioned domain was selected, including:

- Economic superiority, as an internal factor, expressed through the productivity of the working population and the value of production, and the contribution of business administration, as an external factor, which includes the availability of domestic loans to business entities and foreign direct investment, as independent variables.
- Macroeconomic stability, which includes the dynamics of unemployment and inflation and is set as a control variable in the research.
- The time period of the last fifteen years, i.e. from 2010 to 2024.
- Territorial coverage of the Western Balkan countries that are not members of the European Union (Albania, Bosnia and Herzegovina, Montenegro, Serbia and North Macedonia – due to their geographical proximity, market interconnectedness and position in the international economic environment).

The achievement of the objectives of the research project is assessed through the formulation and testing of research hypotheses.

- H1: Higher labor productivity has a statistically significant positive effect on GDP per capita growth.
- H2: Higher availability of domestic credit resources has a positive effect on economic performance.
- H3: Macroeconomic stability has a positive effect on economic growth.

The research project includes defining variables, collecting statistical data, constructing and testing models, as well as interpreting the results and assessing their practical and theoretical significance.

The selected theoretical model that adequately addresses the chosen topic and answers the research questions proposed within the project is the panel data analysis model, which has the capacity to meet the stated requirements.

LITERATURE REVIEW

The econometric procedure implies the quantification of business process factors at both the micro and macro levels, in order to understand the consequences of business decisions prior to their implementation, which is highly useful for small and especially for large business systems. When the term ‘business system’ is used to denote a socioeconomic community, the analysis concerns larger systems; however, with

appropriate adaptation, such modelling remains applicable and meaningful at the micro level as well as at the macro level.

In this regard, several studies based on business system modelling may be highlighted, including those that address:

- Forecasting actual demand in the service sector using simulation models
- The contribution of higher education investment to GDP growth in Western Balkan countries, assessed through panel data analysis.
- Selection of investment alternatives under conditions of risk using regression analysis models and under conditions of uncertainty using models from the field of matrix games.
- Selection of investment policy under conditions of uncertainty as a strategic commitment for entering foreign markets using matrix game theory.

A research approach based on relevant data sources and adequate econometric analysis provides clear and highly applicable guidelines for proactive action supported by verified hypotheses within the context of the specifically selected research project. Professor Fisher S. was among the pioneers who began exploring the topic of macroeconomic stability and growth theory. In his work *Macroeconomic Stability and Growth*, he investigates and ultimately demonstrates that macroeconomic stability, viewed through the lens of low inflation, stable fiscal policy, and the avoidance of balance-of-payments crises, significantly contributes to long-term growth. Davoodi H. and Montiel P. emphasize that macroeconomic policies, particularly monetary and fiscal policy, directly influence growth and stability. In their work *Macroeconomic Stability and Inclusive Growth*, they recommend avoiding procyclical policies in order to maintain stability. In addition to the previously mentioned distinguished scholars, numerous other researchers have examined the topic of macroeconomic stability and its impact on GDP growth. Among them, particular emphasis should be placed on Le Fort Varela, G., Gallardo, B., and Bustamante, F., who use panel regression models (1980–2015) and show that:

- Inflation has a negative impact on growth.
- There are inflation thresholds beyond which the negative effect becomes even stronger.
- Macroeconomic volatility (inflation, current account volatility) reduces the trend of GDP growth.

In addition to macroeconomic stability, numerous scholars have also examined the impact of productivity on macroeconomic growth, particularly GDP growth. Noteworthy contributions include those by Weinstock, L. R., and Korkmaz, S., & Korkmaz, O. In his scientific work *Productivity Growth: Trends and Policy Issues*, Weinstock, L. R. emphasizes that productivity represents the most important determinant of long-term economic growth, as increases in labor efficiency directly influence the growth of overall economic output and the standard of living . Korkmaz, S., & Korkmaz state that an increase in the productivity of production factors enables higher levels of output and economic growth, with human capital, technological progress, and economies of scale representing key determinants of productivity growth Kharel, K. R., Poudel, O., Upadhyaya, Y., and Nepal, P., in their work *Effect of Private Sector Credit on Economic Growth in Nepal*, emphasize that credit to the private sector plays a key role in stimulating economic growth, as it increases investment capacity and encourages the long-term expansion of economic activity.

In a Western Balkan panel setting, Smolo (2021) reports that foreign direct investment may exert a negative effect on growth, while interaction terms between FDI and institutional development become statistically insignificant, suggesting that the growth effects of foreign capital in the region are not necessarily positive or stable.

Similarly, Iliuta and Ram (2005) emphasize that, in transition economies, the estimated effects of foreign direct investment are highly heterogeneous across countries, making it methodologically risky to formulate a single general conclusion about its growth contribution.

Recent evidence for the Western Balkans also points to unexpected interactions between foreign direct investment and institutional quality, indicating that the growth implications of FDI may depend on the broader regulatory and governance context rather than on capital inflows alone.

CONCEPTUAL AND THEORETICAL APPROACHES TO DETERMINING GDP GROWTH

Macroeconomic growth represents one of the key objectives of modern economies, as it reflects a society's ability to increase the volume of production, improve efficiency, raise the standard of living, and achieve long-term stability. Economic growth implies a continuous increase in the production of goods and services within a country, that is, an increase in GDP compared with the previous period (Savić, 2025). Within modern theoretical approaches, GDP growth is viewed as the result of the interaction of several factors, among which labor productivity, investment activity, the availability of financial resources, and the institutional environment stand out. All these components jointly determine the dynamics of overall economic activity and the ability of the economy to respond to market challenges.

Traditional growth models, such as Solow's neoclassical model, are based on the assumption that economic growth relies on capital accumulation, labor force expansion, and technological progress. Technological progress, as an exogenous factor, represents a key component that enables long-term GDP growth without a proportional increase in inputs. The role of productivity is particularly emphasized in modern endogenous growth theories, which highlight that innovation, knowledge, and investment in human capital generate sustainable growth from within internal economic processes.

Aside from productivity, investment activity holds a central place in determining overall economic output. Investments in infrastructure, capital goods, technology, and innovation expand the productive capacities of the economy and increase potential GDP. Their dynamics depend on macroeconomic conditions, interest rate levels, expected rates of return, and the degree of stability of the financial system. The role of financial intermediation in determining GDP growth is particularly emphasized through the credit channel. The only factor that has a positive and statistically significant effect on GDP per capita growth is credit granted to the private sector. For this reason, the availability of financial resources – particularly credit to the private sector – is considered one of the most important drivers of economic growth.

A stable financial system enables the efficient redirection of savings into investments, which opens up space for the development of entrepreneurship, the modernization of industry, and the improvement of competitiveness (Milosavljević, 2025). Credit expansion in the economy acts as a growth multiplier, as it provides firms with funds

for expanding production, innovating, and increasing employment.

Macroeconomic stability is the broader framework within which productivity, investment, and financial flows can achieve their full effect. Stable inflation, sustainable public finances, balanced fiscal policy, low unemployment, and cheaper labor create the prerequisites for a secure and predictable business environment (Milisavljević, 2018). Conversely, high inflation increases uncertainty, reduces the real return on investments, and discourages investment activity, while high unemployment diminishes aggregate demand and slows economic growth.

Modern institutional and administrative approaches to growth further emphasize the importance of efficient institutions, regulatory stability, transparency, and the quality of public administration. Institutional factors influence the speed of decision making, the level of legal certainty, the efficiency of resource management, and the attractiveness of the economy to both domestic and foreign investors. In the Western Balkan countries, institutional modernization has increasingly gained importance in the processes of strengthening economic stability and accelerating GDP growth.

In line with the aforementioned theoretical foundations, it can be concluded that determining GDP growth requires an integrated consideration of a range of economic, structural, and institutional factors. The combination of productivity, investment activity, financial accessibility, and macroeconomic stability forms the basis for long-term sustainable growth, while institutional advancement enables these factors to achieve their maximum effect in the real economic environment.

METHODOLOGY

The empirical strategy is based on a country-year panel covering five Western Balkan economies that are not members of the European Union—Albania, Bosnia and Herzegovina, Montenegro, North Macedonia, and Serbia—over the period 2010–2024. The panel structure allows the analysis to combine cross-country and intertemporal variation and is therefore appropriate for examining how selected business, administrative, and macroeconomic indicators are associated with GDP growth over time. Because the available dataset contains two missing observations for North Macedonia in the series Domestic credit to private sector (% of GDP), specifically for 2010 and 2011, the empirical sample should be treated as a slightly unbalanced panel rather than a perfectly balanced one.

- descriptive statistics for all variables,
- pairwise pearson correlations as an initial indication of linear association, and
- a fixed-effects panel specification as the baseline empirical model.

Descriptive statistics are used to summarize the central tendency and dispersion of the variables, while the correlation matrix is reported only as a preliminary diagnostic aid. Correlation coefficients should not be interpreted as evidence of causality, nor do they by themselves provide a sufficient basis for ruling out multicollinearity in the regression framework.

Panel analysis is particularly suitable in this context because it permits the simultaneous use of cross-sectional units (countries) and repeated annual observations, thereby reducing the informational limitations of purely cross-sectional or purely time-series approaches.

In the present study, the time dimension is annual, which is consistent with the reporting frequency of the selected macroeconomic indicators in the World Bank database. The cross-sectional dimension consists of the five observed countries. Accordingly, the dataset follows the same units across multiple years, which corresponds to the standard structure of macro-level panel data, although not every variable is observed for every country-year combination. The current specification includes country fixed effects only and does not include separate time fixed effects.

The general form of the panel data model can be symbolically expressed by the following equation:

Formula 1. General panel data model

$$yit = \alpha i + \sum k=1K\ \beta k\ xkit + \varepsilon it$$

Source: Authors' own elaboration

- N denotes the number of cross-sectional units, and T denotes the number of time periods;
- Yit represents the value of the dependent variable for the *i*th cross-sectional unit at time *t*;
- Xkit represents the value of the *k*th independent variable for the *i*th cross-sectional unit at time *t*;
- ai denotes the intercept term specific to the *i*-th cross-sectional unit;
- βk denotes the coefficient of the *k*-th independent variable, assumed to be constant across units and time;
- εit represents the stochastic error term of the model.

It represents the stochastic error term of the model and captures unexplained variation in the dependent variable, under the standard assumption that its expected value equals zero.

The panel data model assumes that each observational unit exhibits a different response of the dependent variable to the individual or joint effects of the independent variables, and that these differences may also vary across different time periods.

Among alternative panel specifications, this study uses a fixed-effects model as the baseline specification. The main reason for this choice is that the countries included in the sample differ in structural, institutional, historical, and policy-related characteristics that are difficult to observe directly but may influence GDP growth and remain relatively stable over time. A fixed-effects specification is appropriate when such unobserved country-specific heterogeneity must be controlled for through country-specific intercepts.

Formula 2. Fixed-effects panel model

$$yit = \alpha + \mu i + \sum k=1K\ \beta k\ xkit + \varepsilon it$$

Source: Authors' own elaboration

At the same time, the fixed-effects specification in the present version of the paper should be interpreted as an initial empirical framework rather than as a fully exhausted model-selection result. Additional post-estimation diagnostics—such as a

formal fixed-effects versus random-effects comparison (for example, a Hausman-type test), heteroskedasticity checks, serial-correlation diagnostics, and cross-sectional dependence tests—are not reported in the current version and therefore remain an important direction for model refinement. However, multicollinearity was examined through an auxiliary variance inflation factor (VIF) diagnostic, which did not indicate severe collinearity among the explanatory variables.

The dependent variable is GDP growth (annual %). The explanatory variables are labor productivity, industrial value added, domestic credit to the private sector, and foreign direct investment, while inflation and unemployment are included as control variables. In substantive terms, the coefficients indicate the within-country association between changes in the explanatory variables and changes in GDP growth over time, conditional on time-invariant country-specific effects.

Formula 3. Empirical specification of the fixed-effects panel model

$$GDPgrowthit = \alpha + \mu i + \beta 1\ Productivityit + \beta 2\ IndustryVAit + \beta 3\ Creditit + \beta 4\ FDIit + \beta 5\ Inflationit + \beta 6\ Unemploymentit + \varepsilon it$$

$$GDP_{it} = \alpha + \beta_1 Productivity_{it} + \beta_2 IndustryVA_{it} + \beta_3 Credit_{it} + \beta_4 FDI_{it} + \beta_5 Controls_{it} + \varepsilon_{it}$$

Source: Authors' own elaboration

The empirical calculations reported in this version of the paper were organized in Microsoft Excel and estimated in IBM SPSS Statistics 22. In practical terms, the fixed-effects structure was implemented through country-specific intercepts that allow the model to control for time-invariant differences across the observed countries. This software setup was sufficient for descriptive statistics, correlation analysis, and baseline coefficient estimation, but it also limits the range of panel-specific post-estimation diagnostics that can be presented in the current version.

DATA

The empirical analysis relies on secondary data retrieved from the World Bank's World Development Indicators database. The sample includes five Western Balkan countries that are not members of the European Union—Albania, Bosnia and Herzegovina, Montenegro, North Macedonia, and Serbia—for the period 2010–2024. Variable selection was guided by the theoretical framework of the study and by the availability of internationally comparable annual indicators. The dataset is nearly complete, with the only identified missing observations referring to North Macedonia in the series Domestic credit to private sector (% of GDP) for the years 2010 and 2011.

- **Countries:** Albania, Bosnia and Herzegovina, Montenegro, North Macedonia, and Serbia
- **Period:** annual data, 2010–2024
- **Dependent variable:** GDP growth (annual %)—World Bank indicator code NY.GDP.MKTP.KD.ZG
- **Main explanatory variables:** labor productivity measured as GDP per person employed (constant 2021 PPP $) —SL.GDP.PCAP.EM.KD; industry (including construction), value added (% of GDP) — NV.IND.TOTL.ZS; domestic credit to private sector (% of GDP) — FS.AST.PRVT.GD.ZS;

and foreign direct investment, net inflows (% of GDP) — BX.KLT.DINV.WD.GD.ZS

- **Control variables:** inflation, consumer prices (annual %)—FP.CPI.TOTL.ZG; and unemployment, total (% of total labor force) (national estimate)—SL.UEM.TOTL.NE.ZS

All variables are used in their annual levels or annual percentage forms exactly as reported in the World Bank database. No logarithmic transformation, differencing, standardization, rebasing, or additional rescaling was applied by the authors after data retrieval. Accordingly, the regression coefficients should be interpreted in the original units of the respective indicators. Labor productivity is operationalized through GDP per person employed and is therefore treated as a proxy for output per worker. Industrial value added, domestic credit, and foreign direct investment are expressed as percentages of GDP, while inflation and unemployment are expressed as annual percentages in their original reported form.

In principle, the intended design corresponds to 75 country-year observations (5 countries × 15 years). For six variables, the dataset contains the full 75 observations. The only exception is Domestic credit to private sector (% of GDP), for which two observations are missing for North Macedonia (2010 and 2011), leaving 73 valid observations for that series. In the descriptive statistics, correlations, and model estimation, all available observations were retained, so the analysis is based on a slightly unbalanced panel rather than on an artificially completed dataset. No interpolation or imputation procedure was applied to replace the missing values. Since the period under study includes the COVID-19 shock, the years 2020 and 2021 may contain exceptional macroeconomic disturbances; these observations are retained in the baseline sample in order to preserve the continuity of the observed macroeconomic trajectory, but they must be interpreted with caution and should be re-examined in a robustness analysis.

RESULTS

The structure of the empirical data can be illustrated by the following table.

Table 1. Descriptive Statistics

	GDP growth	Inflation	Industry	Domestic credit	FDI	Unemployment	GDP per person
Valid	75	75	75	73	75	75	75

Source: Authors (2025).

Table 1. presents the descriptive statistics for all variables included in the empirical analysis. The dataset contains 75 country-year observations for six variables, while the domestic credit variable contains 73 valid observations due to two missing values for North Macedonia in 2010 and 2011. Therefore, the panel is only slightly unbalanced.

Table 2. The correlation matrix

		GDP growth (annual %)	Inflation, consumer prices (annual %)	Industry (including construction), value added (% of GDP)	Domestic credit to private sector (% of GDP)	Foreign direct investment, net inflows (% of GDP)	Unemployment, total (% of total labor force) (national estimate)	GDP per person employed (constant 2021 PPP $)
GDP growth (annual %)	Pearson Correlation	1	0.151	-0.126	-0.163	0.084	-0.187	0.152
	Sig. (2-tailed)		0.197	0.280	0.164	0.474	0.107	0.192
	N	75	75	75	73	75	75	75
Inflation. consumer prices (annual %)	Pearson Correlation		1	0.072	-0.189	0.115	-0.255*	0.242*
	Sig. (2-tailed)			0.538	0.105	0.324	0.027	0.037
	N		75	75	73	75	75	75
Industry (including construction). value added (% of GDP)	Pearson Correlation			1	-0.249*	-0.506**	0.002	-0.643**
	Sig. (2-tailed)				0.031	0.000	0.988	0.000
	N			75	75	75	75	75
Domestic credit to private sector (% of GDP)	Pearson Correlation				1	-0.033	0.153	0.156
	Sig. (2-tailed)					0.777	0.190	0.182
	N				73	73	73	73
Foreign direct investment. net inflows (% of GDP)	Pearson Correlation					1	-0.275*	0.222
	Sig. (2-tailed)						0.017	0.055
	N					75	75	75
Unemployment. total (% of total labor force) (national estimate)	Pearson Correlation						1	-0.055
	Sig. (2-tailed)							0.638
	N						75	75
GDP per person employed (constant 2021 PPP $)	Pearson Correlation							1
	Sig. (2-tailed)							
	N							75

Source: Authors (2025).

Note: Table 2. reports pairwise Pearson correlations among the variables included in the empirical analysis. Most coefficients are low to moderate in magnitude, suggesting no severe bivariate association among the explanatory variables. Several statistically significant correlations are observed, particularly those involving industrial value added, inflation, unemployment, and labor productivity; however, these coefficients should be interpreted only as preliminary descriptive evidence rather than as proof of causal or structural relationships. Because the domestic credit series contains two missing observations for North Macedonia in 2010 and 2011, every correlation involving that variable is based on 73 valid observations, whereas all remaining correlations are based on 75 observations. This conclusion is further supported by the variance inflation factor (VIF) diagnostic, which confirms the absence of severe multicollinearity among the explanatory variables.

Table 3. Fixed-Effects Panel Model Estimates

Parameter	Estimate	Std. Error	df	T	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	9.171938	6.714474	68.000	1.366	0.176	-4.226586	22.570462
Inflation, consumer prices (annual %)	0.082276	0.123876	68.000	0.664	0.509	-0.164915	0.329466
Industry (including construction), value added (% of GDP),	-0.159907	0.164558	68	-0.972	0.335	-0.488278	,168465
Domestic credit to private sector (% of GDP)	-0.051781	0.035700	68.000	-1.450	0.152	-0.123020	0.019457
Foreign direct investment, net inflows (% of GDP)	-.073523	,135267	68.000	-0.544	0.589	-0.343444	0.196398
Unemployment, total (% of total labor force) (national estimate)	0.000015	0.000051	6.,000	0.286	0.775	-0.000088	0.000117
GDP per person employed (constant 2021 PPP $)	-0.074414	0.059355	68.000	-1,254	0.214	-0.192855	0.044027

Source: Authors (2025).

Note: The estimates reported in Table 3 are based on the baseline fixed-effects panel specification. The dependent variable is GDP growth (annual %). Due to two missing observations for North Macedonia in the domestic credit series (2010 and 2011), the estimation is based on a slightly unbalanced panel. None of the explanatory or control variables reaches conventional levels of statistical significance in the present specification.

The explicit specification of the panel data model can be expressed by the following equation:

Additional robustness check excluding the COVID-19 years

As a basic robustness check, the model was re-estimated after excluding the COVID-19 years 2020 and 2021. The reduced sample includes 63 valid country-year observations because the two missing values for North Macedonia in the domestic credit series (2010 and 2011) remain excluded from the estimation. The purpose of this re-estimation is to assess whether the baseline findings are driven primarily by the exceptional macroeconomic disturbances associated with the pandemic period.

Table 3a. Robustness Check: Fixed-Effects-Type Re-estimation Excluding 2020 and 2021

Parameter	Estimate	Std. Error	t	p-value	Lower 95%	Upper 95%
Intercept	9.667247	3.185379	3.034882	0.003646	3.286167	16.048327
Inflation	-0.032243	0.058470	-0.551444	0.583523	-0.149372	0.084886
Industry	-0.164921	0.073344	-2.248584	0.028492	-0.311848	-0.017995
Domestic credit	-0.009627	0.032397	-0.297154	0.767449	-0.074526	0.055272
FDI	-0.118444	0.067298	-1.759981	0.083872	-0.253258	0.016371
Unemployment	-0.149002	0.045411	-3.281226	0.001782	-0.239971	-0.058034
GDP per person employed	0.000013	0.000026	0.489961	0.626075	-0.000039	0.000064

Source: Authors (2025).

Note: In the reduced sample, the overall pattern of results remains broadly cautious, since domestic credit, inflation, and GDP per person employed remain statistically insignificant. However, the exclusion of 2020 and 2021 produces two notable changes: industry becomes statistically significant with a negative coefficient, and unemployment becomes statistically significant with a negative coefficient, while FDI remains negative and only marginally close to conventional significance levels. This suggests that the insignificance of the baseline model is not explained solely by the COVID-19 years, but it also indicates that coefficient sensitivity to sample composition should be acknowledged when interpreting the findings.

Auxiliary multicollinearity diagnostic

As an auxiliary diagnostic for multicollinearity, variance inflation factors (VIF) were calculated for all explanatory variables using the reduced estimation sample. The obtained values are reported in Table 3b.

Table 3b. Variance Inflation Factors (VIF)

Variable	R^2	VIF	Status
Inflation	0.2399	1.32	No serious multicollinearity
Industry	0.0048	1.00	No serious multicollinearity
Domestic credit	0.5387	2.17	No serious multicollinearity

FDI	0.3935	1.65	No serious multicollinearity
Unemployment	0.5056	2.02	No serious multicollinearity
GDP per person employed	0.4294	1.75	No serious multicollinearity

Source: Authors (2025).

Note: All variance inflation factors are below the commonly used threshold of 5, which suggests that the explanatory variables do not exhibit severe multicollinearity in the estimation sample. The highest VIF is observed for domestic credit (2.17), which remains well within acceptable limits.

Socioeconomic communities share a common goal of ensuring the prosperity of their members, which is measured through precise indicators such as GDP dynamics over a given period. The quality of the economy, the business and administrative environment, and macroeconomic stability play a crucial role in shaping GDP performance.

DISCUSSION

1. Linking the Results with the Hypotheses:

- **H1 (labor productivity)** – H1 is not supported by the reported results. The coefficient for labor productivity is negative and statistically insignificant (Estimate = -0.074414; p = 0.214), which means that the model does not provide empirical evidence of a positive and statistically significant effect of labor productivity on GDP growth in the analyzed sample.
- **H2 (availability of financial resources)** – The results do not support a positive effect of domestic credit on GDP growth in the present specification. The estimated coefficient for private sector credit is negative and statistically insignificant (Estimate = -0.051781; p = 0.152), so it cannot be interpreted as a positive trend. At most, the findings indicate that no robust empirical support for H2 is obtained in this model.
- **H3 (macroeconomic stability**) – H3 is not empirically supported in the baseline model. Both macroeconomic stability indicators included in the specification—inflation (p = 0.509) and unemployment (p = 0.775)—are statistically insignificant. However, in the robustness specification excluding the COVID-19 years, unemployment becomes statistically significant with a negative coefficient, suggesting that its effect may be sensitive to sample composition.

2. Comparison of the Results with the Existing Literature

- The findings should be interpreted with caution in relation to the existing literature. While prior studies often report positive roles for productivity, finance, investment, and institutional quality, the present model does not produce statistically significant coefficients for these variables in the Western Balkan sample.
- The discrepancy between theoretical expectations and the estimated coefficients may reflect limited sample size, cross-country heterogeneity, measurement issues, or omitted structural and institutional determinants. Therefore, the fixed-effects specification should be viewed as an initial empirical

framework rather than definitive evidence on the drivers of GDP growth in the region.

- The results do not justify strong causal policy claims based on the estimated coefficients alone. Nevertheless, reforms aimed at improving the business and administrative environment remain relevant from a broader theoretical and developmental perspective.
- Similarly, macroeconomic stability remains important in theory, but the current empirical specification does not provide statistically significant evidence that inflation or unemployment explains GDP growth in the observed sample.

3. Policy and Practical Implications

The present results can be more precisely positioned within the existing literature by distinguishing between theoretical expectations and empirically observed regional heterogeneity. A substantial part of the literature emphasizes the positive contribution of productivity, financial intermediation, foreign direct investment, and institutional improvement to long-term growth. However, the evidence is not uniformly consistent across transition economies or within the Western Balkans. In that sense, the absence of statistically significant coefficients in the current specification should not be interpreted as an anomaly, but rather as an indication that the growth effects of these variables may be conditional, nonlinear, or highly dependent on country-specific institutional and structural contexts. This interpretation is supported by studies that report negative, weak, or unstable FDI effects in the Western Balkans, as well as by analyses showing that the contribution of foreign capital cannot be generalized across transition economies because the estimated parameters vary considerably across countries. Likewise, recent regional studies suggest that the interaction between institutions and investment may produce unexpected outcomes, which means that nominal increases in credit availability, investment inflows, or labor productivity do not automatically translate into measurable GDP growth within a short or medium-term panel specification. From this perspective, the discrepancy between theoretical expectations and the current empirical findings may reflect several overlapping factors: limited sample size, the relatively small number of countries, omitted institutional or structural controls, differences in absorptive capacity, and the presence of external shocks during the observed period, especially around the COVID-19 years. Accordingly, the current results are best understood not as a rejection of the broader theoretical literature, but as evidence that the determinants of GDP growth in the Western Balkans are more context-dependent and empirically unstable than simplified linear expectations might suggest.

The additional robustness check excluding the COVID-19 years also refines the interpretation of the baseline findings. In the reduced sample, the coefficients for inflation, domestic credit, and labor productivity remain statistically insignificant, which reinforces the conclusion that the absence of strong empirical support for the main hypotheses cannot be attributed solely to pandemic-related volatility. At the same time, two variables become statistically significant in the COVID-excluded specification: industry (including construction), value added (% of GDP) and unemployment, both with negative coefficients. This suggests that once the exceptional pandemic shock is removed, certain structural relationships become more visible, especially those relat-

ed to the composition of output and labor-market conditions. However, these changes should still be interpreted cautiously. First, the signs of the significant coefficients are not fully aligned with simplified theoretical expectations. Second, foreign direct investment remains negative and only marginally close to conventional significance, which confirms that the estimated effects remain sensitive to model specification and sample composition. Therefore, the robustness check does not overturn the cautious interpretation of the baseline model; rather, it indicates that the empirical relationships in the Western Balkans may be contingent on extraordinary macroeconomic episodes and that some coefficients are unstable across alternative sample definitions.

Overall, the results are better interpreted as only weakly connected to prior theoretical expectations, since the reported estimates do not provide statistically significant empirical confirmation for the main explanatory variables included in the model.

CONCLUSION

This study examined the impact of business, administrative, and macroeconomic factors on GDP growth in Western Balkan countries that are not members of the European Union. The analysis was conducted using a fixed-effects panel data model for the period 2010–2024, with labor productivity, industrial value added, domestic credit, foreign direct investment, inflation, and unemployment included as explanatory variables.

The estimates reported in Table 3 indicate that none of the explanatory or control variables is statistically significant at conventional levels in the present specification. Accordingly, the study does not provide empirical support for the three proposed hypotheses in their stated form. Rather than confirming direct effects of productivity, domestic credit, foreign direct investment, or macroeconomic stability on GDP growth, the findings suggest that the observed growth dynamics may also depend on additional structural, institutional, and country-specific factors not fully captured by the model.

Within these limitations, the study still points to the broader relevance of:

- Improving the business and administrative environment,
- Enhancing access to domestic and foreign financial resources, and
- Maintaining macroeconomic stability.

The contribution of this study should also be interpreted in relation to the broader empirical debate on growth determinants in transition and Western Balkan economies. While a considerable body of literature emphasizes the developmental role of productivity, financial deepening, foreign direct investment, and institutional improvement, more recent regional evidence suggests that these relationships are often empirically unstable, context-dependent, and sensitive to model specification. In that sense, the present findings do not necessarily contradict earlier research, but rather align more closely with studies showing that foreign direct investment may generate weak, negative, or institutionally mediated effects, and that the contribution of finance and productivity cannot be assumed to be uniform across small transition economies. The insignificance of the coefficients obtained in this model may therefore reflect the fact that GDP growth in the Western Balkans is shaped not only by the direct presence of credit, investment, or labor productivity improvements, but also by differences in institutional quality, absorptive capacity, industrial structure, and vulnerability to external shocks. This perspective is particularly relevant for a region characterized by

incomplete structural transformation, uneven reform outcomes, and strong exposure to external demand conditions. Accordingly, the present study adds value not by confirming simplified linear growth assumptions, but by highlighting the empirical limits of such assumptions in a heterogeneous regional setting. In this way, the paper contributes to the literature by showing that the absence of statistical significance may itself be an analytically meaningful result when examining growth dynamics in small transition economies under conditions of institutional and macroeconomic fragility.

The additional robustness check excluding the COVID-19 years further refines the interpretation of the study's conclusions. In the reduced sample, inflation, domestic credit, and labor productivity remain statistically insignificant, which confirms that the absence of strong support for the main hypotheses cannot be explained solely by pandemic-related volatility. However, the COVID-excluded specification also indicates that industry (including construction), value added (% of GDP) and unemployment become statistically significant, both with negative coefficients, while foreign direct investment remains negative and only marginally close to conventional significance levels. These findings suggest that the baseline conclusion of generally weak empirical support should be retained, but with an important qualification: some coefficients are sensitive to extraordinary macroeconomic episodes and to the composition of the estimation sample. Therefore, the robustness exercise does not overturn the cautious interpretation of the main model, but it does show that the determinants of GDP growth in the Western Balkans may become more visible once crisis-specific years are removed, especially in relation to output structure and labor-market conditions.

However, these implications should be treated as indicative rather than conclusive, because they are grounded more in theory and prior literature than in statistically significant coefficients from the present model. Future research should therefore expand the dataset, clarify variable construction, introduce additional institutional and structural controls, and perform diagnostic and robustness checks in order to identify the determinants of GDP growth in transition economies more reliably.

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PREGLEDNI NAUČNI RAD / REVIEW SCIENTIFIC PAPER

HOUSEHOLD MATERIAL STATUS AND CONSUMPTION PATTERNS: IMPLICATIONS FOR DIFFERENTIATED MARKETING STRATEGIES

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Abstract: *Material differences between households have a significant impact on the structure of their consumption. Households of lower material status allocate a larger part of the total consumption to basic foodstuffs, while households of higher material status have greater flexibility in allocating funds to non-essential products, other goods and infrastructure elements.*

The research is focused on examining the relationship between the household material status index and the Engel coefficient, expressed as the share of food consumption in total consumption, for urban and rural households in the Republic of Srpska, in the periods 2015 and 2021/22. The material status index is defined as a composite indicator of the economic position of a household, based on the amount and structure of consumption, and the possession of tangible goods and infrastructure, including assets such as cars, computers, air conditioners, household appliances, etc.

Analysis by Pearson's correlation coefficient showed a strong negative correlation (r = -0.927), which confirms the basic principle of Engel's law: an increase in the material standard leads to a decrease in the relative share of food expenditure. The results indicate that a higher material status index contributes to greater diversification of diet and total consumption, while urban and rural households differ in the structure of expenditure on meat, milk, beverages and other food categories.

The findings of the research provide an empirical basis for the creation of differentiated marketing strategies, based on the material status index, as well as for the design of measures aimed at improving living standards and reducing unequal spending on basic needs.

Keywords: *material status index, material status, consumer patterns, Engel's coefficient, differentiated marketing strategies.*

JEL classification: *M31, M37, M10, D11*

INTRODUCTION

The material status of households is an important indicator of their economic position, which can be seen through the amount and structure of consumption, as well as through the possession of material goods and infrastructure. As such, it forms one of the key components of the broader socioeconomic status of households. Differences in material status are significantly reflected in consumption patterns, especially in the way income is distributed between basic life needs and non-essential goods. In this context, it is particularly important to analyze how the proportion of food consumption changes with the growth of the material standard, which is the essence of Engel's law[1]. Understanding this relationship enables better planning of consumption policies, the design of social programs and the development of differentiated marketing strategies, especially in urban and rural communities. Although Engel's law in its original form relates the proportion of food expenditure to household income levels, in modern research the economic situation is often assessed through composite indicators of material status that include consumption and possession of durable goods, as such indicators can more realistically reflect the real standard of living of households. A similar view is expressed by , emphasizing that composite indicators better reflect the real standard of living than individual measures such as the share of food expenditure. He emphasizes the need to apply objective and subjective indicators in empirical research (which includes material indicators, such as consumption and possession of goods), emphasizing that composite indicators better reflect the real standard of living than individual measures such as the share of food expenditure.

The main problem of the research relates to the quantification of the relationship between the index of the material status of households and the structure of their consumption, as well as to the verification of the applicability of Engel's law in the modern economic context. Accordingly, the research question is: How does the material status of households affect the share of consumption on food and non-essential products?

The aim of this paper is to empirically show that lower material status leads to a higher share of consumption for basic needs, while higher material status allows greater flexibility and greater diversification of consumption. In this study, the material status index is defined as a composite indicator that includes the level and structure of household consumption, possession of durable goods and certain infrastructure resources. This approach allows for a more reliable analysis of consumption patterns from the perspective of the economic standard of households.

The initial hypothesis of the research is that there is a negative correlation between the material status index and the Engel coefficient, i.e. that the relative share of

[1] Engel's law is based on the assumption that lower-income households allocate a relatively larger proportion of their budget to meet basic needs, primarily food. As income increases, the relative share of food expenditure in total consumption decreases, while at the same time the share of expenditure on other categories of goods and services, such as housing, transport, communications, clothing and similar higher-value products, increases

food consumption decreases with the increase in material status. Verification of this hypothesis allows for quantitative confirmation of Engel's law, but also provides a basis for creating targeted marketing and social strategies tailored to different material profiles of households.

A REVIEW OF SIMILAR STUDIES

Modern economic literature strongly supports the empirical validity of Engel's law, but consumption patterns vary depending on social, demographic, or geographic context. For example, an analysis of micro data on urban household consumption in Sulawesi (an island in Indonesia) shows a negative elasticity of the share of food consumption in relation to income, which confirms the pattern according to Engel's law: as income increases, the relative share of food expenditure in total consumption decreases, although food remains necessarily good . An analysis of household consumption in Rwanda conducted by indicates marked differences in food consumption patterns between rural and urban households, as well as between different income groups. The authors emphasize that poorer households allocate a larger part of their resources to basic food products, while with the growth of income, the structure of consumption changes in favor of more diverse and nutritionally better foods. Although the paper primarily analyzes the structure of demand and the composition of consumption, its results are in line with the assumptions of Engel's relation about the change in the share of food consumption depending on income.

Empirical studies of various developed and developing countries also show that income distribution and the influence of factors such as demographics, education, or household structure can modify the Engel curve, but the underlying relationship still remains generally negative in the proportion of food consumption with income growth. Research in Nigeria also confirms that higher-income households spend a lower percentage on food, although socio-demographic factors such as household size and access to credit can affect overall spending .

In addition to classical economic analyses of consumption, papers dealing with the topics of food demand, income distribution among households, and consumption elasticity show that Engel's relation can also be extended in the context of social policies, such as consumer protection programs in low-income countries.

Similar results are confirmed by a multilevel regression analysis conducted in South Africa, where it was found that households of lower socioeconomic status allocate a significantly larger share of the budget for food compared to richer strata of the population .

Global food safety reports further emphasize that the structure of consumption directly reflects the economic capacity of households, with a higher share of spending on staple food products characteristic of resource-constrained populations .

A regional analysis of Engel's law in Bosnia and Herzegovina, conducted by , empirically examines the association between household income levels and the share of consumption on food and non-alcoholic beverages. The results of the research confirm that households with lower incomes allocate a larger relative part of the budget for basic food products, while this share decreases with income growth. The authors conclude that the validity of Engel's law in the context of Bosnia and Herzegovina can be confirmed in the observed period.

This contemporary literature provides an additional empirical basis for the interpretation of the research results, confirming that the negative relationship between material status and the share of food consumption is stable and widely confirmed in various economic contexts.

METHODOLOGY

The research is descriptive-analytical and quantitative, focused on examining the relationship between the index of material status of households and the share of food consumption, in accordance with Engel's law.

The descriptive-analytical method was used to analyze data on the structure and amount of household consumption, possession of material goods and infrastructure elements. The survey population included households in urban and rural areas, and the data were taken from the Statistical Office of the Republic of Srpska (consumer habit survey). The sample is stratified by household type and includes two time points: 2015 and 2021/22.

Primary variables include total household consumption, consumption on food and beverages, structure of food consumption (bread and cereals, meat, milk, fruits and vegetables, beverages and other foods), and possession of material goods and household infrastructure (car, computer, air conditioning, household machine, etc.) for the calculation of the material status index. The inclusion of infrastructure allows for a more precise quantification of material standards and living comforts.

The Household Material Status Index is measured through a combination of consumption and possession of tangible goods and infrastructure, which is a quantitative measure of material standard and purchasing power.

The data were analyzed using descriptive statistics, and the relationships between the material status index and the Engel coefficient were estimated using the Pearson correlation coefficient (r).

Engel's coefficient is expressed by the following formula :

$$\text{Engel coefficient} = \frac{\text{Total spending on food and beverages}}{\text{Total consuption}} \text{ x } 100$$

dok Pearsonova formula glasi:

$$r = \Sigma(X_i - \bar{X})(Y_i - \bar{Y}) / \sqrt{(\Sigma(X_i - \bar{X})^2 \times \Sigma (Y_i - \bar{Y})^2}$$

where:
X_i = Material Status Index
Y_i = Engel's coefficient

RESULTS

This section analyses the structure of household consumption according to functional categories of expenditure, then examines the relative differences between households of different material standards, and identifies consumption patterns that point to a lower or higher material standard. A special focus was placed on the value of expenditure by household categories and type of settlements in Republika Srpska (RS), in 2015 and 2021/22. (Table 1).

Table 1. Average monthly expenditure by categories of households and type of settlements in RS in 2015 and 2021/22 (in KM) with percentage increase

	2015		2021/22		The percentage of increase 2021/22/2015	
Expenditure category	urban	rural	urban	rural	urban	rural
Food & Drink	425.69	400.93	539.28	541.97	126.68	135.18
Housing and utilities	245.25	178.89	334.24	257.36	136.29	143.86
Transportation	139.08	112.24	233.42	271.78	167.83	242.14
Healthcare	54.01	46.78	43.64	41.98	80.80	89.74
Communications	77.98	49.77	130.02	111.97	166.74	224.97
Clothing and footwear	85.81	50.69	118.86	84.65	138.52	167.00
Electricity	116.47	119.06	120.24	145.66	103.24	122.34
Furniture, equipment and services	65.06	52.04	90.46	75.41	139.04	144.91
Catering services	26.04	18.73	50.13	36.93	192.51	197.17
The pigeon	32.32	30.89	47.11	41.98	145.76	135.90
Other consumer goods	159.12	93.71	163.2	136.13	102.56	145.27
Total	1426.83	1153.73	1870.6	1745.82	131.10	151.32

Source: Statistical Office of the Republic of Srpska [RZSRS], 2025

The data from Table 1 show that total monthly household expenditure in the RS increased significantly in the period 2015–2021/22, with the growth being more pronounced in rural areas (51.32%) than in urban areas (31.10%). However, the absolute level of total consumption is still higher in urban households, indicating a higher material standard.

Expenditure on food and beverages has increased in both types of settlements, but the growth in total spending allows for greater diversification of budgets, especially in cities. Most non-essential categories (transportation, communications, hospitality, home furnishing) are seeing strong growth, suggesting a spread of consumption beyond basic needs. In contrast, health expenditure is declining, while electricity is showing more moderate growth compared to other categories.

The structure of food consumption, as the most represented category in monthly expenditures, is shown in Table 2.

Table 2. Average monthly consumption of food per household member in RS in 2015 and 2021/22 (in KM) with percentage increase

	2015		2021/22		Procenat povećanja 2021/22/2015	
Expenditure category	urban	rural	urban	rural	urban	rural
Bread and cereals	55.36	51.6	71.6	66.11	129.34	128.12
Meat	109.13	121.45	133.52	159.75	122.35	131.54
Milk	64.88	59.97	77.88	69.87	120.04	116.51

Fruits and vegetables	77.05	65.89	101.07	97.63	131.17	148.17
Beverages	53.98	50.74	41.08	43.33	76.10	85.40
Oils and fats	16.05	14.99	21.53	21.17	134.14	141.23
Sugar & Confectionery	49.24	36.3	92.6	84.11	188.06	231.71
Total Food & Drink	425.69	400.94	539.28	541.97	126.68	135.17

Source: (RZSRS, 2025)

Table 2 shows that the total annual consumption of food and beverages per household member, in the period 2015–2021/22, increased in both types of settlements, with a more pronounced growth in rural areas (135.17%) compared to urban areas (126.68%). Although urban households had higher consumption per member in 2015 by 2021/22, rural households are reaching or slightly outperforming urban households, indicating changes in the structure and dynamics of consumption in line with material status.

Most categories are seeing growth (bread and cereals, meat, milk, fruits and vegetables, oils and fats), while beverages are the only category with a decline in urban areas. The growth in the consumption of sugar and confectionery products is particularly pronounced, which may indicate changes in eating habits and greater availability of processed products.

The material status of the households observed is shown in Table 3.

Table 3. Indicators of the material status of households by type of settlement in the Republic of Srpska: 2015 and 2021/22 (in %)

	2015		**2021/22**	
Expenditure category	**gradsko**	**ruralno**	**gradsko**	**ruralno**
Cars	40.1	40.6	68	67.7
Computer	54.3	32.1	61.1	45.1
Air conditioning	18.7	5.1	43.4	21.4
Electric stove	97	87.4	98	93.7
Coal stove	72.8	97.5	63.4	91.1
Dishwasher	20.2	9.9	41.6	26
Refrigerator	98.8	98.1	98.4	98.3
washing machine	95.5	87.1	98.1	94.3
Cleaning equipment	92.1	81.2	96.9	95
Stove, boiler, hood	91.8	81.4	85.6	91.7
Sewing & Knitting Machine	8.3	5.9	6.3	7.7
TV	97.7	96.3	96.2	97.8
Video Recorder	26.2	17	28	24.6
Satellite Dish	6.9	13.4	22.1	31.5
Internet connection	70.2	52	83.6	74.2

Izvor: RZSRS, 2025

In the period 2015–2021/22, there was an improvement in the material status of households, both in urban and rural areas. Growth is particularly pronounced in durable goods that signal a higher material standard: cars, computers, air conditioners, dishwashers and internet connections.

Although urban households still have a higher share of ownership of most modern goods, rural households are making significant progress, reducing disparities in material standards. At the same time, there is a noticeable decline in the use of traditional forms of equipment (e.g. coal-fired stoves), reflecting the modernization of households. A high and stable percentage of basic household appliances (refrigerators, washing machines, televisions) shows that they have become the standard, while the material status is increasingly determined by digital connectivity and accessories.

As part of the material status of households, their infrastructure is also observed (Table 4).

Table 4. Infrastructure of the main dwelling unit of the household in the Republic of Srpska by type of settlement (in %)

	2015		2021/22	
Expenditure category	**urban**	**rural**	**urban**	**rural**
Bathroom with toilet	98.7	91.1	99.5	97.4
WC	89.9	87	85.9	77.3
Running water	100	96.8	99	81.6
Electricity	99.7	99.4	100	99.9
Garage	35.9	45.8	42.5	57.6
Garden	28.6	83.2	29.4	73.8

Source: RZSRS, 2025

The quality and availability of infrastructure has a direct impact on the material standard of households. Urbanization enables a higher material status through better communal equipment, while in rural areas the material status is more shaped by a combination of household goods and basic infrastructure.

The data from Tables 1–4 clearly show that households with a higher material standard have greater consumer flexibility and less relative dependence on basic food expenditures. The growth of total expenditure in urban households enables the diversification of budgets and the transition to products with higher added value, while households with a lower material status retain a higher share of spending on basic foodstuffs and show sensitivity to prices.

An analysis of nominal and relative food consumption (Table 2) confirms that an increase in food expenditure does not necessarily mean an increase in its share in the total budget. When total consumption grows faster than food expenditure, the share of food in the budget decreases, which is in line with Engel's principle. These results highlight that a higher material standard allows for greater diversification of consumption, while households with a lower material status index remain focused on basic food categories.

Data on the ownership of tangible goods and household infrastructure (Tables 3 and 4) further confirm the growth of material standards, especially in urban areas,

correlates with greater purchasing power and flexibility in consumption, which is reflected in a lower share of consumption on food and a higher share on other goods, durable goods and household infrastructure.

This analysis confirms the key role of material status in shaping consumer patterns and emphasizes the need for a differentiated marketing approach. Segmentation according to the material standard enables precise targeting of consumers, optimization of campaigns and the creation of products and services tailored to the real possibilities and preferences of different socio-economic groups.

The quantitative verification of the hypothesis included three analyses: calculation of the material status index, calculation of the Engel coefficient, and estimation of the relationship between these two variables using the Pearson correlation coefficient.

1) Material Status Index

To assess the material status of households, the material status index was used, which is determined on the basis of the possession of key material goods and infrastructure, including cars, computers, air conditioners, household machinery, and housing infrastructure (bathroom, running water, energy, garage, garden). A higher material status index reflects a higher level of household equipment and purchasing power, while a lower index indicates more limited access to these resources.

Table 6 shows the ownership of tangible goods and infrastructure by urban and rural households in 2015 and 2021/22, together with the calculated material status index, expressed as the average of the share of ownership of relevant items. These data enable a comparison of the material standard and changes in the technological and infrastructural equipment of households over time.

Table 6. Comparative overview of the material status index and its components in the Republic of Srpska by household type, (2015–2021/22)

Type of household	Year	Material goods (%)	Infrastructure (%)	Material Status Index (%)
Urban	2015	67.64	90	81.25
Rural	2015	58.09	83	75.07
Urban	2021/22	73.81	95	85.5
Rural	2021/22	66.63	91	81.77

Note: The data has been edited by the author.

The data from Table 6 show the growth of the material status index in both types of households between 2015 and 2021/22. Urban households still have a higher material standard (67.64% → 73.81%) compared to rural households (58.09% → 66.63%), which confirms that urban households own more material goods and have higher purchasing power.

The increase in the material status index in both types of households correlates with a decrease in the share of consumption on food (Engel's coefficient), which confirms the hypothesis of a negative correlation between material status and relative consumption on basic needs. A higher material standard allows for greater flexibility in consumption, switching to non-essential products and diversifying the diet.

From a marketing perspective, these changes suggest the need for differentiated strategies in urban and rural areas.

2) Engel's coefficient

The share of household consumption on food in total consumption is presented below, classified by functional categories of goods and type of households (urban/rural) for the years 2015 and 2021/22. Table 5 provides insight into differences in the structure of consumption and identifies patterns associated with lower and higher material standards.

Table 5. Engel's coefficient and structure of consumption of food and other goods in the Republic of Srpska by type of household and year (in %)

Category	Gradsko 2015	Ruralno 2015	Gradsko 2021/22	Ruralno 2021/22
Total food	29.83	34.76	28.83	31.04
Bread and cereals	3.88	4.47	3.83	3.79
Meat	7.65	10.53	7.14	9.15
Milk	4.55	5.2	4.16	4
Fruits and vegetables	5.4	5.71	5.4	5.59
Beverages	3.78	4.4	2.2	2.48
Oils and fats	1.12	1.3	1.15	1.21
Sugar & Confectionery	3.45	3.15	4.95	4.82
Other goods	70.17	65.24	71.17	68.96

Note: The data has been edited by the author.

The above data indicate a negative correlation between the material status index and the share of food consumption, which confirms the basic hypothesis of the research. Urban households, with a higher material status index, spend a lower share of income on food in both observed periods (29.83% in 2015 and 28.83% in 2021/22), while rural households with a lower material status index retain a higher share of food spending (34.76% in 2015 and 31.04% in 2021/22).

These patterns indicate differences in eating habits that are related to product availability, income, and cultural preferences.

From the point of view of marketing strategies, data enables differentiated targeting in production and promotional activities. Producers of staple foods can count on stable demand, while products whose consumption varies, such as meat and sweets, can be especially promoted in urban areas. At the same time, the table provides an empirical basis for policy-making aimed at reducing disproportionate consumption of staple foods among households with lower material status, which can improve nutritional structure and reduce social inequality.

3) Correlation between the index of material status and the share of consumption on food (Engel's coefficient)

For the purpose of testing the hypothesis, the correlation between the index of material status and the share of consumption on food (Engel's coefficient) was calculated using the Pearson correlation (Table 7).

Table 7. Components and value of Pearson's correlation coefficient

Component / Variable	Value
$\Sigma(X_i - \bar{X})(Y_i - \bar{Y})$	-84
$\Sigma(X_i - \bar{X})^2$	406.74
$\Sigma(Y_i - \bar{Y})^2$	20.156
$\sqrt{(\Sigma(X_i - \bar{X})^2 \times \Sigma(Y_i - \bar{Y})^2)}$	90.54
Pearson r (index of material status ↔, Engel's coefficient)	-0.927
Material status ↔ index of other goods (%)	0.927
Material Status ↔ Index Material Goods	0.998
Infrastructure Material Status ↔ Index	0.992

Note: The data has been edited by the author.

The analysis shows that households with a higher material standard spend a smaller share on food (r = -0.927), which is in line with Engel's law. On the other hand, the same groups of households allocate a higher share for other goods (r = 0.927), material goods (r = 0.998) and infrastructure (r = 0.992), reflecting greater consumption capacity and diversity of consumption.

These correlations provide an empirical basis for planning economic and marketing measures, with an emphasis on tailoring products and services to the specific needs of different groups of households.

The obtained results confirm that the material status of households plays a key role in shaping consumption patterns and provide an empirical basis for segmented policies and strategies aimed at improving living standards.

DISCUSSION

The analysis of the results confirms the basic principle of Engel's law. These findings are consistent with previous research in a variety of geographic and socioeconomic contexts. in Rwanda showed a similar negative relationship between income and the share of food spending. in Ghana points out that the marginal share of food consumption decreases with the growth of total consumption, while emphasize that the local context can amplify or mitigate the effect of the Engel curve, but the basic principle remains: a lower material status means a higher share of consumption on food and basic products. further confirms that while the nominal consumption of wealthier households on food is increasing, their share of total income is declining proportionately, which coincides with our findings.

These coincidences confirm the universal applicability of Engel's law and emphasize that material status consistently influences the structure of total consumption. The results have practical implications: an increase in material standards can reduce the relative share of spending on basic foodstuffs and increase spending on other goods and services, which is important for planning subsidies, social transfers and food security. Marketing strategies, which take into account segmentation by material status, can target consumers: in rural communities, the focus may be on basic products, while in urban communities, priority is given to products and services with higher added value .

Although the paper provides strong evidence of the relationship between material status indices and consumption structures, there are limitations, such as not taking

into account seasonal variations, inflation, and regional price differences. For future research, it is recommended to collect more detailed data over time, expand the analysis to more regions and countries, and combine quantitative and qualitative methods to better understand consumer choices .

CONCLUSION

The analysis confirms that there is a strong negative correlation between the index of material status of households, expressed by a combination of possession of material goods and infrastructure, and the share of consumption on food, measured by the Engel coefficient. Households with a higher material status index, mostly urban, spend a smaller share of their income on basic foodstuffs and have greater flexibility in spending on non-essential products and services, while households with a lower material status, predominantly rural, retain a larger share of the budget for basic foodstuffs, and limit other consumption according to the material standard. These results confirm the basic principle of Engel's law and clearly show how the growth of the material standard leads to the diversification of consumption. They also provide practical guidance for creating differentiated marketing strategies that fit the material profile of households and enable the optimization of a targeted approach to consumers.

Consumers with lower material status, especially in rural communities, are focused on basic products, so marketing campaigns for these segments should highlight the value, availability and convenience of products. In contrast, urban households with a higher material status index represent a market for higher value-added products and services or luxury items, so strategies can include premium positioning, innovation, and additional benefits. Understanding the material profile of households enables precise targeting of campaigns, optimization of the assortment and increasing the effectiveness of marketing activities.

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PREGLEDNI NAUČNI RAD / REVIEW SCIENTIFIC PAPER

ALGORITHMIC PERSONALIZATION IN DIGITAL MARKETING: A COMPARATIVE ANALYSIS OF THE IMPACT ON CONSUMER ENGAGEMENT AND LOYALTY

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Abstract: *This paper explores the impact of algorithmic personalization in digital marketing on consumer engagement and loyalty. Using a systematic literature review, in addition to the PRISMA methodological framework, ten relevant studies published in the period 2024–2026 were analyzed, which used various approaches, including quantitative surveys, SEM analyses, experimental research, and conceptual literature reviews. The analyzed works encompass various forms of personalization, including online ads, AI-driven product recommendations, personalized media content, email marketing, and social media content.*

The results show that algorithmic personalization significantly increases user engagement and strengthens consumer loyalty. The effects are more powerful when the content matches the user's identity and values (self-congruity) and when personalized AI recommendations are used. At the same time, excessive personalization or the perception of intrusive communication reduces the effectiveness of strategies, highlighting the need for a balanced approach that respects data privacy and transparency.

Cultural and demographic differences further influence the acceptance of personalization, with younger generations showing greater openness, while older generational groups demanding greater transparency and data protection. The results also show that personalization, which creates relevant and tailored content, deepens the emotional connection with the brand, further strengthening consumer loyalty.

This paper contributes to the understanding of the multidimensional impact of algorithmic personalization and provides guidance for ethical, transparent, and effective application in digital marketing, emphasizing the importance of integrating multiple digital channels and user control over data.

Keywords: *digital marketing, artificial intelligence, consumer engagement, self-congruity, data transparency.*

Jel classification: *M31, D12*

INTRODUCTION

The modern business environment is marked by the intensive development of digital technologies and changes in the way companies communicate with consumers. Digital technologies are "information and communication technology (ICT) that includes computers, learning management systems (LMS), digital media such as wikis, blogs, social media, and podcasts. They typically refer to a broad set of technologies that record, process, store, and transmit information in digital form. Digital technologies can also be hardware devices such as computers, mobile devices such as smartphones, game consoles, video and audio players, and software applications such as web applications, blogs, wikis, social networks and chat sites". The development of digital platforms, social networks and online commerce has significantly transformed traditional marketing strategies and opened up new opportunities for direct and personalized communication with customers. In such an environment, digital marketing is becoming a key element of modern business and customer relationship management, as it enables organizations to more effectively reach target segments and improve the performance of marketing campaigns. Digital marketing refers to the promotion of products or services through digital channels (such as websites, emails, social networks, mobile applications, etc.). It uses digital technology to attract, engage, and retain customers to achieve marketing goals."

Personalized marketing involves tailoring marketing messages, offers, and content to the individual needs, preferences, and behavior of consumers. The development of data analytics, algorithms, and digital tools has enabled companies to collect and analyze large amounts of customer data, enabling the development of personalized product recommendations, targeted advertising, and individualized communication strategies.

This approach to marketing contributes to increasing the relevance of marketing messages, improving the user experience, and strengthening relationships with consumers. Algorithmic personalization is becoming one of the key tools of modern digital marketing, as it allows companies to tailor marketing messages to individual user preferences.

Most modern research points to a significant impact of personalized digital marketing on consumer behavior, including an increase in engagement, purchase intent, and brand loyalty . Personalization enables organizations to develop closer relationships with consumers through relevant and contextually tailored content.

However, the results of individual studies show certain differences in the findings, which is often due to different methodological approaches, sample characteristics or specifics of the digital platforms that were the subject of the research. Therefore, there is a need for a systematic review and comparative analysis of existing research to identify the dominant trends and key factors influencing the effectiveness of personalized marketing strategies .

The aim of this paper is to analyze and compare modern scientific research dealing with the impact of personalized digital marketing on consumer behavior. The paper is based on a systematic review of the literature published in the recent period, with a special focus on the characteristics of the research and the main results.

METHODOLOGY

In this paper, the method of systematic literature review was applied with the aim of analyzing existing scientific research dealing with the impact of algorithmic personalization in digital marketing on consumer engagement and loyalty. Systematic literature review provides a structured and transparent approach to the collection, selection and analysis of relevant scientific papers, thus ensuring the reliability and objectivity of the research. The literature review process was carried out in accordance with the guidelines proposed by PRISMA (PRISMA). Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

The first step of the research was related to the definition of the research problem and the formulation of the research question, which is: how does algorithmic personalization in digital marketing affect consumer engagement and loyalty. Accordingly, auxiliary research questions related to the impact of personalization on consumer perception, trust in digital platforms, as well as purchase intent and long-term brand loyalty have been defined.

In the second phase, a systematic search of the scientific literature was conducted. The search was carried out in relevant academic databases and digital databases, among which the most important are search engines for scientific papers such as Google Scholar, Scopus, Web of Science and ScienceDirect. During the search, combinations of keywords related to the research topic were used, including the terms "AI personalization", "algorithmic personalization", "digital marketing", "consumer engagement", "consumer loyalty" and "purchase intention". Combinations of terms were linked using the Boolean operators AND and OR, in order to obtain as many relevant results as possible.

To ensure the relevance of the analyzed literature, the inclusion and exclusion criteria of the papers have been defined. The inclusion criteria included scientific papers (published between 2024 and 2026), which analyze AI-based personalization or algorithmic data analysis in the context of digital marketing, as well as research that addresses consumer behavior, user engagement or brand loyalty. It was also necessary to have access to the full text of the work. On the other hand, papers that are not related to marketing or consumer behavior, technical studies that analyze algorithms without marketing context, as well as papers that did not provide empirical or theoretical findings relevant to the subject of research were excluded from the review.

The selection process was carried out in several phases in accordance with the PRISMA approach. In the initial phase of identification, a large number of potentially relevant papers were collected from selected databases. Subsequently, the removal of duplicates was carried out, and then a preliminary review phase was carried out, in which the titles and abstracts of the papers were analyzed in order to assess their relevance to the research topic. In the next phase, a detailed analysis of the full texts of the selected studies was performed. After applying all the selection criteria, the final sample for analysis consisted of ten scientific papers dealing with the application of algorithmic personalization and artificial intelligence in digital marketing, and their impact on consumer behavior. marketing.

In the final phase of the research, key information from the selected studies was extracted and systematized. From each paper, data were collected on the authors, year of publication, research objective, methodology, analyzed variables, and main

results of the study. Based on the collected data, a comparative and thematic analysis was carried out, which enabled the identification of common patterns, similarities and differences between the researches.

The application of a systematic literature review enabled the integration of the results of various empirical research, and provided a broader insight into the role of algorithmic personalization in contemporary digital marketing strategies. This approach enables a comprehensive understanding of the relationship between personalized marketing and consumer behavior, which is the basis for further analysis and discussion of the results within this paper.

RESULTS

For the comparability of the studies, the methodology of their processing played a key role. The analysis shows that most studies have used a quantitative approach, most commonly through surveys and statistical analyses, including methods such as structural equations (SEMs), to examine the impact of AI-based personalization on consumer engagement, loyalty, and behavior ; ; ; ;; . Some studies combined experimental methods and online ad analysis to evaluate the effectiveness of personalization in different contexts , while others used empirical quantitative analyses and statistical evaluation of consumer perception and trust in AI marketing ;. One study focused on conceptual analysis and literature review to understand the role of AI in consumer behavior and personalization strategies in digital marketing . The impact and results of the analysed studies are shown in Table 1.

Table 1. Comparative analysis of the impact of algorithmic personalization on consumer engagement and loyalty: a review of 10 studies (2024–2026)

Author and year	The Impact of Algorithmic Personalization on Customer Engagement and Loyalty.	Results
Alsaffarini i Awwad (2026)	AI-powered personalization increases engagement and drives purchasing decisions through relevant, timely, and emotionally appealing messages.	Trust and perceived relevance are key to acceptance (privacy concerns reduce effectiveness). Effectiveness depends more on emotional and cognitive response than on technical sophistication.
Binlibdah (2024)	AI-driven personalization of media content improves engagement and loyalty through interactive and relevant experiences.	AI mediates between strategic communication and user efficiency (personalization alone is not enough without additional intermediary factors).
Bleier and Eisenbeiss (2015)	Personalizing online ads through content, time, and context increases engagement and trust, which indirectly strengthens loyalty.	Targeted re-advertising is effective at an early stage of the purchase process (excessive personalization reduces the effect). The context of the presentation is key to engagement.

Jeličić, Čule Karačić and Mabić (2025)	Personalization increases purchase intent if the ads aren't too intrusive.	A balance between relevant content and respect for privacy is key to positive perception and long-term loyalty.
Markou and saradnici (2025)	Trust and appreciation of the user's identity increase engagement and loyalty.	The transparency and ethics of AI systems reinforce the acceptance of personalization (concerns about autonomy can reduce acceptance).
Sahu, Sankhla and Anjana (2025)	AI enables precise understanding of consumers and optimization of personalized messages for greater engagement and loyalty.	Personalization improves the user experience (excessive personalization and lack of transparency reduce trust).
Sario and saradnici (2024)	Compliance of content with identity (self-congruity) increases emotional connection and loyalty.	AI further enhances connection through relevant content. Responsible data management is key to long-term trust.
Tanawat (2025)	AI personalization on social media increases engagement, but perceptions of privacy can limit acceptance.	Trust and perceived usefulness mediate engagement. Privacy concerns do not have a direct impact on engagement.
Wang and his associates. (2025)	AI personalization improves engagement, trust, satisfaction, and propensity to buy on social media.	Emotional connection enhances loyalty. Excessive personalization and lack of transparency reduce trust. Cultural and demographic differences affect perceptions.
Wuryantini (2025)	Relevant and transparent AI-driven content increases trust and long-term loyalty.	Personalization has a positive effect on engagement, emotional connection, and stable loyalty. A balance between relevance and privacy is key to efficiency.

Source: author's own analysis (2026)

In order to understand in more detail the different aspects of the impact of algorithmic personalization, the results of each of the ten analyzed studies are presented below. Each study provides specific insights into how personalization, across different digital channels and approaches, impacts consumer engagement and loyalty, highlighting key factors such as content relevance, timeliness, privacy perceptions, and emotional connection to the brand. The presentation of individual findings enables comparative analysis and identification of common trends, as well as challenges in the implementation of personalization strategies in digital marketing.

Algorithmic personalization and purchasing decisions in the context of sustainable marketing

A study by Alsaffarini and Awwad (2026) shows that AI-based personalization has a positive impact on consumer shopping behavior, especially when marketing messages are relevant, timely, and emotionally appealing. Trust in artificial intelligence and perceived relevance of recommendations have been identified as key factors that encourage consumers to make purchasing decisions. On the other hand, privacy concerns and lack of trust are significant barriers to the acceptance of personalized mar-

keting messages. "The results highlight that the effectiveness of AI personalization depends less on technical sophistication alone, and more on consumers' cognitive and emotional responses, especially their sense of trust, autonomy, and fairness." In the context of sustainable digital marketing, the need for responsible personalization that includes transparent data management and a consent-based approach to build long-term consumer trust and loyalty, was pointed out.

The Effectiveness of Personalized Media Content

Binlibdah (2024) shows that personalized AI content increases efficiency and consumer interaction. Algorithmic personalization enables brands to create interactive and relevant experiences, which directly contributes to customer engagement and loyalty. The study shows that strategic communication has a significant impact on the development of personalized media content and on the effectiveness of customer service in social marketing companies. In addition, it is pointed out that the personalization of media content itself does not have a significant direct impact on the effectiveness of the service, which suggests the existence of additional intermediary factors. In this context, artificial intelligence plays a key role as it mediates between strategic communication, personalized content, and customer service results. By integrating artificial intelligence, organizations can more effectively apply personalized content and improve digital communication with users. The findings of the research emphasize that the application of artificial intelligence contributes to the optimization of marketing communication strategies and the improvement of the overall effectiveness of the service.

The Effectiveness of Online Advertising Through Content, Time, and Context

Bleier and Eisenbeiss (2015) point out that the success of an ad depends on a combination of relevant content, the right moment, and the context of the display. Algorithmic personalization in digital marketing must carefully balance these factors to increase user engagement and build trust, which indirectly increases loyalty. The results of the research show that the personalization of online banners through the method of targeted re-advertising can significantly affect the shopping behavior of consumers in the digital environment. The greatest effect of personalization occurs at an early stage of the purchase decision-making process, especially immediately after a consumer's visit to an online store. However, highly personalized ads lose effectiveness over time, indicating the phenomenon of over-personalization, while moderately personalized ads have a longer-lasting effect. Also, the effectiveness of personalized ads depends on the context in which they are displayed, as they increase consumer engagement on websites with compliant content, while on non-congruent pages they may have a weaker effect. From the aspect of digital marketing, the importance of proper timing, context of presentation and understanding of consumer behavior in order to optimize the application of personalized marketing strategies is emphasized.

Perception of intrusiveness and intention of online shopping

A study by Jeličić, Čule Karačić and Mabić (2025) shows that personalization increases purchase intent, but that excessive intrusiveness of ads can reduce efficiency.

This confirms that algorithmic personalization requires a balance between relevant content and respect for privacy, which is key to maintaining positive engagement and long-term loyalty. The results of the research show that the perceived personalization of online ads has a significant impact on the intention of online purchases of consumers. Personalized ads can increase the relevance and engagement of consumers, thereby positively influencing their willingness to buy. However, when consumers perceive personalization as too intrusive, then it can negatively impact their purchase intent. The findings also indicate that it is important to strike a balance between the level of personalization and privacy protection in order to maintain a positive perception of consumers. Viewed in the context of digital marketing, the results highlight the need for responsible use of data and careful design of personalized marketing strategies that enhance the user experience without creating a sense of intrusiveness.

Consumer Trust and Identity in AI Marketing

Markou et al. (2025) highlight that trust and identity significantly influence the adoption of AI personalization. Strategies that build trust and take into account the identity of users increase engagement and strengthen consumer loyalty. The results of the research show that trust and perceived ethics play a key role in the acceptance of personalized advertising based on artificial intelligence. When consumers perceive AI systems as transparent, trustworthy, and fair, they are more likely to respond positively to personalized marketing messages. Also, greater knowledge and experience in the use of artificial intelligence tools contributes to the formation of more positive attitudes towards this form of digital marketing. Conversely, concerns about consumer identity and autonomy can reduce acceptance of personalization, as it is sometimes perceived as an invasion of privacy or personal expression. For the purposes of the digital marketing vision, the results suggest that the successful application of artificial intelligence requires building trust, transparency in the use of data, and respect for the identity and autonomy of consumers.

Analysis of consumer behavior and optimization of strategies

Sahu, Sankhla and Anjana (2025) show that AI enables a more accurate understanding of consumer behavior and the creation of personalized messages. Algorithmic personalization through analytics and recommendations contributes to greater engagement and long-term loyalty. The results of the research show that the application of artificial intelligence in personalized marketing significantly improves the user experience and increases the intention of buying the consumer. Analyzing consumer behavior using advanced technologies, such as machine learning algorithms and predictive models, allows marketers to create relevant and targeted marketing messages. Consumers respond positively to personalized content when they perceive it as timely, useful, and unobtrusive. However, excessive personalization and lack of transparency in the use of personal data can cause embarrassment and reduce consumer trust. From a digital marketing perspective, the results highlight the need for a balanced approach that combines the analytical precision of artificial intelligence with ethical data management and user privacy.

Self-congruence and user engagement

A study by Sario et al. (2024) shows that content alignment with user identity (self-congruity) increases engagement and interaction with the brand. Algorithmic personalization, which reflects the identity of the consumer, strengthens emotional connection and loyalty. The results of the research show that self-alignment between consumer identity and brand image has a significant impact on consumer engagement. When consumers perceive a brand as aligned with their values and personal identity, they are more likely to develop a stronger emotional connection and loyalty to the brand. AI-based marketing personalization further strengthens this relationship by enabling the creation of content and offers tailored to the preferences and interests of consumers. Artificial intelligence systems can, through the analysis of consumer data, better understand their needs and thus increase the effectiveness of marketing activities. However, the results highlight that responsible and transparent data management and respect for user privacy are essential for long-term consumer trust.

AI personalization on social networks

Tanawat (2025) points out that personalization increases engagement, but that perceptions of privacy and intrusiveness can limit acceptance. Algorithmic personalization on social media must carefully balance relevant content and privacy protections so that engagement is sustainable and user loyalty is long-term. The results of the research show that AI-based personalization in social media marketing significantly affects consumer perception, especially trust and perceived usefulness of content. These factors play an important mediating role as they positively influence consumer engagement and their interaction with digital content. While personalization increases trust and usefulness, it does not directly lead to greater consumer engagement on its own. The results also show that privacy concerns do not have a significant direct impact on users' engagement on social media. In the context of digital marketing, the findings highlight that successful personalization strategies, based on artificial intelligence, should be aimed at building trust and increasing the perceived value of content to encourage more active consumer involvement.

Influencing Behavior and Purchasing Decisions

Wang et al. (2025) show that personalization has a positive impact on purchasing decisions and engagement with a brand. Algorithmic personalization directly improves user interaction and motivates long-term loyalty, especially on social media platforms. The results of this study show that AI-driven personalization on social media significantly improves consumer engagement, trust, satisfaction, and propensity to buy. The emotional connection that consumers develop through relevant and tailored content further enhances brand loyalty and interaction with marketing campaigns. Nevertheless, excessive personalization and non-transparent data processing practices can cause embarrassment and reduce trust, creating a privacy personalization paradox. The findings also point to cultural and demographic differences in perceptions of privacy and engagement, with younger generations more likely to embrace personalization with some skepticism, while older generational groups demand greater transparency. In practical terms, the study came to the realization that marketing strategies need to balance precise personalization with ethical practices, transparency and emotional in-

telligence in order to achieve positive outcomes for consumers and brands.

Trust and long-term loyalty

Wuryantini (2025) emphasizes that relevant and personalized content increases customer trust and loyalty. Algorithmic personalization that ensures relevance and transparency strengthens long-term relationships and stable customer loyalty. This study confirms that personalization in digital marketing, especially when supported by artificial intelligence, significantly affects consumer loyalty through a number of intermediary factors. Key elements include trust and transparency in the use of data, engagement and emotional connection with the brand, perceived value and relevance of content, and data privacy and security protection. The results show that consumers are more likely to remain loyal to a brand when personalization provides real benefits, remains unobtrusive, and ensures data security. For marketers, this means that strategies must balance technological sophistication and AI-driven personalization with ethics, transparency, and respect for privacy. By applying these principles, companies can improve engagement, emotional connection, and long-term customer loyalty, while avoiding negative reactions caused by excessive or irresponsible personalization.

DISCUSSION

An analysis of 10 studies clearly shows that algorithmic personalization has a significant impact on consumer engagement and loyalty, but the success of these strategies depends on a combination of several key factors: content relevance, timeliness of communication, emotional appeal, user trust, and transparency in data management. Most studies (;;) emphasizes that personalization that matches the identity and values of consumers increases emotional connection and engagement, which strengthens brand loyalty in the long run. A similar conclusion emerges from studies by Sario et al. (2024) and Markou et al. (2025), which confirm the importance of self-congruence and trust in the positive acceptance of AI-driven personalization.

However, several studies (; ;) warns of the paradox of privacy personalization: while consumers value relevance and customized content, excessive or intrusive personalization can cause embarrassment and reduce trust, negatively impacting engagement and loyalty. The joint results suggest that balancing personalization with ethics, transparency, and privacy protections is key. In other words, algorithmic personalization in digital marketing shows a high potential to increase engagement and loyalty, but its effectiveness depends on a careful balancing of technological sophistication, ethics, and an emotional approach to consumers.

Based on this analysis, guidelines have been formulated that provide practical insights for marketers and at the same time point to the directions of future research in this rapidly growing field. The studies point to key recommendations that can improve digital marketing strategies in the future:

1. Developing emotionally and psychologically intelligent AI systems (algorithms need to understand the identity, values, and preferences of users in order for content to be relevant and engaging).
2. Transparent and ethical data management (incorporating a consent-based approach and clear communication about the use of data increases trust and long-term loyalty).

3. Balancing personalization and unobtrusiveness (over-personalization can cause discomfort, while moderate and relevant personalization leads to optimal engagement).
4. Use of advanced analytics and predictive models (AI can accurately identify consumer needs and preferences, but the implementation must be carefully designed to avoid negative effects).
5. Focus on cultural and demographic differences (strategies should be adaptable to different market segments, taking into account local privacy norms and consumer expectations).

CONCLUSION

The aim of this study was to analyze the impact of algorithmic personalization in digital marketing on consumer engagement, trust, and loyalty through a systematic review of the literature and a comparative analysis of available studies. By applying the systematic review methodology and the PRISMA framework, ten relevant papers published in the period 2024–2026 were identified, which were analyzed by key dimensions of personalization and its effect on consumer behavior.

The results clearly show that algorithmic personalization in digital marketing has a significant impact on consumer engagement and loyalty, but the success of strategies depends on a careful balancing of technical sophistication, content relevance, and ethical data management. The results show that relevant, timely and emotionally appealing content encourages user interaction, strengthens trust in the brand and increases the propensity to buy, while self-congruence and emotional connection further enhance engagement and loyalty.

However, the analysis also highlights the paradox of privacy personalization: while consumers value personalized content, excessive intrusiveness or non-transparent use of data can reduce trust and negatively impact engagement. Transparency, ethical approach and protection of user privacy are key intermediary factors in achieving long-term loyalty. Furthermore, cultural and demographic differences highlight the need for adaptive strategies that respond to specific consumer preferences and expectations.

The analysis suggests that a combination of AI-driven personalization, emotionally intelligent content, and responsible data management is the optimal approach to increase engagement and loyalty. For future research, further evaluation of different levels of personalization, the influence of cultural and demographic variables, and experimental verification of the interaction between technical and psychological factors is recommended.

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PREGLEDNI NAUČNI RAD / REVIEW SCIENTIFIC PAPER

CRYPTOCURRENCY ADOPTION ACROSS ECONOMIES: A COMPARATIVE ANALYSIS OF MACROECONOMIC, TECHNOLOGICAL, REGULATORY, AND INSTITUTIONAL DETERMINANTS

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Abstract: *This paper examines the determinants of cryptocurrency adoption across developed and emerging economies with the objective of identifying the key economic, technological, institutional, and regulatory factors influencing digital financial market development. The research is based on a structured literature review methodology that includes recent scientific publications, institutional reports, and industry analyses related to cryptocurrencies, blockchain technologies, stablecoins, and decentralised finance (DeFi). The study analyses how macroeconomic instability, technological readiness, institutional trust, and regulatory frameworks shape cryptocurrency adoption across countries and regions. The findings indicate that cryptocurrency adoption is particularly significant in economies affected by inflation, currency instability, and limited access to traditional financial services, where cryptocurrencies and stablecoins increasingly function as alternative financial mechanisms and payment solutions. In contrast, developed economies demonstrate stronger institutional participation, more advanced digital infrastructure, and clearer regulatory frameworks supporting cryptocurrency market integration. The study also highlights the growing importance of stablecoins, DeFi systems, and international regulatory initiatives in shaping contemporary digital financial ecosystems. The paper concludes that cryptocurrency adoption is strongly influenced by the interaction of macroeconomic conditions, technological development, institutional trust, and regulatory readiness, which together explain substantial regional differences in global digital financial transformation.*

Keywords: *cryptocurrency adoption, macroeconomic factors, technological readiness, regulatory frameworks, institutional trust*

JEL Classification: *E42, G15, G28, O33*

INTRODUCTION

The rapid advancement of digital technologies and the globalization of financial markets have accelerated the adoption of cryptocurrencies across developed and emerging economies (Bhimani et al., 2021). Cryptocurrencies are decentralized digital assets that enable transactions, fund transfers, and value storage through blockchain-based systems without direct control from central banks or governments (Alqaryouti et al., 2020). Although cryptocurrencies are often associated with speculative investment behaviour and high market volatility (Panetta, 2023), their increasing adoption suggests that their role is expanding toward broader financial and economic applications.

The emergence and expansion of cryptocurrencies are closely linked to financial instability and technological transformation. The global financial crisis of 2008 weakened confidence in traditional financial institutions and stimulated interest in decentralized financial systems based on technological innovation (Rejeb et al., 2021). In this context, Satoshi Nakamoto introduced *Bitcoin: A Peer-to-Peer Electronic Cash System* in 2008, presenting Bitcoin as the first decentralized peer-to-peer payment system (Nakamoto, 2008). Over time, cryptocurrencies evolved into a global financial phenomenon supported by the transformative potential of blockchain technology, which enables decentralized transaction validation, transparency, and enhanced cybersecurity within digital ecosystems (Mbaye, 2021). Blockchain is therefore increasingly recognized as a disruptive innovation capable of reshaping financial services and broader business models (Chen et al., 2022).

Cryptocurrency markets expanded further during the COVID-19 pandemic, which accelerated the digitalization of economic and social activities worldwide. Increased market volatility and uncertainty stimulated interest in alternative financial assets, including cryptocurrencies (Pelagidis & Kostika, 2022; Apostu et al., 2022). Recent research additionally suggests that inflation, currency depreciation, and declining trust in traditional monetary systems may encourage economic actors to redirect capital toward cryptocurrencies as alternative mechanisms for preserving value and facilitating financial transactions (Choi et al. 2024; Basu, 2025). Nevertheless, despite their potential advantages, cryptocurrencies continue to raise important financial, technological, and regulatory concerns related to consumer protection, institutional legitimacy, and regulatory clarity (Phillips et al., 2023).

Despite the growing relevance of cryptocurrencies and blockchain technologies, empirical research comparing cryptocurrency adoption across countries and regions remains limited. Existing studies mainly focus on technological, investment, or regulatory aspects separately, while less attention has been devoted to the combined influence of macroeconomic factors (MF), technological readiness (TR), institutional trust (IT), and regulatory frameworks (RF) on cryptocurrency adoption (CA). Accordingly, this study examines how these factors shape cryptocurrency adoption across developed and emerging economies through the following research questions:

- **RQ1:** How does cryptocurrency adoption (CA) differ between developed and emerging economies?
- **RQ2:** To what extent do macroeconomic factors (MF) and technological readiness (TR) influence cryptocurrency adoption across countries and regions?
- **RQ3:** How do regulatory frameworks (RF) and institutional trust (IT) shape the development and adoption of cryptocurrency markets?

By addressing these questions, the paper aims to identify the key determinants influencing cryptocurrency adoption within the global digital economy. The remainder of the paper is structured as follows: Section 2 presents the literature review, Section 3 outlines the research methodology and data sources, Section 4 discusses the results related to cryptocurrency adoption trends, institutional trust, and regulatory frameworks, while the final section summarizes the main findings, implications, and directions for future research.

LITERATURE REVIEW

The adoption of technological innovations varies across organizations, industries, and national economies depending on institutional structures, economic conditions, and technological capabilities (Wang et al., 2020). Similar patterns are evident in cryptocurrency and blockchain adoption, where countries differ significantly in their readiness to integrate decentralized financial technologies into existing economic systems. Previous research has primarily focused on the technological characteristics of blockchain systems, while comparatively less attention has been devoted to the determinants of cryptocurrency adoption (CA) across countries (Bhimani et al., 2021; Kouhizadeh et al., 2021; Schlecht et al., 2021). Following the introduction of Bitcoin in 2008 and Ethereum in 2015, cryptocurrency markets expanded rapidly and enabled the development of decentralized finance (DeFi) ecosystems, increasing the integration of crypto-assets into global financial systems (Aquilina et al., 2025). Recent valuation-oriented research additionally emphasizes that decentralized blockchain platforms such as Ethereum increasingly derive value not only from transaction activity, but also from monetary premium effects, network expansion potential, and technological optionality embedded within decentralized financial ecosystems (Kovšca et al., 2026).

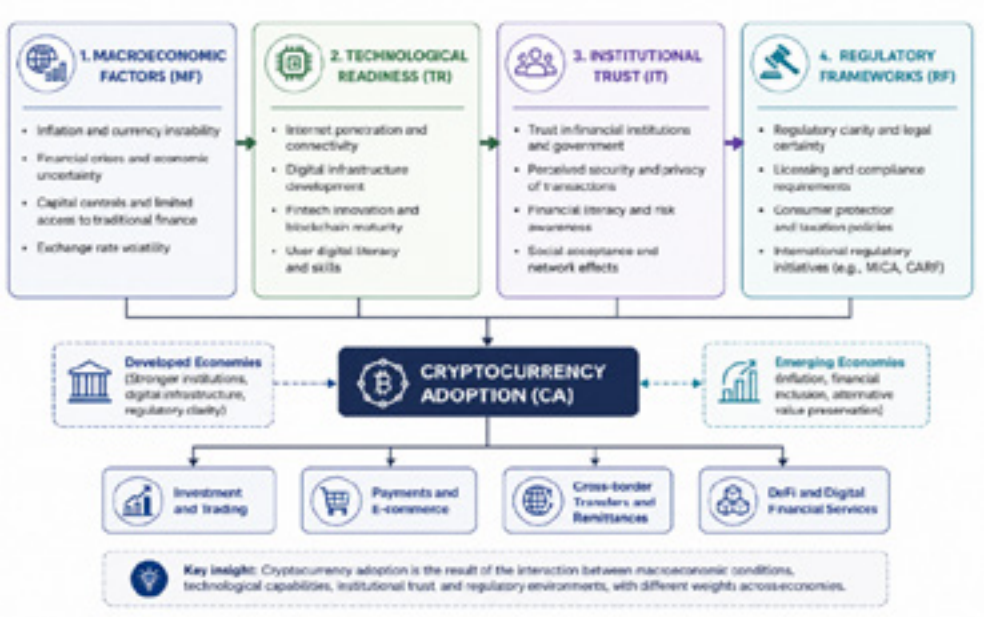
The multidimensional nature of cryptocurrency adoption can additionally be interpreted through broader innovation adoption theories, particularly the Technology-Organization-Environment (TOE) framework and Institutional Theory, which emphasize the interaction between technological capabilities, institutional environments, and regulatory conditions in shaping technological diffusion.

Existing studies suggest that cryptocurrency adoption is shaped by the interaction of macroeconomic factors (MF), technological readiness (TR), institutional trust (IT), and regulatory frameworks (RF) across developed and emerging economies (Bodkhe et al., 2020; Stockburger et al., 2021). Macroeconomic instability, inflation, and currency depreciation often encourage cryptocurrency adoption as an alternative mechanism for preserving value and conducting financial transactions (Blau et al., 2021; Conlon et al., 2021; Marthinsen & Gordon, 2022; Choi et al.,2024, Aman et al., 2025). In developed economies, cryptocurrency adoption is more commonly associated with technological innovation, institutional participation, and speculative investment motives (Enajero, 2021; Mahmood & Aslam, 2018). Technological readiness (TR) also represents an important determinant of cryptocurrency adoption, as countries with advanced digital infrastructure and higher levels of digital inclusion demonstrate greater capacity to integrate digital financial technologies into everyday activities. The broader expansion of digital platform economies and virtual monetization models, particularly within gaming and online ecosystems, additionally contributes to the normalization of digital assets, virtual transactions, and alternative payment mechanisms among con-

sumers (Kovšca et al., 2023). Regulatory frameworks (RF) and institutional trust (IT) further influence cryptocurrency market development. Supportive regulations may encourage innovation and strengthen consumer confidence, whereas restrictive or unclear regulations can discourage adoption (Mishra & Varshney, 2024). Similarly, lower trust in governmental institutions and traditional financial intermediaries may increase interest in decentralized financial systems (Umair et al., 2025). Recent global trends additionally confirm substantial regional differences in cryptocurrency adoption (CA), where developed economies demonstrate stronger institutional participation and regulatory clarity, while emerging economies exhibit faster adoption driven by inflationary pressures, stablecoin usage, and financial inclusion needs (CoinDesk Data, 2026).

Figure 1 presents the conceptual framework underlying the study, highlighting the multidimensional interaction between macroeconomic, technological, institutional, and regulatory determinants of cryptocurrency adoption across developed and emerging economies.

Figure 1. Conceptual framework: Determinants of cryptocurrency adoption across economies



Source: Authors

RESEARCH METHODOLOGY

This study applies a qualitative research approach based on a structured literature review (SLR) to examine the determinants of cryptocurrency adoption (CA) across developed and emerging economies. The methodology enables a systematic synthesis and critical evaluation of scientific knowledge related to cryptocurrencies, blockchain technologies, and the economic, technological, institutional, and regulatory factors influencing their adoption. To strengthen the comparative analysis, the study incorporates both academic literature and secondary data from institutional reports published by Chainalysis, CoinDesk Data, the Bank for International Settlements

(BIS), the Organisation for Economic Co-operation and Development (OECD), and the European Central Bank (ECB).

The literature search was conducted using the databases Web of Science and Scopus, complemented by Google Scholar and ResearchGate. The search strategy included keywords such as "cryptocurrency", "blockchain technologies", "digital assets", "cryptocurrency adoption", "financial technology", "regulation", and "institutional trust", while the review focused on studies published between 2020 and 2025. The screening process included title review, abstract review, and full-text assessment. As presented in Table 1, 40 studies meeting the predefined criteria were retained for the final analysis.

Table 1: Study Selection Process for the Structured Literature Review

Review Stage	Number of Records
Records identified through database searching	1,240
Duplicate records removed	230
Records screened	1,010
Records excluded after title and abstract review	780
Full-text articles assessed for eligibility	230
Studies included in the final structured literature review	40

Source: Author's

The inclusion criteria comprised peer-reviewed journal articles, conference papers, reports, and doctoral dissertations examining cryptocurrency adoption or blockchain implementation from economic, technological, institutional, or regulatory perspectives. Non-scientific publications, duplicate records, inaccessible full texts, and highly technical studies without practical relevance were excluded. The selected literature was categorized into four thematic dimensions aligned with the conceptual research framework: macroeconomic factors (MF), technological readiness (TR), regulatory frameworks (RF), and institutional trust (IT). In addition, a basic quality assessment and risk of bias evaluation were conducted based on peer-review status, methodological transparency, empirical grounding, and relevance to the research objectives.

RESULTS AND DISCUSSION

State and Trends of Cryptocurrency Adoption Across Countries

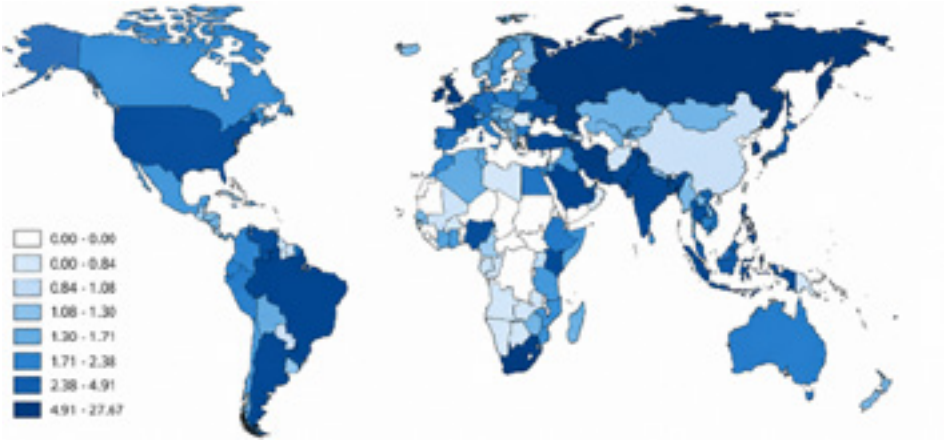
The literature review indicates that cryptocurrency adoption (CA) differs significantly across countries and regions, directly addressing RQ1. These differences are shaped by macroeconomic conditions (MF), technological readiness (TR), regulatory frameworks (RF), and institutional development. Emerging economies are more likely to adopt cryptocurrencies in response to inflation, currency instability, and limited access to traditional financial services. Argentina represents a notable example, where inflation and currency depreciation increased the use of cryptocurrencies and stablecoins such as Tether (Garita et al., 2024), while El Salvador adopted Bitcoin as legal tender to promote financial inclusion, although everyday usage remained limited (Goldbach & Nitsch, 2024). In contrast, African countries continue to face challenges related to internet accessibility, regulatory uncertainty, and cryptocurrency volatility (Mbaye,

2021), whereas Japan and South Korea have focused on institutional supervision and regulatory integration of cryptocurrency markets.

Although prior studies generally associate cryptocurrency adoption with macroeconomic instability, evidence from several developed economies suggests that speculative investment motives and institutional participation may represent equally important drivers.

The literature additionally emphasizes that the rapid expansion of cryptocurrency markets has increased exposure to financial crime and regulatory circumvention, reinforcing the need for harmonized regulatory and accounting frameworks (Blahušiaková, 2022; Juhaida Johari et al., 2020). Estonia represents a notable example where ring-fencing and swarming exposed weaknesses in regulatory oversight and institutional control (Ylönen et al., 2024). Figure 2 further supports RQ1 by demonstrating that higher cryptocurrency adoption is present not only in developed economies but also in emerging markets characterized by economic instability, rapid digital transformation, and declining trust in traditional financial systems.

Figure 2: Global Distribution of Cryptocurrency Ownership in 2022



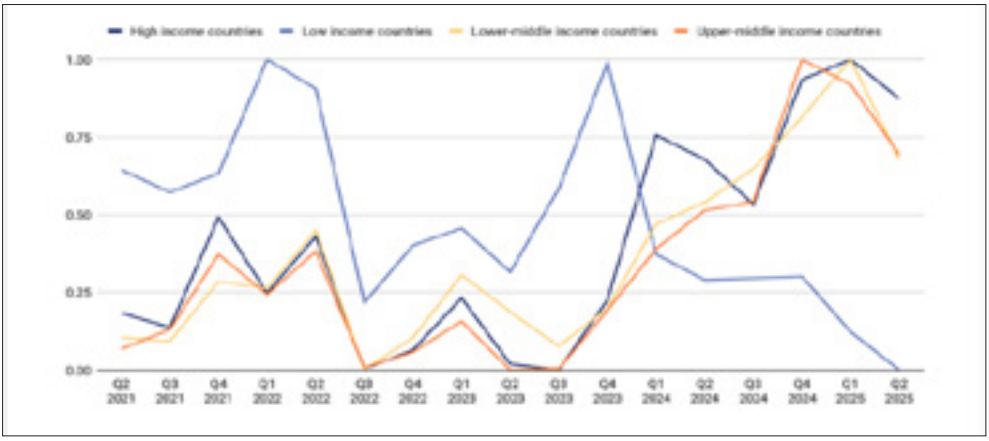
Source: Sergio & Wedemeier, 2025

Figure 3 complements this geographical perspective by presenting the evolution of cryptocurrency adoption across different country income groups between Q2 2021 and Q2 2025 using the Global Crypto Adoption Index developed by the Chainalysis research team (2025). The index is based on four sub-indices measuring the use of cryptocurrency services across 151 countries and is adjusted for population size and purchasing power. Index values range from 0 to 1, where values closer to 1 indicate higher levels of cryptocurrency adoption.

Figure 3 presents cryptocurrency adoption trends across different country income groups between Q2 2021 and Q2 2025 using the Global Crypto Adoption Index developed by Chainalysis (2025). The findings indicate that cryptocurrency adoption increased across high-income, upper-middle-income, and lower-middle-income economies after 2023. Stronger growth is particularly visible in countries such as China, Brazil, Argentina, India, Nigeria, and Pakistan, where cryptocurrency adoption is asso-

ciated with inflation, limited access to traditional financial services, expanding digital infrastructure, and increasing use of alternative payment methods. In contrast, developed economies demonstrate more stable adoption patterns supported by stronger institutional participation, developed financial markets, and clearer regulatory systems. Together, Figures 2 and 3 support RQ1 and RQ2 by indicating that cryptocurrency adoption is influenced by the interaction of economic conditions, technological readiness, and institutional development across countries and regions. These findings additionally suggest that cryptocurrency adoption cannot be explained solely through inflationary pressures, but rather through the interaction between technological maturity, regulatory legitimacy, and financial system development.

Figure 3: Index score by country income bracket (Q2 2021–Q2 2025)



Source: Chainalysis Team, 2025

Table 2 provides a structural overview of cryptocurrency market development across regions. The table supports RQ1 and RQ2 by presenting indicators related to market activity, institutional participation, regulatory readiness, and user adoption. CeFi trading share reflects cryptocurrency market activity, stablecoin flow share indicates the use of digital assets in transactions and cross-border payments, while exchange-traded product assets under management (ETP AUM) measure institutional participation and investor confidence. Stablecoin laws and licensing frameworks represent regulatory readiness, whereas cryptocurrency ownership rates indicate the level of user and business adoption across developed and emerging economies.

Table 2: Comparative Overview of Cryptocurrency Adoption Across Regions

Region	CeFi Trading	Stablecoin Flows	ETP AUM	ETP Presence	Stablecoin Regulation	Licensing Frameworks	Crypto Ownership
North America	$1.6T	$5.18T	$158B	Yes	Yes	64	11.0%
Asia	$3.0T	$12.5T	$1.5B	Yes	Yes	76	8.82%
EU	$2.1T	$5.62T	$6B	Yes	Yes	78	3.80%
LATAM	$2.0T	$5.64T	$0	No	No	34	8.00%

Region	CeFi Trading	Stablecoin Flows	ETP AUM	ETP Presence	Stablecoin Regulation	Licensing Frameworks	Crypto Ownership
Africa & Middle East	$1.4T	$4.8T	$0	No	Yes	27	7.70%
UK	$143.5B	$2.46T	$11.6M	Yes	No	19	5.74%

Source: Authors according to CoinDesk Data - The 2026 Global Digital Asset Adoption Index

The findings reveal substantial regional differences in cryptocurrency market maturity. Asia records the highest market activity, particularly in stablecoin flows and CeFi trading volume, while North America demonstrates the greatest institutional depth due to high ETP assets under management. The European Union shows comparatively high regulatory readiness through licensing frameworks and legal support for stablecoins. In contrast, Latin America exhibits relatively high cryptocurrency ownership despite lower institutional participation, suggesting that adoption is strongly influenced by inflationary pressures and practical financial needs. Africa and the Middle East also demonstrate increasing adoption supported by stablecoin usage and expanding digital financial activity, although institutional participation and regulatory structures remain less developed. Overall, the results indicate that cryptocurrency adoption is shaped by the interaction of macroeconomic conditions, technological readiness, institutional participation, and regulatory frameworks across regions.

Institutional Trust and Regulatory Frameworks

The findings additionally indicate that institutional trust (IT) and regulatory frameworks (RF) represent important determinants of cryptocurrency adoption, thereby directly contributing to RQ3. Previous research emphasizes that trust, privacy, and financial literacy significantly influence cryptocurrency acceptance within business environments. Palos-Sanchez et al. (2021) identified trust as a key determinant affecting perceptions of privacy, while García-Monleón et al. (2023) argue that cryptocurrency adoption is shaped by both financial value and users' knowledge and familiarity with cryptocurrencies. Similarly, Zamora-Pérez (2026) highlights that cryptocurrency owners and payment users demonstrate different behavioural profiles, whereas Ursu et al. (2025) emphasize the importance of financial and technological knowledge for entrepreneurial openness toward cryptocurrency adoption. Collectively, these findings underline the importance of institutional trust, financial literacy, perceived security, and regulatory clarity in strengthening broader cryptocurrency adoption.

Alongside institutional trust, regulatory frameworks constitute another critical determinant of cryptocurrency market development. The rapid growth of blockchain technologies and cryptocurrencies has exposed limitations within existing legal and regulatory systems, particularly regarding consumer protection, accounting treatment, and legal oversight (Benson et al., 2024; Wronka, 2024; Niftaliyev, 2023). Hubbard (2023) notes that specific United States Generally Accepted Accounting Principles (US GAAP) guidelines for crypto-assets still do not exist, resulting in cryptocurrencies often being classified as intangible assets or goodwill.

In response to the growing importance of digital assets, the European Union introduced the Markets in Crypto-Assets Regulation (MiCA) aimed at strengthen-

ing investor protection and reducing regulatory gaps within the European financial system (Zetzsche et al., 2025). MiCA establishes a harmonized framework for crypto-asset markets and regulates crypto-asset issuers and Crypto-Asset Service Providers (CASPs), including asset-referenced tokens, e-money tokens, and utility tokens (Xiong & Lou, 2024). Alongside MiCA, the revised Transfers of Funds Regulation introduced additional requirements concerning the traceability of cryptocurrency transactions (Xiong & Lou, 2024). Nevertheless, MiCA has been criticized for relying heavily on legal mechanisms originally developed for traditional securities markets, which may limit its effectiveness in addressing the specific characteristics of crypto-assets (Barczentewicz & De Gândara Gomes, 2024). Comparative research additionally demonstrates substantial differences in national regulatory approaches toward crypto-assets. Wronka (2024) emphasizes that the United Kingdom has adopted a more principles-based regulatory framework focused on innovation and industry growth, whereas Germany applies a more cautious and prescriptive approach prioritizing investor protection and market stability. Furthermore, unresolved issues related to taxation and accounting treatment continue to represent important challenges for broader institutional integration and market stability (Halász, 2024).

According to the OECD (2023), the rapid expansion of crypto-asset markets and cross-border digital transactions has additionally increased challenges related to tax transparency and international financial supervision. In response, the OECD introduced the Crypto-Asset Reporting Framework (CARF) aimed at establishing standardized international rules for the automatic exchange of information related to crypto-asset transactions between tax authorities.

Beyond regulatory concerns, cryptocurrencies also involve operational and security-related risks, including hacking attacks, financial losses, and illicit activities (Luchkin AG et al., 2020). However, cryptocurrencies and blockchain technologies simultaneously provide important advantages such as lower transaction costs, increased efficiency, broader customer access, enhanced transaction security, and support for innovative business models and startup financing (Kharis & Giurgiu, 2023; Fauzi et al., 2020; Rejeb et al., 2021). Overall, the findings suggest that cryptocurrency adoption is influenced by the combined effects of macroeconomic instability, technological readiness, institutional trust, and regulatory development across developed and emerging economies.

CONCLUSION

The findings of this study confirm that cryptocurrency adoption is shaped by the interaction of macroeconomic factors (MF), technological readiness (TR), institutional trust (IT), and regulatory frameworks (RF), with significant differences observable between developed and emerging economies. Cryptocurrency adoption is particularly significant in economies affected by inflation, currency instability, and limited access to traditional financial services, where cryptocurrencies and stablecoins increasingly function as alternative financial mechanisms and payment solutions. In developed economies, cryptocurrency adoption is more frequently associated with technological innovation, institutional participation, and speculative investment motives.

The findings additionally indicate that technological readiness, financial literacy, institutional trust, and regulatory clarity represent important prerequisites for

broader cryptocurrency adoption and long-term market development. At the same time, the rapid expansion of digital assets continues to raise challenges related to financial stability, tax transparency, consumer protection, and regulatory harmonization across countries and regions.

The main contribution of this paper lies in the integration of economic, technological, institutional, and regulatory perspectives into a comprehensive analytical framework explaining cryptocurrency adoption across countries and regions. The findings provide important implications for policymakers, financial institutions, and businesses by emphasizing the need for balanced regulatory frameworks, improved financial literacy, stronger investor protection, and greater institutional transparency in digital financial markets.

The findings additionally suggest that policymakers in emerging economies should focus on balancing innovation support with financial stability objectives, while developed economies may prioritize institutional integration and regulatory harmonization of digital assets. Consequently, cryptocurrency adoption should be understood as a multidimensional socio-economic and technological phenomenon rather than solely as a response to financial instability.

Several limitations of the study should nevertheless be acknowledged. The research is primarily based on secondary literature and institutional reports without the use of original empirical data. In addition, the rapid evolution of cryptocurrency markets and regulatory environments may affect the long-term stability of certain findings. Future research could therefore focus on empirical analyses conducted on specific industries, business sectors, and national markets in order to examine cryptocurrency adoption patterns, organizational behaviour, and regulatory adaptation in greater detail.

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STRUČNI RAD / PROFESSIONAL PAPER

UNFAIR COMPETITION IN EUROPEAN SUPER LEAGUE COMPANY CASE

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Abstract**:** *European Super League company case before the Court of Justice of the European Union will have a great impact on European economy, market and competition. The common rules on competition are one of the basic parts of the Treaty on functioning of the European Union. They provide prohibition of all actions that are incompatible with the internal market in the European Union. The very establishment of the Super League in football caused a lot of attention on the international level and triggered specific reactions from FIFA and UEFA. The decision of the Court of Justice of the European Union in this procedure is one of the first where the European Union market law and law on competition affects the sport in general. The most important parts of this decision, reflects not only on the legal aspects of sports in the European Union and the internal acts of international sports entities, but also deeply penetrates into commercial law and economic principles that affect the functioning of international sports competitions. For this reason, in this paper is used case study method for examining in-depth, detailed impact of this decision on internal market of the European Union.*

Keywords*: Super League company, FIFA, UEFA, Court of Justice of the European Union, unfair competition*

JEL classification: *K21*

INTRODUCTION

The creation of monopolies and unfair competition are not rare phenomena in the market and have become among the first to be subject to legal regulation and sanctions in Europe. According to the provisions of Paris Convention for the Protection of Industrial Property (Paris Convention, 1883), any act of competition contrary to honest practices in industrial or commercial matters constitutes an act of unfair competition (Article 10(2) of Paris Convention). Unlike perfect competition, whereby a large number of sellers operate in the market, a market structure of monopoly is characterised by the existence of one single producer of a product, who provides all the buyers in the market (Nevo-Ilan, 2007). Free competition between enterprises is considered the best means of satisfying

supply and demand in the economy and of serving the interests of consumers and the economy as a whole (World Intellectual Property Organisation, 1994). However, where there is competition, acts of unfair competition are liable to occur.

In accordance to the Treaty on the functioning of the European Union (Consolidated version of the Treaty on the functioning of the European Union, 2012), All agreements among undertakings, decisions made by business associations, and coordinated practices that could influence trade between Member States and aim to prevent, restrict, or distort competition in the internal market are forbidden (Article 101 of the Treaty on the functioning of the European Union). This specifically pertains to agreements that: directly or indirectly establish purchase or selling prices or other trading conditions; restrict or regulate production, markets, technical advancements, or investment; divide markets or sources of supply; impose different conditions on similar transactions with other trading parties, thus disadvantaging them competitively; condition the conclusion of contracts on the acceptance by other parties of additional obligations which, by their nature or under commercial norms, are unrelated to the subject of these contracts (Article 101(a, b, c, d, e) of the Treaty on the functioning of the European Union). These agreements or decisions are rendered null and void automatically. Any misuse by one or more companies of a dominant position within the internal market or in a significant portion of it are forbidden as inconsistent with the internal market to the extent that it may influence trade between Member States (Article 102 of the Treaty on the functioning of the European Union). The competition policy of European Union strives three goals: the effectiveness of the competition has to be maintained; the fair competition has to be ensured between the competitors; and it should conduce the uniting of separate markets to one free market through the harmonisation of their competition policies (Kukrus & Kaabel, 2004). In the European Union, unfair competition law is not fully harmonised, because the Unfair commercial practices Directive (Directive 2005/29/EC, 2005), harmonises the approach to unfair practices in business-to-consumer relations; the Directive on misleading and comparative advertising (Directive 2006/114/EC, 2006), sets forth harmonised rules in the field of advertising; and the protection of undisclosed know-how and business information has been harmonised in the Trade secrets Directive (Directive 2016/943, 2016), (Senftleben, 2024).

In the field of sports, the European Union aids in promoting European sports concerns, considering the unique aspects of sports, its foundations in voluntary involvement, and its social and educational roles (Article 165(1) of the Treaty on the functioning of the European Union). Therefore, the Treaty on the functioning of the European Union brings sport within the explicit reach of the founding treaties for the first time (García & Weatherill, 2012). The European Union's actions focus on, among other things, fostering the European aspect of sport by encouraging fairness and transparency in sporting events, fostering cooperation among sport governing bodies, and safeguarding the physical and moral integrity of sportsmen, particularly the youngest one (Article 165(2) of the Treaty on the functioning of the European Union). The European Union and its Member States promote cooperation with third countries and relevant international organisations in education and sport (Article 165(3) of the Treaty on the functioning of the European Union). The European Union institutions and Member States are supporting the economic aspect of sport through their policies and dialogue.

The European Commission consistently engages in Europe and globally to create a more economically dynamic society through sport, while emphasising the importance of reinforcing connections with sports organizations and enterprises.

The sport economy as a whole is not a separate statistically measured sector, but is part of various other industries and economic sectors. From an economic point of view, sport is an activity which has repercussions in many different areas of the economy (Kleissner & Grohall, 2015). There are cases of competition law decisions relating to sale of sports broadcasting, sale of tickets, sports betting, sale of sports equipment and sales of merchandise (For example: European Commission, 23 July 2003, Case 37.398, *Joint selling of the commercial rights of the UEFA Champions League*, OJ 2003 L 291/25; Case No. 1342/5/7/20 *Sportradar AG and Another v Football Data-Co Limited and Others*; on 4 June 2024, Ticombo, a ticketing marketplace, lodged an antitrust complaint with the European Commission alleging that UEFA abuses a dominant position with its football event ticket resale policy). The Decision of the European Union (Decision 2003/778/EC, 2003), relates to the rules, regulations and all implementing decisions taken by UEFA and its members concerning the joint selling arrangement regarding the sale of the commercial rights of the UEFA Champions League, a pan-European club football competition. In Decision it was concluded that UEFA's joint selling arrangement results in enhanced production and distribution by developing a quality branded league-centric product sold through a unified point of sale. Also, the joint selling of the media rights to the UEFA Champions League by UEFA is unlikely to eliminate competition in respect of a substantial part of the media rights in question. UEFA is the exclusive, absolute legal and beneficial owner of the commercial rights in all competitions. In Europe, the monopolistic tendency is prevalent in professional sports, where a pyramid structure is often employed with the governing body positioned at the apex, enjoying sole oversight over their respective sports' international or national competitions (https://rb.gy/p2u0jn, 2025). Consequently, the parties interested in the sports industry have a monopoly on sporting events and tournaments, which leads to the deprivation of other parties from competition and the provision of competitive prices and a better product, and as a result, the parties that acquire the rights of these events monopolise these sporting events and the spectators (Kisswani, 2020).

This issue has come to the forefront of the attention of a company founded at the initiative of some of the biggest football clubs in Europe, with the aim of challenging the dominant position of the Federation of International Football Associations and the Union of European Football Associations. The European Super League was established in accordance with national regulations in Spain, at the initiative of a group of established professional football clubs in Spain (Atletico Madrid, Barcelona, Real Madrid), Italy (Milan, Inter, Juventus), and the United Kingdom (Arsenal, Chelsea, Liverpool, Manchester City, Manchester United, Tottenham). European Super League company intended to launch a project for a new international professional football competition called the Super League. To this end, the establishment of three more companies was planned, responsible first for the financial, sporting and disciplinary management of the Super League after its launch, then for the use of audiovisual rights associated with this competition, and finally for the exploitation of other commercial assets associated with this competition.

The establishment of such a competition caused stormy reactions from football organisations at the European (the Union of European Football Associations) and world level (the Federation Internationale de Football Association). The Federation Internationale de Football Association is a private association founded in Paris in 1904, registered in the Commercial Register in Zurich in accordance with Swiss regulations, with its headquarters in Zurich. The tasks of the Federation Internationale de Football Association (FIFA) include the promotion of football, the organisation of its own international competitions and the drawing up of rules and regulations governing football. The Federation Internationale de Football Association (FIFA) has 211 member associations and has recognised six existing confederations. The Union of European Football Associations is a private association, founded in Switzerland in 1954, registered in the Commercial Register of Vaud in Switzerland, in accordance with its regulations. Its headquarters are in Nyon, Switzerland, and it is a non-profit, public interest, politically and religiously neutral entity. Its governing bodies are the UEFA Congress, the UEFA Executive Committee, the UEFA President and the UEFA judicial bodies. In addition, there is an administrative body that manages, under the jurisdiction of the UEFA General Secretary. The Union of European Football Associations is one of six regional football confederations recognised by the Federation Internationale de Football Associations and has 55 affiliated European national associations. It is the governing body of football in Europe.

Because of the reactions of FIFA and UEFA, the European Super League company, initiated proceedings before the Commercial Court in Madrid, claiming that the rules of FIFA and UEFA on the approval of competition and the use of media rights are contrary to the regulations of the European Union. This Court in Madrid expressed certain doubts about this lawsuit, among other things, due to the fact that FIFA and UEFA have a monopoly on that market. Therefore, in order to resolve this issue, the Spanish court sent a request for preliminary proceedings to the Court of Justice of the European Union.

THE LAUNCH OF THE SUPER LEAGUE AND THE REACTIONS OF FIFA AND UEFA

Within the elite ranks of competitions in Europe, there has always been a tendency for the strongest clubs to participate, both because of the quality of the matches, adequate media attention and, of course, greater financial income from ticket sales and media rights. Thus, although there is a romantic myth that the European Cup was developed for sporting reasons, power, nationalism and money were also significant factors (Doidge, Nuhrat & Kossakowski, 2023). Ever since 1955, when the European Cup was founded as the strongest football club competition in Europe, there have been individual clubs that have participated by invitation (the champions of Poland, Scotland, Yugoslavia, the Netherlands, Austria, Switzerland, Portugal, Hungary did not participate, but teams by invitation). On 4 September 1955, the first match in the then newly formed competition was played between Sporting Lisbon and Partizan Belgrade, with a 3–3 draw. This competition, together with the national leagues, maintained and increased the power of elite clubs. The competition also reinvigorated the power of UEFA, which had been founded only a year earlier. In the following years and decades, this was reflected in the establishment of new competitions, the Inter-Cit-

ies Fairs Cup in 1955, the Cup Winners Cup in 1960, and the UEFA Cup in 1971. The European Cup was renamed the Champions League in 1992, while the Cup Winners Cup ceased to exist after 1999. The UEFA Cup was renamed the Europa League in 2009, and UEFA established a new competition, the Conference League, in 2021. This last competition is important for champions of countries that do not have a significant football tradition, economic power and quality, because if they are eliminated from the Champions League qualifiers, they have the opportunity to qualify for this consolation competition. However, according to the financial allocations, it is clear which competition is the most important. It is the Champions League that would be most affected by the establishment of the Super League, as a new elite competition in football.

The formation of a new elite football competition is the main goal of the Super League, i.e. the establishment of the first European competition independent of the Union of European Football Associations, which is held every year and in which football players and clubs of the highest sporting level participate, including clubs that are permanent members of the Super League and other clubs that qualify for that competition. This competition does not prevent the participation of participating clubs in their national competitions and domestic leagues. The founding clubs had previously notified FIFA and UEFA that they had established a new professional football competition. The other motivations behind the attempt for the formation of the Super League can be financial gain; financial security; familiarity with the closed league model; and the decline of competitive balance in European men's football (Brannagan, Scelles, Valenti, Inoue, Grix & Perkin, 2022).

On January 21, 2021, FIFA and UEFA issued a statement (https://rb.gy/4rkyed, 2025), in which they once again reiterated and strongly emphasised that such a competition would not be recognised by either FIFA or the confederation. Any club or player involved in such a competition would therefore be prohibited from taking part in any tournament organised by FIFA or the respective confederation. In accordance with the regulations of FIFA and the confederations, every competition must be organised or acknowledged by the appropriate authority at their respective level, with FIFA overseeing the global level and the confederations managing the continental level. In this regard, the confederations acknowledge the FIFA Club World Cup, both in its existing and revised format, as the sole worldwide club competition, whereas FIFA acknowledges the club competitions managed by the confederations as the exclusive continental club competitions. The fundamental principles of sporting merit, solidarity, promotion and relegation, and subsidiarity form the basis of the football pyramid that guarantees football's worldwide success and are thus incorporated in FIFA and confederation statutes. Football has a rich and prosperous history due to these foundations. Participation in continental and world competitions should always be achieved on the field.

This statement is further supported by a joint statement (https://tinyurl.com/2wwnpnn9, 2025), from UEFA, the English Football Association, the English Premier League, the Royal Spanish Football Federation, Spain's La Liga, the Italian Football Federation and Italy's Serie A, which emphasises the awareness that some English, Spanish, and Italian clubs might be preparing to declare the formation of a closed, Super League. It was emphasised that if this occurs, the signatories of the statement, along with FIFA and all its affiliates, will stay united in their attempt to halt this selfish initiative, which is driven by the self-interest of a small number of clubs when society

requires unity more than ever. Every possible measure will be taken into account, at every level, including judicial and sporting, to stop this from occurring. Football relies on transparent competitions and sporting achievement, and it must remain so. As stated earlier by FIFA and the six confederations, these clubs will be excluded from taking part in any other competitions at the domestic, European, or world level, and their players may be prohibited from representing their national teams. Appreciation was conveyed to clubs in other nations, particularly French and German clubs, that chose not to participate in this competition. An invitation was sent to all football enthusiasts, supporters, and politicians to unite in opposing such a project if it were to be revealed. It was noted that this ongoing personal interest of some individuals has lasted too long and needs to end.

It is for these reasons that the European Super League company filed a request for regular proceedings and a request for the determination of interim protective measures in *ex parte* proceedings against UEFA and FIFA.

PROCEEDINGS BEFORE THE COMMERCIAL COURT IN SPAIN

On April 18, 2021, an unfair competition dispute (Madrid Commercial Court no. 17, 20 April 2021, no. 14/2021, European Super League Company S.L.), was initiated before the Commercial Court No. 17 in Madrid, Spain, initiated by the company European Super League. Namely, this company filed an ordinary lawsuit and a request for exemption from the *inaudita parte* prohibition in antitrust matters against the Federation of International Football Associations (FIFA) and the Union of European Football Associations (UEFA). Already on April 20, 2021, the Commercial Court of Madrid issued an order confirming the interim measures regarding *inaudita parte* and determined that this issue be processed and referred to the Court of Justice of the European Union for preliminary ruling. The Commercial Court to which the request was addressed has determined the possibility of a FIFA and UEFA monopoly regarding the organisation and approval of international competitions. This is because FIFA and UEFA hold 100% of the market share in the organisation of international football competitions and have been organising and exploiting the market for organising football competitions with a monopoly for decades, enacting all regulations applicable to those competitions and assuming the authority to impose sanctions or disciplinary measures against clubs and players participating in those football competitions, as there is currently no competitor in the market for organising and operating football competitions. The Commercial Court stated that the regulations of FIFA and UEFA, along with the enforcement of sanctions and prohibitions linked to them, create a significant barrier to the inclusion of new contenders in the European market for international football club competitions and to the marketing of rights related to these competitions, which are not interchangeable, but inherently and functionally complementary. The Commercial Court highlighted that this monopoly leads to significant economic impacts, since FIFA, along with its member associations and confederations, are the initial proprietors of all rights stemming from the competition. This encompasses various financial rights, audiovisual and radio recordings, reproduction and television broadcasting rights, multimedia, marketing and promotional rights, as well as intangible rights like emblems and rights related to publication regulations. FIFA is assigning the associations and confederations sole responsibility for approving the distribution of the afore-

mentioned exploitation rights. The provision of these economic rights is unconditional and has no expiration.

PROCEEDINGS BEFORE THE COURT OF JUSTICE OF THE EUROPEAN UNION

The request for preliminary ruling was drawn up on the basis of Article 98(1) of the Rules of Procedure of the Court of Justice of the European Union and was lodged on 27 May 2021 (Case C-333/21, https://tinyurl.com/45jcuta5, 2025). In line with the stipulations of this article of the Rules of procedure, requests for pre-processing must be sent to the Member States in their original form, along with a translation into the official language of the state addressed. If required because of the request's length, this translation will be substituted by the translation of the request's summary into the official language of the state it is sent to and will serve as a basis for that state to take a position. The summary includes the complete text of one or more inquiries submitted for preliminary ruling. As specified in the request for a preliminary ruling, that summary particularly include the subject of the dispute in the main proceedings, the key arguments of the parties involved in those proceedings, a concise summary of the rationale for the request for a preliminary ruling, and the relevant case-law and provisions of both national and European Union law cited. In this court proceedings, the prosecutor asked for a ruling, arguing that FIFA and UEFA's resistance to the Super League is in fact a violation of anti-competitive agreements and an exploitation of their dominant market position regarding the organisation of international club football tournaments in Europe and the market for the commercialisation of rights associated with those competitions. The prosecutor initiated the adoption of provisional protective measures in order to facilitate the establishment and operation of the Super League.

The request for preliminary ruling is based on article 267 of the Treaty on the functioning of the European Union, which seeks the interpretation of articles 45, 49, 56, 63, 101 and 102 of the Treaty on the functioning of the European Union. The provisions of article 267 of the Treaty on the functioning of the European Union provide that the Court of justice of the European Union have jurisdiction to rule on preliminary questions concerning: 1) interpretation of the treaties and 2) validity and interpretation of acts of the institutions, bodies, offices or agencies of the European Union. Article 45 of the Treaty refers to the free movement of persons, services and capital, as it ensures the freedom of movement of workers within the European Union, while article 49 guarantees the right of establishment, i.e. prohibits restrictions on the freedom of establishment of citizens of one member state in the territory of another member state. Article 56 of the Treaty prohibits restrictions on the freedom to provide services within the European Union in relation to nationals of Member States who are established in another member state and not in the state of the person for whom the services are intended. Article 63 prohibits all restrictions on the movement of capital between Member States, as well as between Member States and third countries. Article 101 of the Treaty on the functioning of the European Union addresses competition rules, especially the conflict with the internal market and the ban on any agreements among companies, along with the rulings by associations of companies and coordinated actions that could influence trade among Member States, and are aimed at or result in preventing, limiting, or distorting competition within the internal market. Also, article

102 of the Treaty on the functioning of the European Union forbids any exploitation by one or more undertakings of a dominant position in the internal market or in a significant segment of it as long as it may influence trade among Member States.

The European Super League company stated that FIFA and UEFA have misused their dominant position by arbitrarily deciding to prohibit rival competitions and forcing clubs to relinquish rights to exploit the contests in which they take part. It has also noted that UEFA and FIFA hinder free market competition by enforcing unreasonable and excessive limitations on the Super League. FIFA and UEFA were ordered to stop anti-competitive behavior, to prevent such actions going forward, and to avoid taking any measures or actions, as well as making statements or announcements that (in)explicitly obstruct or hinder the planning of the Super League, its commencement and operation, including the involvement of clubs and players in it. According to the request, FIFA and UEFA must be barred from announcing or threatening, preparing, starting, and/or enforcing any disciplinary or punitive actions, either directly or via their associated members (such as national associations), confederations, licensed clubs, or national or domestic leagues (or from encouraging or promoting third parties to announce, threaten, prepare, start, and/or enforce such disciplinary or punitive actions), against clubs, their management and staff, and/or players involved in the Super League's preparation and participation, specifically ensuring they do not exclude these clubs and/or players from any international or national competition they regularly enter or meet the standard requirements for. Due to all of the above, the European Super League company has requested that FIFA and UEFA to immediately eliminate all consequences of anti-competitive practices that occurred before or during the duration of this proceeding.

In this proceeding on 15 December 2022, the opinion was delivered by the independent lawyer Athanasios Rantos from Greece (https://tinyurl.com/dzmzwec9, 2025), who was re-elected Advocate General of the Court of Justice of the European Union on 21 April 2021 and whose engagement lasts from 7 October 2021 to 6 October 2027. He suggested to the Court of Justice of the European Union that articles 101 and 102 of the Treaty on the Functioning of the European Union should be understood in a manner that does not contradict articles 22 and 71-73 of the FIFA Statute, along with articles 49 and 51 of the UEFA Statute. This stipulates that the formation of a new pan-European club football tournament requires prior authorisation, as the significance of the anticipated competition means that the restrictive impacts of the aforementioned system are both intrinsic and appropriate for attaining UEFA and FIFA's legitimate goals, which are associated with the distinct nature of sport. Articles 101 and 102 of the Treaty on the functioning of the European Union should be understood as not preventing FIFA and UEFA, their member associations, or national leagues from threatening sanctions on clubs belonging to those associations when those clubs engage in a project to create a new pan-European club football competition, which might endanger the legitimate goals of the mentioned federations. Nevertheless, the sanctions of exclusion imposed on players who are not involved in the specific project are excessive, especially concerning their removal from national teams, Articles 101 and 102 of the Treaty on the functioning of the European Union must be interpreted in such a way that they do not conflict with articles 67 and 68 of the FIFA Statute, to the extent that restrictions relating to the exclusive commercialisation of rights relating to competitions organ-

ised by FIFA and UEFA are inherent in achieving legitimate objectives linked to the specificity of sport and are proportionate to those objectives. Furthermore, it is for the referring court to examine to what extent the exemption provided for in article 101(3) of the Treaty on the functioning of the European Union can be applied to the members in question, i.e. whether there is an objective justification for that conduct within the meaning of article 102 of the Treaty on the functioning of the European Union. Articles 45, 49, 56 and 63 of the Treaty on the functioning of the European Union must be interpreted in such a way that they are not in conflict with articles 22 and 71-73 of the FIFA Statute, nor articles 49 and 51 of the UEFA Statute, which stipulate that creating a new pan-European club football tournament requires prior authorisation to the extent that this requirement is deemed suitable and essential for that aim, considering the unique characteristics of the proposed competition.

In its judgment issued on December 21, 2023 (https://tinyurl.com/4ysf622m, 2025), the Court of Justice of the European Union has found that the practice of sport, given that it constitutes an economic activity, is covered by the provisions of the European Union law applicable to such activities. Having regard to the objectives of the Union, the practice of sport is subject to EU law only in so far as it constitutes an economic activity within the meaning of the Treaty (C-36/74 - Walrave and Koch v Association Union Cycliste Internationale and Others, 12.12.1974). Also, freedom of movement for workers, regulated under the Treaty, extends not only to the actions of public authorities but also to rules of any other nature aimed at regulating gainful employment in a collective manner. A professional football charter of the national football federation falls within this scope if the charter has the status of a national collective agreement (C-325/08 - Olympique Lyonnais SASP v Olivier Bernard and Newcastle UFC, 16.3.2010.).

Only certain special rules are adopted solely for specific non-economic reasons. They relate to the issues that concern only sport as such, particularly those relating to the exclusion of foreign players from teams participating in competitions between their national teams or the determination of classification criteria, used for the selection of sportsmen in individual sports (C-415/93, Union royale belge des sociétés de football association ASBL v Jean-Marc Bosman, Royal club liégeois SA v Jean-Marc Bosman and others and Union des associations européennes de football (UEFA) v Jean-Marc Bosman, 15.12.1995.). This proceeding indicates that the Treaty prohibits: 1) the enforcement of rules established by sports associations, which dictate that a professional footballer, who is a citizen of one Member State, cannot be hired by a club from another Member State after their contract ends unless the new club compensates the previous club with a transfer, training, or development fee; and 2) the enforcement of regulations set by sports associations that limit the number of professional players from other Member States that football clubs can field in matches within their organised competitions.

In addition to these special rules, adopted by sports associations, which regulate the paid employment or provision of services of professional or semi-professional players, there are other rules which do not formally regulate such work or provision of services. Nevertheless, they directly affect them and may be covered by the provisions of the Treaty on the functioning of the European Union, relating to the free movement of persons, services and capital (article 45), as well as by the provisions prohibiting restrictions on the freedom to provide services (article 56). Additionally, the

rules concerning such associations may fall under the provisions that protect the right of establishment (article 49), and these associations might be regarded as undertakings according to the rules related to competition (article 101) and the abuse of a dominant position within the internal market (article 102). The rules adopted by associations and their actions are covered by the provisions of the Treaty on the functioning of the European Union. They relate to competition rules, when the conditions for the application of those provisions are met. Since such rules are covered by the aforementioned provisions of the Treaty on the functioning of the European Union in case they contain requirements applicable to individuals, they should be designed and implemented in compliance with the general principles of European Union law, particularly the principles of non-discrimination and proportionality (Zglinski, 2022).

Article 165(1) of the Treaty on the functioning of the European Union provides, *inter alia*, that the Union shall contribute to promoting the European dimension of sport, taking into account the specific nature of sport, its structures based on voluntary activity, and its social and educational function. Pursuant to the stipulations of paragraph 2 of this article of the Treaty, the European Union's actions shall focus on enhancing the European aspect of sport by fostering fairness and transparency in sports events and cooperation among sport governing bodies. It also seeks to safeguard the physical and moral integrity of sportsmen, particularly the youngest female in sport. As stated in paragraph 3 of this article of the Treaty, the European Union and its Member States shall promote cooperation with third countries and relevant international organisations in the areas of education and sport, especially with the Council of Europe. According to the Court of Justice of the European Union, the provisions of this article of the Treaty on the functioning of the European Union must be interpreted in accordance with the provisions of article 6 of the Treaty, which provides that the European Union is competent to take action to support, coordinate or supplement the action of the Member States. One domain of such activity at the European level encompasses education, vocational training, youth, and sports. While the relevant institutions of the European Union are to consider the diverse elements and objectives defined in article 165 of the Treaty, and based on that article, incentive measures or recommendations are adopted in the area of sport, it is not mandatory that those various elements and objectives, as well as those incentive measures and recommendations, are included or taken into account when applying the rules the interpretation of which the referring court seeks from the Court of Justice of the European Union. This applies irrespective of their connection to the freedoms concerning the movement of people, services, and capital (articles 45, 49, 56, and 63 of the Treaty), or competition rights (articles 101 and 102 of the Treaty). Even Article 165 of the Treaty cannot be viewed as a specific rule that wholly or partially excludes sports from other primary law provisions of the European Union, which may apply to it or impose special considerations on sports within that application.

When claimed that a rule, adopted by a sports association constitutes an obstacle to the freedom of movement of workers or an anti-competitive prohibited agreement, the consideration of that rule as an obstacle or anti-market prohibited agreement should in any case be based on a concrete examination of the content of the said rule in the actual context in which it is to be implemented. Such examination may include taking into account, for example, the nature, organisation or functioning of the sport in question

and, more specifically, its degree of professionalisation, the way it is dealt with, the way in which the different actors involved interact, and the roles played by the structures or bodies responsible for it at all levels and with which the European Union encourages co-operation in accordance with article 165(3) of the Treaty. Moreover, once it is determined that there exists an impediment to the freedom of movement of workers, the association which adopted the rule in question has the possibility of proving its justification, necessity and proportionality, based on specific objectives deemed legitimate.

Having made its final decision, the Court of Justice of the European Union has also assessed the provisions regarding: rules relating to the prior approval of inter-club football competitions and the participation of clubs and sportsmen in those competitions; the procedures under which clubs and sportsmen participating in unsanctioned competitions are threatened with sanctions; the way in which rules, such as those adopted by FIFA regarding the right to use the said competitions, should be understood; possibilities for justifying rules, which relate to the prior approval of competitions, as well as the participation of clubs and sportsmen in those competitions; freedom of movement.

Based on the above-mentioned positions, the Court of Justice of the European Union has decided that article 102 of the Treaty on the functioning of the European Union "must be interpreted as meaning that the adoption and implementation of rules by associations which are responsible for football at world and European levels and which pursue in parallel various economic activities related to the organisation of competitions, making subject to their prior approval the setting up, on European Union territory, of a new interclub football competition by a third-party undertaking, and controlling the participation of professional football clubs and players in such a competition, on pain of sanctions, where there is no framework for those various powers providing for substantive criteria and detailed procedural rules suitable for ensuring that they are transparent, objective, non-discriminatory and proportionate, constitutes abuse of a dominant position".

The Court ruled that article 101(1) of the Treaty on the functioning of the European Union "must be interpreted as meaning that the adoption and implementation, directly or through their member national football associations, of rules by associations which are responsible for football at world and European levels and which pursue in parallel various economic activities related to the organisation of competitions, making subject to their prior approval the setting up, on European Union territory, of a new interclub football competition by a third-party undertaking, and controlling the participation of professional football clubs and players in such a competition, on pain of sanctions, where there is no framework for those various powers providing for substantive criteria and detailed procedural rules suitable for ensuring that they are transparent, objective, non-discriminatory and proportionate, constitutes a decision by an association of undertakings having as its object the prevention of competition".

According to the Court, articles 101(3) and 102 of the Treaty on the functioning of the European Union "must be interpreted as meaning that rules by which associations which are responsible for football at world and European levels and which pursue in parallel various economic activities related to the organisation of competitions make subject to their prior approval the setting up, on European Union territory, of interclub football competitions by a third-party undertaking, and control the participation of professional football clubs and players in such competitions, on pain of sanctions, may benefit from

an exemption to the application of Article 101(1) of the Treaty on the functioning of the European Union or be considered justified under Article 102 of the Treaty on the functioning of the European Union only if it is demonstrated, through convincing arguments and evidence, that all of the conditions required for those purposes are satisfied".

Articles 101 and 102 of the Treaty must be interpreted as: 1) "not precluding rules laid down by associations which are responsible for football at world and European levels and which pursue in parallel various economic activities related to the organisation of competitions, inasmuch as they designate those associations as being the original owners of all of the rights emanating from competitions coming under their 'jurisdiction', where those rules apply only to competitions organised by those associations, to the exclusion of those which might be organised by third-party entities or undertakings"; 2) "precluding such rules in so far as they confer on those same associations an exclusive power relating to the marketing of the rights at issue, unless it is demonstrated, through convincing arguments and evidence, that all the conditions required in order for those rules to benefit, under Article 101(3) of the Treaty on the functioning of the European Union, from an exemption to the application of Article 101(1) of the Treaty on the functioning of the European Union and be considered justified under Article 102 of the Treaty on the functioning of the European Union are satisfied".

The Court ultimately ruled that article 56 of the Treaty on the functioning of the European Union "must be interpreted as precluding rules by which associations which are responsible for football at world and European levels and which pursue in parallel various economic activities related to the organisation of competitions make subject to their prior approval the setting up, on European Union territory, of interclub football competitions by a third-party undertaking, and control the participation of professional football clubs and players in such competitions, on pain of sanctions, where there is no framework for those rules providing for substantive criteria and detailed procedural rules suitable for ensuring that they are transparent, objective, non-discriminatory and proportionate".

This decision actually means that the ban on clubs by FIFA and UEFA from joining the Super League competition is not in accordance with European Union regulations, and that these two organisations have abused their dominant position. Therefore, the FIFA and UEFA rules, on which such a ban is based are not justified. According to this decision, a foundation such as the Super League, does not have to be approved, as the Court does not have jurisdiction over it. Although the Court unequivocally assesses the monopolistic behaviour of FIFA and UEFA, and requires both organisations to reconsider some of their restrictive practices, this decision also gives them the opportunity to provide a framework through which they can justify some of their own practices. To have control over access to football competitions, the statutes of FIFA and UEFA must be changed to ensure transparency and fairness for participants. Non-competition provisions must be proportionate and limited to what is absolutely necessary for the existence of FIFA and UEFA competitions. If the statutes can legally reflect these requirements, FIFA and UEFA could retain control over competitive projects. The Court of Justice has ruled that FIFA and UEFA rules on the use of media rights may hinder the exploration of new, potentially innovative and interesting competitions. New and innovative competition projects could improve the financial situation of professional football clubs and offer viewers a more diverse range of options.

CONCLUSION

The decision of the Court of Justice of the European Union is one of the first to deal with the relationship between European Union law and sports law. It is significant in several aspects, since it does not only reflect on the legal aspects of sport in the European Union and the internal acts of international sports entities, but also deeply delves into commercial law and economic principles that influence the functioning of international sports competitions. This decision applies to football competitions, but may also apply to other sports that have the same or similar organisation.

The decision does not affect the right of international sports organisations such as FIFA and UEFA to organise their competitions, based on the acts and rules they have adopted. However, these rules must be transparent, objective, non-discriminatory and proportionate. Accordingly, they cannot restrict other organisations from creating new competitions by abusing their dominant position. This is actually done by the rules of FIFA and UEFA, which, through (dis)approval, control and sanctions, prevent fair competition that could offer appropriate competitive conditions for football competitions. These rules allow discretionary powers that block the establishment of alternative competition under threat of sanctions and are contrary to European Union competition law, in particular articles 101 and 102 of the Treaty on the functioning of the European Union.

According to the Court of Justice of the European Union the adoption of rules on the prior approval of competitions and on the participation of clubs and players is legitimate under European Union regulations, in order to achieve the purpose of guaranteeing the homogeneity and coordination of these competitions within the overall calendar of matches, as well as to promote and maintain sports competitions based on equal opportunities and merit. However, the rules on prior approval and participation, including the related sanction regime, must be subject to limitations, obligations and review that can eliminate the risk of abuse of a dominant position. In this regard, it is necessary to establish a framework for substantive criteria and detailed procedural rules to ensure that they are transparent, objective, precise and non-discriminatory.

This decision does not necessarily affect the possibilities that FIFA and UEFA have when organising international football competitions, but their rules must be adapted to the legal framework established in the European Union. The economic characteristics of these football competitions are clearly recognised and fall unequivocally within the remit of European Union regulations. The boundaries of these regulations significantly touch upon the field of sports law, which clearly shows that it is a matter of regulating complex, global economic industries. This decision, together with the one that established the so-called Bosman rule, affects the way in which European Union regulations might interact with a global industry, which football undoubtedly already is. The Court of Justice of the European Union has opened the door wide for European Union regulations to address in more detail the regulation of this topic, but also areas such as sports law in general.

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a. Ako je rad pisan na jezicima naroda u BiH sažetak sadrži od 150 do 300 riječi. Na kraju rada, iza popisa literature, piše se sažetak u proširenom obliku na engleskom jeziku (summary), čija dužina treba da bude od 400-500 riječi. Sažetak se piše u trećem licu, u jednom odlomku i obvezno sadržava:(1)cilj istraživanja,(2)metode istraživanja,(3)osnovni rezultat istraživanja,te(4)zaključak istraživanja.

b. Ako je rad pisan na engleskom jeziku nije potrebno pisati summary na kraju rada, dok su ostala pravila za pisanje sažetka identična kao pod a).

Ključne riječi

Ključne riječi pišu se na na jezicima naroda u BiH i engleskome jeziku (ako je rad pisan na jezicima naroda u BiH), te moraju sadržavati suštinu rada. Navodi se do pet ključnih riječi.

JEL klasifikacija

JEL klasifikacija navodi se ispod ključnih riječi i na jezicima naroda u BiH i na engleskome jeziku (ako je rad pisan na jezicima naroda u BiH) u skladu s klasifikacijom Journal of Economic Literature

(dostupna na **https://www.aeaweb.org/econlit/jelCodes.php?view=jel).**

PREPORUČENA STRUKTURA RADA[1]

1. Uvod

Sadržava definisanje problema, predmeta i ciljeva istraživanja, te motiv za provođenje istraživanja. U uvodu se navodi i hipoteza rada, ili više njih, o kojima se autor očituje u zadnjem poglavlju rada – zaključku. Uvod završava opisom strukture rada.

2. Pregled literature

Pregled literature sadržava pregled relevantne literature iz područja rada s ključnim dosadašnjim spoznajama, odnosno relevantnim rezultatima provedenih istraživanja. Izuzetno, autor može pregled literature uključiti u uvod.

3. Metodologija

Metodologiju je važno prikazati jasno i precizno, utvrditi metodološki doprinos autora ako je prisutan, te njenim prikazom omogućiti testiranje i drugim autorima.

4. Empirijski podaci

Empirijski podaci predstavljaju dokumentacionu podlogu provođenja istraživanja u radu.

5. Rezultati i rasprava

Rezultati i rasprava dio su rada u kojem se objašnjavaju rezultati provedenog istraživanja, uspoređuju sa sličnim istraživanjima, analiziraju ograničenja navedenih rezultata u njihovu tumačenju, značenje rezultata i njihove implikacije.

6. Zaključak

Zaključak je posljednje poglavlje rada. On se ne smije poistovjetiti sa sažetkom rada. Potrebno je da sadrži očitovanje o polaznoj hipotezi, ocjenu rezultata istraživanja, doprinosa provedenog istraživanja, osvrt na ograničenja i probleme u provođenju istraživanja, smjernice za buduća istraživanja, preporuke proizišle iz rezultata

[1] U zavisnosti od specifičnosti teme, a u dogovoru s Uredničkim odborom, rad se može i drugačije koncipirati.

istraživanja i drugo. Kao i sažetak, zaključak se piše u jednom odlomku.

LITERATURA

Popis literature treba biti na kraju rada, a može obuhvatiti samo djela na koja se autor poziva u tekstu. Slaže se po abecednom redu prezimena autora navedenih djela bez razvrstavanja po vrstama, a podaci o djelu moraju biti potpuni, u skladu s bibliografskim standardima. Ako je više radova istog autora objavljeno iste godine, uz godinu se koriste oznake „a,b,c".

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Christensen, C. M. (2012). The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail. Boston, M. A.: Harvard Business School Press.

Mieg, H. A., Töpfer, K. (ur.) (2013). Institutional and Social Innovation for Sustainable Urban Development. Oxon i New York: Routledge.

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Braun, G. O., Scott, J. W. (2013). Smart Growth: sustainability innovations. In: Institutional and Social Innovation for Sustainable Urban Development, Mieg, H. A., Töpfer, K. (ur.). Oxon i New York: Routledge: 44-57.

Peter, C. (2013). Privatization, urban fragmentation, and sustainable development. In: Institutional and Social Innovation for Sustainable Urban Development, Mieg, H. A., Töpfer, K. (ur.). Oxon i New York: Routledge: 130-146.

Doktorske disertacije: navodi se prezime, inicijali autora. (godina) Naslov rada, vrsta rada te institucija gdje je rad obranjen.

Hall, R. P. (2006). Understanding and Applying the Concept of Sustainable Development to Transportation Planning and Decisi- on-Making in the U.S., doktorska disertacija Massachusetts Institute of Technology,

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Giddings, B., Hopwood, B., O'Brien, G. (2002). Environment, economy and society: fitting them together into sustainable develop- ment. Sustainable Development, 10(4): 187-196.

Granger, C. W. J. (1969). Investigating Causal Relations by Econometric Models and Cross-spectral Methods. Econometrica, 37(3): 424-438.

Serije članaka/službene publikacije:

Heal, G. (2011). Sustainability and its measurement. NBER Working Paper 17008, National Bureau of Economic Research, Cambridge, MA. Dostupno na: http://www.nber.org/papers/w17008.pdf.

Radovi prezentovani na konferencijama:

Moylan, K. (2009). The Future of EU Cohesion Policy and its implications for Irish Regional Policy. Rad prezentovan na Regional Science Association International Conference, Irska, 3.9.2009. Dostupno na: http://cua.ie/gorm/publications/The_Future_of_EU_ Cohesion_Policy_and_its_Implications_for_Irish_Regional_Policy_Sept%202009.pdf [13.1.2015.].

Internetski izvori: prezime, inicijali autora/urednika. (godina) Naslov. Institucija/izdavač/časopis/… Internet adresa, datum pristupa- nja u uglatoj zagradi. (Ako su dva ili tri autora, redom navesti njihova prezimena i inicijale odvojene zarezom.)

McMaster, I., Bachtler, J. (2005). Implementing Structural Funds in the New Member States: Ten Policy Challenges. European Policies Research Centre. Dostupno na: http://www.eprc.strath.ac.uk/eprc/Documents/pdf_files/12A07_McMaster-Bachtler_paper. pdf [24.11.2014.].

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