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Садржај / Contents

ОРИГИНАЛНИ НАУЧНИ РАД / Original scientific article

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The analysis of job characteristics leading to high job satisfaction in Romania[1]

Анализа карактеристика радног места који доводе до високог нивоа задовољства запослених у Румунији

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Abstract: Job satisfaction is one of the most analysed job attitudes which may have significant positive consequences on the individual-level and organizational-level performances, too. This is why companies have to analyse the antecedents of job satisfaction. Work design and work characteristics have compelling impact on employees' job satisfaction. The aim of this paper is to identify the work characteristics with the highest impact on job satisfaction across various occupations and positions in Romania. The empirical research had been carried out within the Global Work Design Project initiated by the Academy of Management HR Division, based on the work design questionnaire (WDQ) developed by Morgeson and Humphrey (2006). The Romanian sample consisted of 394 employees from 69 organizations. In our paper we identify the job features and characteristics which lead to high job satisfaction. The findings may have empirical implications on companies' HR strategies not only in Romania, but also in other countries from the Central and Eastern European region.
Keywords: work design, job characteristics, job satisfaction, employee turnover, WDQ, Romania
JEL classification: M54, J81

Сажетак: Задовољство послом је једна од најчешће анализираних ставова запослених који могу да имају значајне последице на индивидуалне и организационе перформансе. Због наведеног разлога је битно да компаније анализирају узроке задовољства запослених. Дизајн посла и карактеристике посла имају значајан утицај на задовољство запослених радним местом. Циљ овог рада је да утврди карактеристике посла који имају највећи утицај на задовољство послом у оквиру разних занимања и радних места у Румунији. Емпиријско истраживање је реализовано у оквиру Глобалног пројекта дизајна рада покренутог од стране Одсека за људске ресурсе Академије за менаџмент, на бази Упитника за дизајн посла (WDQ) развијеног од стране аутора Моргенсон и Хамфри (2006). Узорак из Румуније се састоји од 394 запосленог и 69 организација. У овом раду аутори су идентификовали димензије и карактеристике који

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доводе до високог нивоа задовољства радним местом. Резултати могу да имају практичне импликације на ХР стратегије предузећа не само у Румунији него и у регији Централне и Источне Европе.
Кључне речи: дизајн посла, карактеристике посла, задовољство послом, флуктуација запослених, WDQ, Румунија
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Introduction

There are numerous definitions of job satisfaction, but it is generally defined as a positive emotional state that is derived from an individual's experience at work (Locke, 1976). Job satisfaction is associated with a range of positive outcomes such as increased motivation, engagement, commitment, performance and productivity, and it has a significant impact on reducing the employees' turnover intention (Spector, 1997). As such, it is important for organizations to take measures to ensure that employees are satisfied with their job roles. Work design may be one of such measures, as it refers to the way tasks, roles, responsibilities and activities are created, organized and structured in the workplace to achieve an organization's goals.

Nowadays, in the era of automatization, use of artificial intelligence and other innovations in the work processes, work design and redesign are vital elements of human resource management activities. Among the five core job characteristics defined by Hackman and Oldham (1975), i.e. skill variety, task identity, task significance, autonomy, and feedback from the job itself gets more important. The data from the European Union confirm it, as in 2021 altogether 42% of workers across the EU27 reported a high level of engagement at work, while in high-involvement organizations, where employees had more control over their work and felt more involved in decision-making processes, this percentage increased to 51% (Eurofound, 2022). Results shows that poor-quality work design (low discretion and task complexity, high timing constraints) continue to be prevalent even when new jobs are introduced. Even in modern workplaces workload and physical load had intensified, while the cognitive demands of the position and job discretion declined. It may be emphasized that in 2021, almost half of the employees in the EU27 worked at high intensity (high speed and tight deadlines) and almost a fifth of the workers experienced emotionally disturbing situations. At the same time, around half of the workers had the autonomy to change the order of their tasks or the speed of their work, and to determine their work methods (Eurofound, 2022).

The aim of this paper is to identify the work characteristics with the highest impact on job satisfaction across a wide range of occupations and positions based on the research data from Romanian companies, obtained within the Global Work Design Project initiated by the Academy of Management HR Division.

The paper consists of four parts. In the first part the authors present the main theoretical findings related to the impact of work design on job satisfaction, the second part of the paper is devoted to the presentation of the research methodology, while the results and discussion are given in the third part, finally conclusions are presented in the last chapter of the paper.

1. Theoretical background

The relationship between workers' happiness and productivity has been widely acknowledged for a long time (Wright & Cropanzano, 2000), and several studies focus on how organizations can ensure happy and productive workers. Work design theory also hypothesizes a relationship between work design and job satisfaction (Morgeson & Humphrey, 2006).

Work design, defined as "the content and organization of one's work tasks, activities, relationships, and responsibilities" (Parker, 2014, p. 662), is a "key determinant of employee well-being, positive work attitudes, and job/organizational performance" (Parker, Van den Broeck & Holman, 2017, p. 267). Work design is created and sustained both by managers through formal decision-making processes, and by the employees themselves, through informal or social processes, but research results point to the fact that managerial choices have a key role (Parker, Morgeson & Johns et al., 2017).

One of the most popular job design theory, the Job Characteristics Model (JCM) of Hackman and Oldham (1975, 1976) identifies five core job characteristics (skill variety, task identity, task significance, autonomy, and feedback from the job itself) that can create three psychological states of employees (experienced meaningfulness of work, experienced responsibility for the outcome of the work and knowledge of the actual results of the work activities) which may lead to personal and work outcomes such as high internal work motivation, high satisfaction with the work, high quality work performance, low absenteeism and turnover.

As a development of the abovementioned job design theory, Morgeson and Humphrey (2006) grouped work characteristics as follows: *motivational work characteristics* – including task characteristics (autonomy, task variety, task significance, task identity, feedback from job) and knowledge characteristics (job complexity, information processing, problem solving, skill variety, specialization); *social characteristics* (social support, interdependence, interaction outside the organization, feedback from others) and *contextual characteristics* (ergonomics, physical demands, work conditions and equipment use).

Jobs within broad occupational categories would differ on certain work characteristics, i.e. knowledge characteristics and autonomy would be higher for jobs in professional occupations than jobs in nonprofessional occupations, while jobs in nonprofessional occupations would have higher levels of physical demands and less positive work conditions than jobs in professional occupations (Morgeson & Humphrey, 2006).

The effect of job characteristics on employees' attitudes may depend on national culture and economic situation, too. A study conducted in Serbia by Ćulibrk and his colleagues (2018) showed that job satisfaction in Serbia is affected by work characteristics but, contrary to many studies conducted in developed economies, in Serbia organizational policies and procedures do not significantly influence job satisfaction. Dramićanin et al. (2021) got similar results, as they found that in Serbia the most important factors of job satisfaction are communication, nature of work, relationships with co-workers and

supervision. Considering the employees' level of education, Ćulibrik et al (2018) proved that the more educated the employees are, they seem to care more about the characteristics of their work. On the other hand, Hauff et al. (2015) found that dimensions of job characteristics (income, independent work, and good relationships with colleagues), have similar effects on job satisfaction and it do not vary significantly across countries.

Work redesign process may have some challenges. Individuals charged with work design or redesign may encounter several problems. Morgeson and Humphrey (2006) state that if a job already has high level of motivational characteristics, additional increases simply are not feasible or will lead to negligible effects on satisfaction. The Work Design Questionnaire (WDQ) enables assessing the different work characteristics; therefore, a wide range of options can be considered in order to achieve different redesign goals. Other redesign problems may appear because of the costs of increased training and compensation requirements, and the impossibility to change the task characteristics without producing job overload or job complexity. The authors suggest focusing on the job's social characteristics, as by increasing employees' social support, the work becomes more interesting to perform with lower training requirements (Morgeson & Humphrey, 2006).

Morgeson, Garza and Campion (2012) concluded that work characteristics may influence various attitudinal, cognitive, behavioural and well-being outcomes. Autonomy, task identity, task significance, task variety and feedback from the job have an impact on subjective performance, while autonomy, task identity, feedback from the job and social support are negatively related to absenteeism. The research of Zhao et al. (2016) pointed to similar results. They have found that skill variety was negatively associated with job satisfaction, but positively associated with job stress. Besides, the results of Zhao et al. (2016) showed that high autonomy reduced job stress but did not increase job satisfaction, while feedback improved job satisfaction but did not decrease job stress. Ali and Anwar (2021) got interesting research results. They found that job redesign is significantly and inversely related to employee performance. Meanwhile job satisfaction is found to be positively and significantly related to employee performance. They also suggest that any proposed job redesign will be an effective HR strategy to significantly mobilize employee performance only when firms ensure that the implementation of job redesign involves the concerned employees and enhances their job satisfaction.

According to Nielsen et al. (2017), employee well-being and performance may be successfully improved through interventions focused on developing resources at following levels: *individual level* (self-efficacy, competence, hope, optimism, resilience and job crafting), *group level* (social support, good interpersonal relationships between employees, teamwork), *leader's level* (good quality relationship between leader and employees, transformational leadership) and *organizational level* (the way work is organized, designed, and managed, autonomy and HR practices).

The Gallup's engagement survey demonstrated that the relationship between engagement and work performance is substantial and highly generalizable across organizations. To improve employees' productivity managers can meet the following needs: job clarity, proper equipment and resources, work that aligns with one's talents, consistent

feedback, being cared about as a person, encouragement received for one's development, interest in one's progress, opportunities to learn and grow, opinions being asked for and considered, an organizational mission which makes the job important, co-workers commitment to quality work and having a best friend at work (Gallup, 2020).

Furthermore, Zhao et al. (2016) show that job design may have an impact on life satisfaction, too. They indicated that autonomy, task identity, and task significance reduced job stress, feedback increased job satisfaction, while task significance enhanced life satisfaction. Otherwise, high job demands combined with low decision latitude (also called as job strain), had been associated with an increased risk of cardiovascular disease and mental health issues. Han et al. (2020) found that high levels of job demands can evoke chronic stress, over-fatigue and emotional exhaustion, leading to decreased job satisfaction. Other psychosocial work factors, such as long working hours, job insecurity, effort–reward imbalance, workplace bullying, organizational injustice, and work–family conflict also negatively influence employees' well-being (Niedhammer, Bertrais & Witt, 2021).

Indirectly, job characteristics may have a significant impact on employees' turnover intention, too. Zaharie, Kerekes & Osoian (2019) found a rather strong negative relationship between burnout and the turnover intentions and a moderate negative relationship between job satisfaction and the turnover intentions of the employees in the healthcare sector, while job satisfaction weakly moderates the relationship between burnout and turnover intentions.

Job characteristics have an impact on job quality as well. The Eurofound (2022) survey examined the following dimensions of job quality: physical and social environment (exposure to physical risks and demands, support from their colleagues and managers, intimidation, discrimination at work), job tasks (work intensity, emotionally disturbing situations, autonomy), organizational characteristics (ability to influence decisions that were important for their work, involvement in improving work organization, processes, and in setting work objectives), working time arrangements (flexibility, work at night, work in free time, short notice calls into work), job prospects (career advancement, opportunities for learning), and intrinsic job features (recognition, usefulness, opportunities to use one's knowledge and skills). An index of job quality was constructed by comparing the job demands (which affect workers negatively) and the job resources (which affect workers positively) of an individual. The results show that in 2021 about 30% of EU workers were engaged in strained jobs, where they experienced more job demands than job resources. Despite the changes workers experienced in their work due to the COVID-19 pandemic and the global crisis emerging afterwards, the link between job quality and the core indicators of the quality of working life remained unbroken: job quality is positively associated with well-being, good work–life balance, fewer work–life conflicts, better ability to make ends meet, better work engagement and greater trust within the workplace. Working conditions and quality of jobs influence the engagement of employees with their work: workers satisfied with their experience at work are also more likely to engage with their work. Autonomy to work leads to learning at work, increases creativity in the workplace and supports organizational performance, as it encourages workers to increase their discretionary effort (Eurofound, 2022).

In relation with COVID-19 pandemics and current energy crisis it is important to analyse the impact of remote work on job satisfaction, too. Bellmann and Hübler (2021) found no clear effects of remote work on job satisfaction are revealed, but the impact on work–life balance is generally negative. If the imbalance is conditioned by private interests, this is not corroborated in contrast to job conditioned features. Employees working from home are happier than those who want to work at home, job satisfaction is higher and work–life balance is not worse under a strict contractual agreement than under a nonbinding commitment. Remote work may lead to job instability and insecurity. The research of Nemțeanu, Dinu and Dabija (2021) conducted in Romania found that job insecurity negatively correlates with satisfaction concerning supervisor support and promotion opportunities, and perceived job instability has a significant negative impact on individual work satisfaction, satisfaction with supervisor support and promotion opportunities. Taboroši et al (2023) have found that in Serbia teleworking employees are generally more satisfied with their job than the conventionally employed.

Based on the abovementioned theories and research results it is evident that job characteristics have a significant impact on job attitudes, especially on job satisfaction. The empirical part of the paper has the aim to show research results on the impact of job satisfaction.

2. Methodology

The empirical research had been carried out within the Global Work Design Project initiated by the Academy of Management HR Division, based on the work design questionnaire (WDQ) developed by Morgeson and Humphrey (2006). There were four questionnaires developed altogether: respondent employees and their supervisors completed two questionnaires each, in two rounds. In the first round, employees had to complete a questionnaire referring to job autonomy, task variety, task significance, task identity, feedback from job, job complexity, information processing, problem solving, skill variety, skill specialization, social support, interdependence, interactions outside the organization, feedback from others, ergonomics, physical demands, work conditions and job satisfaction, while the supervisors completed a questionnaire related to the organization and to the performance of the respondent employees. The second round of questionnaires were administered two weeks after the first round. This time, the employees assessed items related to organizational culture, job satisfaction, turnover intentions and burnout, while the supervisors evaluated the employees' behaviour and the organizational structure. Each construct was built of three items (statements) assessed on a5-point scale (from 1 – strongly disagree to 5 – strongly agree).

To ensure international comparability of the Romanian data, the original English language questionnaires were adapted to Romanian economic and social situation in several steps. At first, members of the research team translated the questionnaire into Romanian, then other research team members checked the Romanian translation and sent the questionnaire to a professional translator to translate it back into English. Both the translated and back-translated questionnaires were sent for approval to the lead team and in the final step the

issues raised by the lead team were resolved by a researcher who did not take part in the previous stages of translation.

The questionnaires were administered between November 2017 and September 2018. The research was based on convenience sampling method. As data collection process implied a considerable effort from the respondent organizations, it was difficult to find organizations that would allow us to complete the whole procedure, so we used personal contacts inorder to maximize response rate. The Romanian sample consists of 394 employees from 69 organizations. Almost two thirds (64%) of respondents are women and 36% are men, and 70.2% are university graduates. Most of the respondents (39.5%) belong to the 20-29 years old age group, 27.9% are 30-39 years old, 18.5% are 40-49 years old and 14.1% are over 50 years of age. Regarding the economic sector of the employing organization, 21.5% of the respondents work in healthcare and social assistance, 13.1% in professional, scientific and technical services, 11.0% in construction, 10.7% in manufacturing, 6.6%-6.6% in transportation and warehousing, retail trade and educational services, 18% in other services and 6.6% in other sectors.

In our paper we build up the model of the typical Romanian job (the average values of the work characteristics) and compare it with the ideal one (the average values of the work characteristics for the respondents with high job satisfaction, low turnover intention and low level of burnout). Furthermore, we test for the correlation between the level of job satisfaction (declared by the employees) and task performance (assessed by the supervisor).

3. Results

In order to determine the characteristics of the typical Romanian job, we aggregated the items measuring the following constructs: job autonomy, task variety, task significance, task identity, feedback from job, job complexity, skill variety, social support, feedback from others and work conditions. Results are presented in Table 1.

Table 1: Values of different work characteristics and the level job satisfaction, turnover and burnout

Construct measured	N	Minimum	Maximum	Mean	Std. Deviation
Job autonomy	389	1.00	5.00	3.3973	0.79511
Task variety	392	1.00	5.00	3.8584	0.95990
Task significance	392	1.00	5.00	3.5306	1.00987
Task identity	393	1.50	5.00	4.0305	0.82299
Feedback from job	392	1.00	5.00	3.8503	0.90983
Job complexity	393	1.00	5.00	2.6113	1.01622
Skill variety	392	1.00	5.00	3.8514	0.81980
Social support	389	1,40	5.00	4.0478	0.63723
Feedback from others	390	1.00	5.00	3.3726	0.93529
Work conditions	387	1.20	5.00	3.6765	0.81485
Job satisfaction average	393	1.00	5.00	4.1433	0.72257
Task performance	394	1,50	5.00	3.9239	0.79493

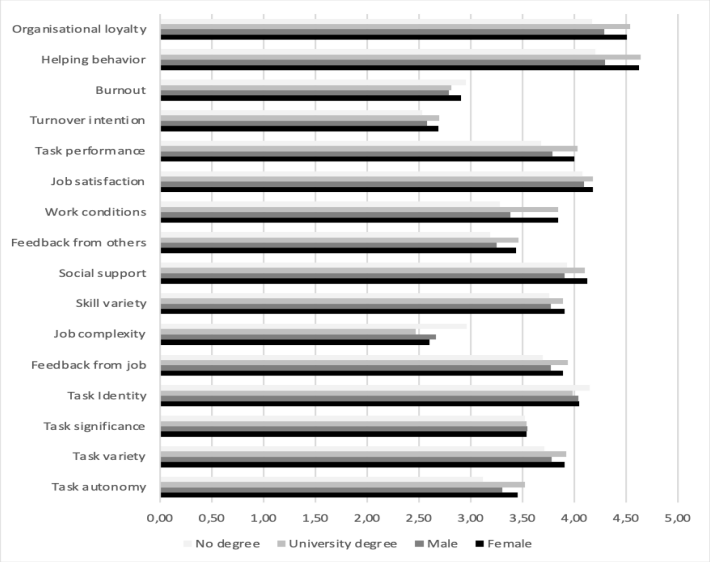
Turnover intention	393	1.00	5.00	2.6431	0.65735
Burnout	393	1.00	6.00	2.8514	1.05478
Helping behaviour	394	1.50	6.00	4.5082	1.06160
Organizational loyalty	391	1.00	6.00	4.4249	1.08647

Source: the authors' research

The job satisfaction of each respondent was calculated by averaging the items related to the job satisfaction construct for both rounds. The overall value of job satisfaction for the whole sample was 4.14 (on a scale from 1 to 5), which can be considered as rather high. The average turnover intention of the respondents was 2.64 (on a scale from 1 to 5), 80.4% of the respondents did not consider leaving the organization (values up to 3.00) and only 3.8% were ready to leave (values 4.00 to 5.00). The average level of burnout was 2.85 (on a scale from 1 to 6), 63.1% of the respondents were extenuated occasionally or even less frequently (values up to 3.00), while 17.6% felt extenuated often or very often at work. The task performance of the respondents was appreciated by their supervisors at the first round of questionnaires. The overall performance of the respondents was described as 3.92 (on a scale from 1 to 5); besides more than half of the employees (55.1%) performed well (values 4.00 to 5.00) and only 17.3% of the employees were described as low performers (values up to 3.00) according to their supervisors. The supervisors also appreciated that the employees have a rather supportive behaviour towards their colleagues (in average 4.51 on a scale from 1 to 6) and they also show loyalty towards the organization they work for (in average 4.42 on a scale from 1 to 6).

Figure 1 presents the research results based on respondents' gender and educational level. For most of the studied constructs gender differences are not significant, except that women perceive more social support (at the 0.01 level) and better work conditions (at the 0.01 level). Supervisors consider that women perform better (at the 0.05 level) and are more ready to help their colleagues (at the 0.01 level). University graduates have jobs which provide significantly higher task autonomy (at the 0.01 level) and more feedback (at the 0.05 level); they also perceive more feedback from others (at the 0.01 level) and more social support (at the 0.05 level), while those without university degree have to face significantly more complex jobs (at the 0.01 level). The supervisors appreciated that university graduates have significantly higher (at the 0.01 level) task performance, helping behaviour and organizational loyalty than those without a degree. However, there is no significant difference between the job satisfaction averages of these two groups, and the turnover intention of university graduates is significantly higher (at the 0.05 level).

Figure 1. Work characteristics and elements of employee behaviour, by gender and education



Source: the authors' research

According to the results presented in Table 2, in the Romanian sample job satisfaction correlates significantly (at the 0.01 level) and positively with the following work characteristics:

- job autonomy (Pearson correlation = 0.378)
- task variety (Pearson correlation = 0.517)
- task significance (Pearson correlation = 0.456)
- task identity (Pearson correlation = 0.403)
- feedback from job (Pearson correlation = 0.379)
- skill variety (Pearson correlation = 0.469)
- social support (Pearson correlation = 0.354)
- feedback from others (Pearson correlation = 0.385)
- work conditions (Pearson correlation = 0.145)

On the other hand, job satisfaction correlates significantly (at the 0.01 level) and negatively with job complexity (Pearson correlation = -0.229).

Table 2: Values and significance of the Pearson correlation coefficients of different work characteristics and job satisfaction

		Variety	Signifi-cance	Identity	Feed-back from job	Job complexity	Skill variety	Social support	Feed-back from others	Work conditi ons	Job satis-faction
Autonomy	Pearson corr.	.425(**)	.250(**)	.170(**)	.313(**)	-0.070	.302(**)	.260(**)	.334(**)	.229(**)	.378(**)
	Sig. (2-tailed)	0.000	0.000	0.001	0.000	0.166	0.000	0.000	0.000	0.000	0.000
Variety	Pearson corr.	1	.492(**)	.163(**)	.301(**)	-.452(**)	.558(**)	.164(**)	.209(**)	-0.038	.517(**)
	Sig. (2-tailed)		0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.453	0.000
Signifi-cance	Pearson corr.		1	.418(**)	.335(**)	-.180(**)	.536(**)	.283(**)	.258(**)	0.032	.456(**)
	Sig. (2-tailed)			0.000	0.000	0.000	0.000	0.000	0.000	0,526	0.000
Identity	Pearson corr.			1	.456(**)	.142(**)	.324(**)	.309(**)	.297(**)	.156(**)	.403(**)
	Sig. (2-tailed)				0.000	0.005	0.000	0.000	0.000	0.002	0.000
Feedback from job	Pearson corr.				1	-.108(*)	.250(**)	.304(**)	.513(**)	.207(**)	.379(**)
	Sig. (2-tailed)					0.034	0.000	0.000	0.000	0.000	0.000
Job complexity	Pearson corr.					1	-.307(**)	0.074	0.084	0.095	-.229(**)
	Sig. (2-tailed)						0.000	0.146	0.098	0.063	0.000
Skill variety	Pearson corr.						1	.221(**)	.190(**)	0,012	.469(**)
	Sig. (2-tailed)							0.000	0.000	0.816	0.000
Social support	Pearson corr.							1	.450(**)	.213(**)	.354(**)
	Sig. (2-tailed)								0.000	0.000	0.000
Feedback from others	Pearson corr.								1	.250(**)	.385(**)
	Sig. (2-tailed)									0.000	0.000
Work conditions	Pearson corr.									1	.145(**)
	Sig. (2-tailed)										0.004

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Source: the authors' research

Our results (presented in Table 3) confirm previous findings about the positive relationship between job satisfaction and task performance (Pearson correlation = 0.265). Furthermore, the results show that job satisfaction significantly (at the 0.01 level) and correlates positively with the respondents' readiness to help out colleagues at work (Pearson correlation = 0.345) and with the loyalty towards the organization (Pearson correlation = 0.468). Another important research result, which may have an implication for HR management too, is that job satisfaction correlates significantly (at the 0.01 level) and negatively with turnover intention (Pearson correlation = -0.292) and burnout (Pearson correlation = -0.167).

Table 3: The correlation between different work characteristics and job satisfaction

		Task performance	Turnover intention	Burnout	Helping behaviour	Org. loyalty
Job satisfaction	Pearson Correlation	.265(**)	-.292(**)	-.167(**)	.345(**)	.468(**)
	Sig. (2-tailed)	0.000	0.000	0.001	0.000	0.000
Task performance	Pearson Correlation	1	-0.009	0.016	.557(**)	.605(**)
	Sig. (2-tailed)		0.858	0.751	0.000	0.000
Turnover intention	Pearson Correlation		1	.339(**)	-.140(**)	-.159(**)
	Sig. (2-tailed)			0.000	0.006	0.002
Burnout	Pearson Correlation			1	-0.022	-0.013
	Sig. (2-tailed)				0.657	0.800
Helping behaviour	Pearson Correlation				1	.748(**)
	Sig. (2-tailed)					0.000
Organizational loyalty	Pearson Correlation					1
	Sig. (2-tailed)					

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

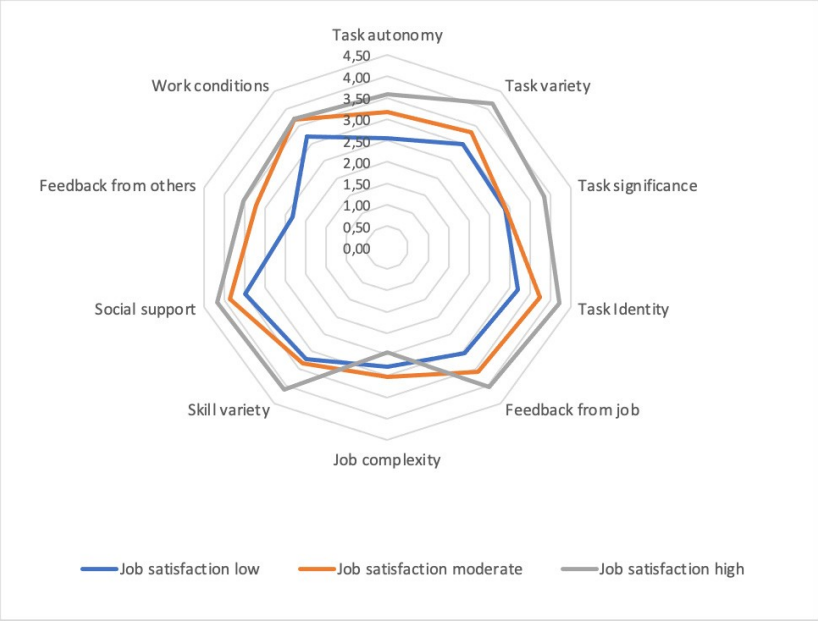
Source: the authors' research

In order to identity the work characteristics which lead to high job satisfaction, the respondents were divided into three groups:

- 263 respondents (67.0%) belong to the group of employees with high job satisfaction (at least 4.00, mean value 4.55),
- 104 respondents (26.4%) belong to the group of employees with moderate job satisfaction (3.00 to 3.99, mean value 3.56) and
- 26 respondents (6.6%) belong to the group of employees with low job satisfaction (1.00 to 2.99, mean value 2.38).

The ANOVA test shows that all differences between the means are significant (at the 0.01 level), except the one regarding work conditions. Figure 2 presents that jobs which ensure high satisfaction have values over 4 (on a 1 to 5 scale) for task variety, task identity, feedback from job, skill variety and social support, and values over 3.5 for task autonomy, task significance and feedback from others, while job complexity is rated only 2.44.

Figure 2: Work characteristics of respondents with different levels of job satisfaction



Source: the authors' research

The benefits of high job satisfaction are given in Figure 3. Respondents belonging to the high job satisfaction group perform better, are more helpful and more loyal to the organization they work for, based on the appraisal of their supervisors. Moreover, the burnout level and turnover intention of those with high job satisfaction is lower. The ANOVA test demonstrates that all these differences are significant at the 0.01 level.

Figure 3: Performance and behaviour of respondents with different levels of job satisfaction

Source: the authors' research

Conclusion

It is essential for organizations to understand the link between work design and job satisfaction in order to ensure job satisfaction of their employees. Studies have shown that work design plays an important role in jobsatisfaction. Work autonomy and job design have a strong influence on employees' satisfaction levels. Our results confirm previous findings that job satisfaction correlates positively with job autonomy, task variety, significance and identity, feedback from the job, skill variety, social support, feedback from others, and workconditions. On the other hand, job satisfaction correlates negatively with job complexity.

Although there is no significant difference between the job satisfaction of female and male respondents, women perceive more social support, benefit from better work conditions, but also perform better and are more ready to help their colleagues. There is no significant difference between the job satisfactions of those with and without a university degree either, but the jobs of university graduates provide higher task autonomy, more feedback, and more social support, while those without university have to face complex jobs. Despite university graduates perform better, have higher levels of helping behaviour and organizational loyalty, their turnover intention is significantly higher than of those without a degree.

An important research implication concerns to HR management. In order to define HR activities and processes it is important to know that employees with high job satisfaction perform better, are more helpful and more loyal to the organizations they work for. Furthermore, the burnout level and turnover intention of thosewith high job satisfaction is lower. Organizations may increase the job satisfaction and individual-level performances of their employees by increasing the level of control the employees have over their work. Besides, it is important to design and redesign jobs in a manner that they offer a high degree of task variety and identity.

The limitation of the study is the overrepresentation of women, university graduates and employees from healthcare sector in the sample. Therefore, the job characterized by the mean values of the constructs can't be considered the "typical Romanian job". Still, the relationship between the work characteristics and job satisfaction, as well as between job satisfaction and performance, burnout and turnover are clearly demonstrated by our data and the managerial implications are valid. To reveal the implications of the COVID-19 pandemics, the research should be repeated in the coming years, but with a simplified methodology (only one round of questionnaires).

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DEA efficiency of Serbian banks-comparison of three approaches

Ефикасност банака у Србији применом ДЕА анализе – компарација три приступа

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Abstract: The aim of this paper is to analyse three approaches in order to give a comprehensive analysis of the efficiency of the banking sector in Serbia. The paper analyses the intermediate, operating and profitability approach for measuring bank efficiency in order to give an answer to the question which is the most efficient and where can be improvements made. The paper applies a non-parametric data envelopment analysis (DEA) on a sample of 23 banks operating in Serbia in the period during and after the covid-19 pandemic, i.e. for 2019, 2020 and 2021. The results of the analysis showed that efficiency is the highest according to the intermediate approach, while the efficiency of banks is the lowest in the approach of measuring profit efficiency. The fact that the lowest levels of efficiencies in each approach were achieved by small banks with a small market share should be added to the results of the analysis. The results of the research are certainly influenced by low interest rates and the activities of mergers and acquisitions, which are intensive on the Serbian banking market.
Keywords: DEA, Bank efficiency, intermediary approach, operating approach, profitability approach.
JEL classification: G21, G14, C61, C67

Сажетак: Циљ овог рада је да анализом три приступа да свеобухватну анализу ефикасности пословања банкарског сектора Србије. У раду се користе интермедијарни, оперативни приступ и приступ ефикасности генерисања профита у циљу давања одговора на питање који од њих је најефикаснији и где се могу учинити побољшања. У раду је примењена непараметарска анализа обавијености података на узорку од 23 банке које послују у Србији у период уочи и након пандемије covid-19, тј. за 2019, 2020 И 2021. годину. Резултати анализе су показали да је највећа ефикасност према интермедијалном приступу, док је најмања ефикасност банака у приступу мерења генерисања профита. Резултатима анализе треба

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додати чињеницу да су најмање нивое ефикасности постизале мале банке са малим тржишним учешћем. На резултате истраживања свакако имају утицаја ниске каматне стопе И активности мерџера И аквизиција, који су интензивни на банкарском тржишту Србије.
Кључне речи: DEA, ефикасност банака, интермедијални приступ, оперативни приступ, профитни приступ.
ЈЕЛ класификација: G21, G14, C61, C67

Introduction

The financial system of Serbia relies mainly on banking institutions. Therefore, the efficiency of the banking sector is crucial for the functioning of the financial system. Banks are the most supervised institutions by the National bank of Serbia. After the global financial crisis, the Basel Committee on Banking Supervision strengthened the standards of banks supervision focusing more on the risk management regarding the capital (capital buffers) (Martin, 2021) and for the first time liquidity was also supervised by Basel III standards (Milojević & Redžepagić, 2021). Besides the regulation and supervision of banks, one important analysis is the efficiency of the banks operating in the financial system. Efficiency analyses are important for the decision makers in the banks as well as for the policy makers.

Efficiency can be measured in many different ways. The aim of this paper is to measure the efficiency of the banks operating in Serbia using and comparing different approaches. Namely, the functioning of banking institutions can be considered throughout the intermediary function, operating function and profitability function. Considering these facts, we analyse and compare the efficiency of all three functions of the banks in order to have a systematic overview of the banks' efficiency in the Serbian banking sector and to give an answer which function is the most efficient in the Serbian baking sector. This comparison of all three approaches is rare in the literature; therefore, this paper aims to fill this gap. In this way there is a contribution from the theoretical as well as from the practical point of view as this systematic approach covers the gap in literature and gives also a basis for the decision makers in the banking industry.

For the purpose of our research, we use data envelopment analysis (DEA). DEA is a non-parametric method of efficiency analysis of the decision making unit. The decision making units in our research are the banks. DEA was used first time by Charnes et al. (1978) and since then widely used also for the efficiency measuring of companies and financial institutions.

We use DEA on the sample of all Serbian banks in the period from 2019 to 2021. Our aim is to compare three different approaches used in the banking sector analysis and to show which banks are more efficient regarding the different approaches.

The paper is structured as follows. After the introduction, we present the theoretical background on which our research is based. Data and methodology part of the paper is committed to the sample and the methodology of our research. The results and discussion section includes the results of the descriptive statistics and the DEA analyses of the banks.

The conclusion summarizes the results of our research and gives recommendations for further research.

1. Literature review

Charnes, Cooper and Rhodes (1978) were the first to apply data envelopment analysis in their research. Since then DEA is widely used in all industries where efficiency is in the focus of the measurement. DEA technical efficiency models can be input or output oriented, dependent on the desirable decision making demand. According to that it can measure the ability to get the maximum output without modifying the inputs, and second it can measure the achievement of the given output levels by minimizing the input variables. In the bank efficiency literature, the starting point is that the bank will use a business model that minimizes the input prices and the costs of its output variables or a model that maximizes profits by the given the prices (Hughes & Mester, 2008). The former is input oriented and the latter is output oriented.

Using DEA models in the finance industry, especially in the banking industry, many approaches have been set. The literature in this field is focused basically on one approach and rarely considers all approaches together. Besides that, DEA analysis is widely used as two-stage analysis. It is important in the stage analysis to make a difference between internal and external two-stage models.

Internal two-stage DEA models are known also as network DEA models. These models are structured in two stages (Chen et al., 2009). One type of efficiency is measured in the first stage and another type of efficiency in the second stage, but the output variables in the first stage are at the same time the input variables in the second stage. So, for example, there can be several combinations of efficiency measures: cost efficiency and productive efficiency (Wanke & Barros, 2014); the deposit producing process efficiency and the profit earning process efficiency (Wang et al., 2014); profit efficiency and market efficiency (Liu et al., 2015; Lu & Lo, 2006; Seiford & Zhu, 1999).

External two-stage models use the combination of DEA analysis in the first stage and a regression analysis in the second stage (Milenković et al., 2022; Paleckova, 2019; Simar & Wilson, 2011; Sufian, 2010). In these models, DEA efficiency index is measured first, and some regression methods like Bootstrap, Tobit, OLS, AHP, ANN and others are used in the second stage (Henriques et al., 2020).

Regarding the several approaches used in DEA analysis and variables used in them, there is no consensus in the literature which variables are used. There are even differences in variables used in the same approach. The use of the variables depends on the decision making unit (DMU) and the desirable efficiency that should be analysed. In the following subsection, we synthesize the variables used in different approaches in the existing literature.

1.1. Branch efficiency approach

The branch efficiency is a service oriented approach which measures mostly the cost efficiency of the banks' branches. This approach uses bank level data. Cvetkoska and Savić (2017) use a sample of eight branches. They use a survey to collect data for the input and output variables. In their case, the input variables are personnel, equipment, business premises, and material expenses, and the output variables are lending to citizens, corporate lending, domestic payment operations – total transactions, domestic payment operations – officers, domestic payment operations – average per employee, bank cards, ATM transactions, POS terminals and imprinters transactions, denar saving passbooks, foreign currency saving passbooks and current accounts, deposits structure, realized inflows from legal entities, realized outflows from legal entities, total F/X purchase, inflows from individuals, and outgoing payments from individuals (Cvetkoska & Savić, 2017).

Wu et al. (2006) use the neutral network DEA approach to evaluate branch efficiency of the banks. They use a sample of large Canadian banks. The inputs used in this model are personnel expenses and other expenses of the branches, and the output variables are deposits, revenues and loans of the branches.

Paradi and Zhu (2013) give an overview of the branches research using DEA in their research, with all inputs and outputs used in different studies.

1.2. Intermediary approach

The intermediary approach is used for comparisons between banks and cross-country comparisons of banks. This approach is based on the primary function of the bank the intermediation; therefore, this approach measures the efficiency of generating loans and other placements from the available sources.

Boďa and Zimková (2015) use total deposits, total capital and operating expenses as input variables, and total loans and net interest income as output variables.

Sufian (2011) is one of the rare authors that compare different approaches. In his intermediary approach he uses deposits, labour and capital as input variables, and loans and investments as output variables. Similar to Sufian (2011), Barros et al. (2011) use the number of employees, deposits and total assets as inputs, and loans and securities as outputs.

Milenkovic et al. (2022) use the intermediary DEA approach in the first stage using deposits, labour expenses and capital as inputs, and loans and investments as output variables.

Jemric and Vujicic (2002) combine balance sheet data and survey data, while in comparison of the operating and intermediary approach they use the following variables for the intermediary approach: fixed assets and software, number of

employees and total deposits received as inputs; total loans extended and short-term securities issued by official sectors - CNB bills and MF treasury bills as outputs.

1.3. Operating approach

The operating approach considers the efficiency of banking operations; it is also called the production approach. The aim of this approach is to minimize the operational costs of the banks.

In comparison to the intermediary approach, Jemric and Vujicic (2002) use interest and related costs, commissions for services and related costs, labour related administrative costs (gross wages), and capital related administrative costs (amortization, office maintenance, office supplies etc.) as input variables in their operating approach. For the output variables, they use interest and related revenues, and non-interest revenues (commissions for provisions of services and related revenues).

Paleckova (2019) measures the cost efficiency of the Czech and Slovak commercial banks using interest expenses, other operating expenses and personal expenses as inputs and interest income as the output variable.

In his comparative research into the operating approach, Sufian (2011) uses the following inputs: interest expenses, labour, and the following variables for the outputs interest income and non-interest income.

Boďa and Zimková (2015) use capital and total operational expenses as input variables, and total deposits, total loans and net interest income for the output variables.

1.4. Profitability approach

The profitability or also value-added approach is used to measure the efficiency of earning revenue in banks. It is commonly used in bank efficiency measurement because of the importance of profit in financial institutions like banks.

In the efficiency of the profit earning process, Wang et al. (2014) use deposits as the input variable in the second stage and non-interest income, interest income and non-performing loans as the output variables.

Sufian (2011) has a different view of the profitability approach and he uses labour, capital and interest expenses as inputs, and deposits, loans and investments as output variables in his research.

Profit oriented approach by Boďa and Zimková (2015) means that the input variable is total operating expense and the output variable is net interest income.

In the first stage of the DEA efficiency analysis, Seiford and Zhu (1999) use the profitability approach using employees, assets and equity as inputs, and revenues and

profits as output variables. The same variables are used by Luo (2003) in his research on profitability and marketability efficiency of large banks.

2. Data and methodology

In this paper, efficiency of the Serbian banking sector in the last three years will be analysed as the relation between achieved outputs and used inputs. Therefore, Data Envelopment Analysis (DEA) is a very popular and suitable method for efficiency assessment of various decision making units (DMUs). DEA tends to present DMUs' efficiency in outputs maximization while using minimum inputs or inputs minimization when attaining maximum outputs. Additionally, DEA is conducted based on existent and known data on inputs and outputs. In this analysis, banks that operate on Serbian market in 2019, 2020 and 2021 will be observed as different DMUs and their efficiency will be calculated by three different approaches: intermediary, operating and profitability approach. These approaches use the same DEA methodology, while the selection of input and output variables differs, as presented in the Table 1.

Table 1: Description of efficiency approaches

Intermediary approach	Operating approach	Profitability approach
Inputs: Deposits, Labour, Capital	Inputs: Interest expenses, Labour, Non-interest expenses	Inputs: Loans, Investments
Outputs: Loans, Investments	Outputs: Interest income, Non-interest income	Outputs: Interest income, Non-interest income, Net income

Source: the authors' research

For intermediary approach deposits, labour and capital are used as input variables, while loans and investments are output variables. The operating approach uses different variables. Interest expenses, labour and non-interest expenses are on the side of inputs, while interest income and non-interest income are selected on the side of outputs. The third approach which will be applied is profitability approach, which uses loans and investments as input variables and interest income, non-interest income and net income as output variables. All values of the variables are presented in thousands of RSD.

Data were collected from the National Bank of Serbia database. Descriptive statistics for all input and output variables are presented in Tables 2, 3 and 4. The descriptive statistics shows that there are no significant changes in the values of the input and output variables during the considered three years.

Table 2: Descriptive statistics for input and output variables in 2019 shown in 000 RSD

	Minimum	Maximum	Standard deviation	Mean
Deposits	3148129.00	538672810.00	137469847.29	177353752.00
Capital	1413215.00	100067067.00	29568573.20	43630100.00
Loans	3445960.00	425076129.00	103189962.28	136243697.50
Investments	0.00	143761175.00	41832752.40	54810173.00
Labour	141504.00	6213247.00	1614607.51	1708452.00
Interest income	172604.00	22673804.00	5856083.38	8478563.50
Interest expenses	27399.00	2879692.00	802930.76	1497478.00
Non-interest income	31551.00	12194157.00	2943444.69	2704357.50
Non-interest expenses	2739.00	4502305.00	1088061.28	641941.50
Net income	0.00	12329459.00	3698071.12	4136715.50

Source: the authors' research

Table 3: Descriptive statistics for input and output variables in 2020 shown in 000 RSD

	Minimum	Maximum	Standard deviation	Mean
Deposits	3175997.00	587544810.00	153490871.05	147636351.57
Capital	1710107.00	109014630.00	30329628.12	28330732.17
Loans	3364720.00	462543282.00	113454048.40	111091951.30
Investments	63.00	159029527.00	45793926.76	33462531.43
Labour	147222.00	6376881.00	1761033.96	1861813.22
Interest income	30100.00	22209990.00	5727963.06	5831813.48
Interest expenses	6794.00	2367475.00	717708.32	826966.87
Non-interest income	36509.00	11825359.00	2842490.84	2391241.35
Non-interest expenses	3920.00	4325330.00	1077940.97	779315.39
Net income	0.00	9801586.00	2942948.21	1795150.43

Source: the authors' research

Table 4: Descriptive statistics for input and output variables in 2020 shown in 000 RSD

	Minimum	Maximum	Standard deviation	Mean
Deposits	3539155.00	614369840.00	185385459.93	182155226.09
Capital	1740554.00	119042009.00	33728588.38	31289618.87
Loans	3076103.00	505875568.00	148540016.10	141063176.48
Investments	0.00	153827349.00	47213902.26	37827461.13
Labour	162251.00	6862623.00	1885800.77	2040924.26
Interest income	23966.00	22315269.00	6230920.06	6467620.78
Interest expenses	12766.00	2264569.00	738467.72	853366.78
Non-interest income	47978.00	18988785.00	4494652.87	3587699.35
Non-interest expenses	5560.00	7561620.00	1709127.60	1164230.04
Net income	0.00	10371359.00	2863822.84	2180890.57

Source: the authors' research

One of the main characteristics of DEA method is that it compares efficiency of each DMU with the best one, rather than the average. Various metrics of input and output variables may be used; therefore, the application area of this method is very wide, both on micro and macroeconomic level. Recently, various types of DEA models were developed in order to incorporate some specifics of different application areas and obtain more reliable results. Using DEA methodology efficiency scores that lie between 0 and 1 will be calculated for each DMU separately for every year. It is important to state that those results represent relative efficiency measures, because they depend on the number of DMUs involved, as well as on the number and structure of the inputs and outputs (Radovanov et al., 2020). Results of DEA method show how many decision making units are ineffective, compared to the effective ones. It is also possible to suggest the desired changes of input and output variables, in order to improve the efficiency score of inefficient units. Furthermore, output oriented DEA model with variable return to scale (Banker et al., 1984) will be applied to analyse the efficiency of the Serbian banking sector:

$$\max \phi \qquad (1)$$

$$s.t. \sum_{j=1}^{n} x_{ij}\lambda_j \leq x_{io} \quad i = 1, 2, \dots, m;$$

$$\sum_{j=1}^{n} y_{rj}\lambda_j \geq \phi y_{ro} \quad r = 1, 2, \dots, s;$$

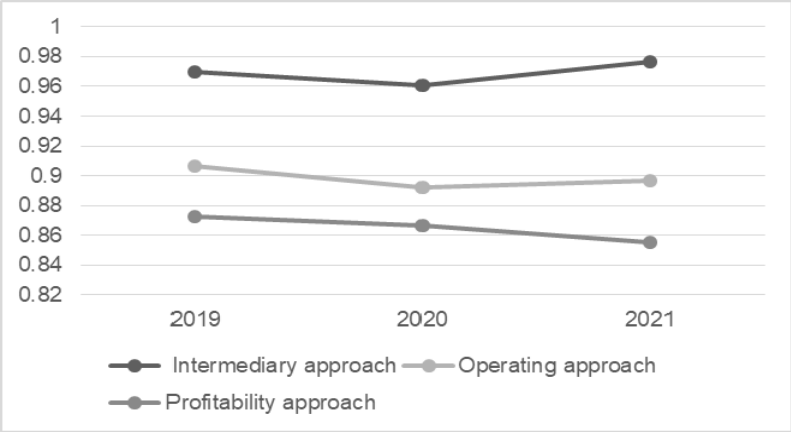
$$\sum_{j=1}^{n} \lambda_j = 1$$
$$\lambda_j \geq 0$$

where n is the number of DMUs and DMU_o represents the bank under evaluation. Assume that we have *s* output variables and *m* input variables. Observed output and input values are y_r and x_i respectively, thus y_{ro} is the amount of output *r* used by DMU_o, while x_{to} is the amount of input *i* used by DMU_o. λ is the DMU's weight and the efficiency score is ϕ. The main disadvantages of DEA are sensitivity to the choice of input and output variables and the inability to predict. DEA presents an ex-post analysis based on already known data (Škare & Rabar, 2016). 'Rule of thumb' states that to apply DEA successfully, the number of selected DMUs has to be at least two to three times higher than the number of variables used as inputs and outputs combined, so that efficiency results would be adequately dispersed (Sarkis, 2007).

3. Results and discussion

Results of the applied DEA model show that Serbian banking sector operates at an enviable level of efficiency, since the average efficiency scores are higher than 0,85 for all applied approaches. The highest efficiency scores are achieved if intermediary approach is applied, while profitability approach has the lowest average efficiency scores in the observed three years (Figure 1). Answering the research question which function of the banks is the most efficient, it can be seen that it is the intermediary, then the operating, and the profitability function is on the third place. These findings show that there is space to enhance the profitability and the cost efficiency of the banking industry in Serbia.

Figure 1: Average Efficiency Scores



Source: the authors' research

Considering the efficiency scores separately for each approach, we can conclude which banks were more or less efficient in the analysed period. This finding is important to the decision making units of each bank in order to make decisions improving the position of each individual bank.

The intermediary approach has been shown as the most efficient approach. Banks in the Serbian financial sector are the most efficient when it comes to the intermediate i.e. converting collected deposits to loans and investments. The average scores of the individual banks in the considered period was above 0.9 except Alta bank and Raiffeisen bank (Table 5.).

Table 5: Results of DEA model: Intermediary Approach

DMU	2019	2020	2021
API	1.00	0.96	1.00
ADDIKO	1.00	1.00	1.00
AIK	1.00	1.00	1.00
INTESA	1.00	1.00	1.00
BOC	1.00	1.00	1.00
POSTANSKA STEDIONICA	1.00	1.00	1.00
CREDITAGRICOLE	1.00	1.00	1.00
ERSTE	1.00	1.00	1.00
EUROBANKDIREKTNA	1.00	1.00	0.97
EXPO	0.85	0.90	0.93
HALK	0.90	0.91	0.96
ALTA	0.86	0.63	0.91
KOMERCIJALNA BANKA	1.00	1.00	1.00
MIRABANK	1.00	1.00	1.00
NLB	1.00	1.00	1.00
OTP	0.92	0.99	1.00
3 BANKA	1.00	1.00	1.00
PROCREDIT	1.00	1.00	1.00
RAIFFEISEN	0.87	0.85	0.91
NASA AIK	0.97	0.92	0.90

SRPSKA	1.00	1.00	1.00
MOBI	0.92	0.94	0.86
UNICREDIT	1.00	1.00	1.00
Mean	0.97	0.96	0.98
St. deviation	0.05	0.08	0.04
Minimum	0.85	0.63	0.86
Maximum	1.00	1.00	1.00

Source: the authors' research

When it comes to the operating approach, it is on the second place among the efficiency of the approaches. This means that when it comes to the cost management of the banks, they have been showed as less efficient compared to the intermediation. Lower efficiency scores were shown by Api bank, Poštanska štedionica, Expo, Alta and Mobi bank (Table 6.). According to the asset classification of the banking sector in Serbia, these banks are classified as small banks. We can therefore conclude that lower levels of the operating efficiency approach is caused by the cost inefficiency of the above listed small banks.

Table 6: Results of DEA model: Operating Approach

DMU	2019	2020	2021
API	0.39	0.38	0.56
ADDIKO	1.00	1.00	1.00
AIK	1.00	1.00	1.00
INTESA	1.00	1.00	1.00
BOC	1.00	1.00	1.00
POSTANSKA STEDIONICA	0.63	0.61	0.73
CREDITAGRICOLE	0.83	0.83	0.84
ERSTE	0.78	0.82	0.96
EUROBANKDIREKTNA	0.97	1.00	0.90
EXPO	0.75	0.83	0.73
HALK	0.96	0.85	0.78
ALTA	1.00	0.69	0.79
KOMERCIJALNA BANKA	1.00	1.00	1.00

MIRABANK	1.00	1.00	1.00
NLB	0.81	0.84	0.86
OTP	1.00	1.00	1.00
3 BANKA	1.00	1.00	1.00
PROCREDIT	0.89	1.00	0.95
RAIFFEISEN	1.00	1.00	1.00
NASA AIK	0.96	0.96	1.00
SRPSKA	1.00	1.00	1.00
MOBI	0.86	0.70	0.53
UNICREDIT	1.00	1.00	1.00
Mean	0.91	0.89	0.90
St. deviation	0.15	0.16	0.15
Minimum	0.39	0.38	0.53
Maximum	1.00	1.00	1.00

Source: the authors' research

The profitability approach of the Serbian banks' efficiency is the lowest among the analysed approaches. This means that there is a potential for increasing the profitability of the Serbian banking sector. Lower efficiency scores are shown by Api bank, Expo, Halk, Alta, NLB, Procredit, Nasa AIK and Srpska bank. These are banks with lower market share except Procredit bank, which focuses on entrepreneur loans. The lower levels of profit efficiency can be explained because of the lower interest rate levels on the given loans by the banks as well as the high costs of lowering NPL (Vesić et al., 2019). Furthermore, the Serbian banking market records a large number of acquisitions in recent years, where the less profitable banks are targets for the acquiring banks.

Table 7: Results of DEA model: Profitability Approach

DMU	2019	2020	2021
API	0.78	0.69	1.00
ADDIKO	0.87	0.85	0.79
AIK	1.00	1.00	1.00
INTESA	1.00	1.00	1.00
BOC	1.00	1.00	1.00
POSTANSKA STEDIONICA	1.00	1.00	1.00

CREDITAGRICOLE	1.00	1.00	1.00
ERSTE	0.91	0.91	0.93
EUROBANKDIREKTNA	1.00	1.00	0.86
EXPO	0.48	0.47	0.44
HALK	0.69	0.68	0.63
ALTA	0.56	0.83	0.75
KOMERCIJALNA BANKA	1.00	1.00	0.87
MIRABANK	1.00	1.00	1.00
NLB	0.72	0.75	0.65
OTP	1.00	0.91	1.00
3 BANKA	1.00	1.00	1.00
PROCREDIT	0.85	0.68	0.73
RAIFFEISEN	1.00	1.00	1.00
NASA AIK	0.72	0.79	0.75
SRPSKA	0.48	0.48	0.40
MOBI	1.00	1.00	1.00
UNICREDIT	1.00	0.90	0.84
Mean	0.87	0.87	0.85
St. deviation	0.18	0.17	0.18
Minimum	0.48	0.47	0.40
Maximum	1.00	1.00	1.00

Source: the authors' research

Conclusion

The aim of this research was to compare the three commonly used approaches and to show which is the most efficient. As the literature review showed, these approaches are seldom used in a comparison. Among the three considered approaches, the most efficient is the intermediary, then the operating, and the profitability approach is on the third place. Each approach considers the efficiency of the banks from a different angle. The intermediary approach measures the efficiency of deposits, labour and capital to generate loans and investments. The operating approach measures the cost efficiency by putting in relationship interest expenses, non-interest expenses and labour cost with interest income and non-interest income. The profitability approach measures the

ability of the banks to generate profit, or precisely measures the efficiency of achieving interest income, non-interest income and net income on the basis of loan and investment placements.

The limitations of this study are mainly linked with the applied methodology, since the results of DEA models highly depend on the selection of sample and variables. DEA is a relative method and can only measure efficiency compared to other units. Therefore, modification of number of banks in the analysis or choice of different input or output variables would surely lead to some changes in the efficiency scores and results. At the same time, DEA has no predictive possibilities and the results remain sensitive to the choice of both DMUs and variables. Furthermore, we did not focus on the determinant which are affecting the efficiency of the banks in this study. Further research should investigate the internal and external determinant of the bank efficiency.

Considering the period during and after the COVID-19 pandemic, the Serbian banking sector has shown high efficiency scores in all three considered approaches. Lower scores have been shown by smaller banks with lower market share in the Serbian banking market.

It is important to mention that the reason for the lower profit efficiency lays in the low interest rates, which were on the historic minimum level during the pandemic. The reason for the lower scores can also be high activity of mergers and acquisitions in the last year, and the synergic effects of the M&A can be expected in the coming years. It can also be noticed that the less efficient and small banks are expected to be acquired by the more efficient bigger banks. Besides that, the Serbian banking market is regarded as low-concentrated (Bukvić, 2020). According to the results of this study more mergers and acquisitions are to be expected on the Serbian market in order to increase the efficiency scores on several levels.

The importance of the results showed is also valuable from the practical point of view for the bank managers. In all three approaches we listed the banks' efficiency scores based on which the decision makers can conclude which banks can improve either the cost, profitability or intermediary efficiencies. Considered on the whole, it can be concluded that the most improvement is required in the profit efficiency management of several banks. Therefore, the profitability in the banking sector can be improved by taking over the less profitable small banks from the banks which have more market share in order to increase the profit levels.

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Original scientific article

The influence of subjective norms on the use of heat pumps in achieving sustainable development

Утицај субјективних норми на коришћење топлотне пумпе у постизању одрживог развоја

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Abstract: Sustainable development, use of renewable energy sources and energy efficiency have been the focus of interest of the scientific and professional public in recent decades. The aim of the research is to investigate the influence of subjective norms on the use of heat pumps within the framework of behavior in the function of energy efficiency. In addition, the profile of consumers is investigated in the context of their sociodemographic characteristics. Marketing research was conducted on a convenience sample of 208 respondents on the territory of Serbia, in August 2019. The measurement of subjective norms according to the heat pump was performed on the basis of a Likert scale, while the analysis of the sociodemographic characteristics of the respondents was performed using the SPSS program package. Based on the results of the research, it was concluded that the influence of subjective norms on the introduction of the use of heat pumps is closest to the score 3, which is neutral on a five-point Likert scale, as well as that subjective norms can be statistically significantly explained by income and the number of children under the age of 18 as sociodemographic characteristics of the respondent.
Keywords: renewable energy sources, subjective norms, heat pumps, socio-demographic characteristics of consumers.
JEL classification: M31

Сажетак: Одрживи развој, коришћење обновљивих извора енергије и енергетска ефикасност су последњих деценија стављене у фокус интересовања научно-стручне јавности. Циљ рада је да се у оквиру понашања у функцији енергетске ефикасности истражује утицај субјективних норми на коришћење топлотне пумпе. Поред тога истражује се профил потрошача у контексту њихових социодемографских карактеристика. Маркетинг истраживање је спроведено на пригодном узорку од 208 испитаника на територији Србије, у августу 2019. године. Мерење субјективних норми према топлотној пумпи је извршено на основу Ликертове скале, док је анализа социодемографских карактеристика испитаника извршена коришћењем SPSS програмског пакета. На основу резултата истраживања изведена су закључна разматрања да је утицај субјективних норми на увођење коришћења топлотне пумпе најближи оцени 3 која је неутрална на петостепеној Ликертовој скали, као и да се субјективне норме могу статистички значајно објаснити приходом и бројем деце млађе од 18 година као социодемографским карактеристикама испитаника.
Кључне речи: обновљиви извори енергије, субјективне норме, топлотне пумпе, социодемографске каректеристике потрошача.
ЈЕЛ класификација: M31

Introduction

The concept of sustainable development in contemporary living conditions is one of the current and inexhaustible research topic. The transition trend towards reducing the use of fossil fuels in the member states of the European Union, as well as in the Republic of Serbia, defines a series of measures that motivate and encourage more intensive use of renewable energy sources. Munitlak-Ivanovic (2008) states that, while taking into account the pollution tolerance threshold, the environment can be viewed as a resource for carrying out economic activities, but also as a waste recipient.

Rašić-Jelavić & Pajdaković-Vulić (2021) consider that there are several objectives of environmental protection, starting with reducing air and water pollution, reducing waste, more efficient consumption of resources, increasing the use of renewable energy sources, improving energy efficiency, improving recycling and reuse of products, etc.

Boskovic, Djuric & Turanjanin (2017) point out that for sustainable development, the existence of environmentally conscious consumers is necessary along with a continuous change in consumer behavior towards energy-saving behavior.

The focus on the importance of using renewable energy sources, on the one hand, and relatively few researches on this topic in the Republic of Serbia, on the other hand, determined the author to choose the research of subjective norms for the heat pump, as a product that uses renewable energy sources - hydro and geothermal energy.

Karic, Blagojevic & Skundric (2010) point out in their work that geothermal energy is a renewable energy source and that geothermal heating represents an environmentally acceptable type of heating. In this context, the authors state that heat pumps extract low-temperature energy from the environment and increase it in order to heat the space without combustion, the emission of harmful gases and without environmental pollution. As the main advantage of the heat pump, the authors cite efficiency, i.e. low level of electricity consumption compared to standard heating systems, which is an extremely important fact at the time of the current energy crisis. At the same time, heat pumps can also be used for space cooling, with affordable maintenance of the system, according to Karic et al. (2010).

The first part of the paper presents an overview of the scientific and professional literature and previous research on the influence of subjective norms, energy efficient behavior, and environmental protection. The second part of the paper gives an overview of the empirical research results on the influence of subjective norms regarding the use of heat pumps in the Republic of Serbia in the context of the sociodemographic characteristics of the respondents. At the same time, consumer profiling using sociodemographic characteristics can have significant repercussions on the creation of marketing strategies.

In order to achieve the aim of the paper, a primary marketing survey was conducted on the territory of the Republic of Serbia in July 2019, which included 208 respondents. The prerequisite for someone to be a respondent is that they are the decision maker regarding the purchase of the researched product and that there are (or will be in the future) technical grounds for installing and using a heat pump in the household.

1. Investments in energy efficiency

Energy efficiency is an important segment of environmental efficiency within the framework of sustainable development in business operations (Rakić, Krstić & Rađenović, 2021). The authors suggest in their research that energy efficiency is different in different industries because they involve different products and processes.

People's daily behavior increases household energy consumption, which affects the uncertainty of the efficiency of household energy saving policies much more than in other sectors, according to Zhang, Yu, Wang & Wei (2018), who conclude that it is necessary to analyze consumer behavior for sustainable household energy consumption.

Barr, Gilg & Ford (2005) and Zhang et al. (2018) point out that energy-saving behavior is behavior by which consumers try to reduce their overall energy use. In this context, Zhang et al. (2018) believe that energy saving implies efficient use of energy aimed at reducing energy consumption.

The European Union has ambitious energy efficiency targets related to household behaviors in terms of energy efficiency with a focus on a low-carbon society (Bye, Fæhn & Rosnes, 2018), while Niamir, Ivanova, Filatova, Voinov & Bressers (2020) point out that households are directly and indirectly responsible for 70% of CO_2 emissions.

Considering the process of industrialization and urbanization in China, Aboltins & Blumberga (2018) suggest that it is important to promote proper consumption patterns, motivate the population to adopt energy-saving lifestyles and reduce CO_2 emissions, and conclude that improving energy efficiency technology is the best way to promoting the reduction of CO_2 emissions in households.

Ouyang, Long & Hokao (2010) also emphasize that it is necessary to promote consumer behaviors in the context of time-saving, energy-efficient technology or a comfortable environment and conclude that when the alignment of lifestyle trends, energy-efficient technologies and behaviors is achieved, changes in behavior towards energy-saving behavior occur spontaneously.

In research conducted in the capital city of Shandong Province in China Zhang et al. (2018) consider three main factors that define energy efficient behavior in households: individual subjective and objective factors (e.g. gender, age, occupation, degree of concern, sense of responsibility, values), factors of external influence (e.g. quality of energy-saving

products, social norms, public and education) and intentions to save energy (including usual behaviors - habits and behaviors in the function of purchasing energy-efficient products).

Based on the obtained results, Zhang et al. (2018) conclude that there is a need for state support and stimulation of companies for the production of high-quality energy-efficient products, in order to encourage the motivation of energy-saving behavior in households.

There is an interest of the respondents in the use and saving of energy in the household, but access to information on the most effective activities for saving is necessary in order to make a decision on the implementation of energy-saving behavior observed by Ouyang et al. (2010) and Jareemit & Limmeechokchai (2017).

In their research, Niamir et al. (2020) presented a dynamic process of changing household behavior that takes place in several stages. In doing so, the authors analyze three determinants of energy behavior in the Netherlands and Spain:

1. investments in house insulation, solar panels and/or energy-efficient devices,
2. saving energy by changing energy usage habits such as turning off unused devices or adjusting the temperature in the house and
3. transition to green sources of electricity.

The results show that in the period from 2006 to 2016, compared to households in Spain, households in the Netherlands were more active in energy-efficient investments, specifically in house insulation activities 6% more, in installing solar panels 12.6% more, Niamir et al. (2020) say.

Rankings of energy-saving household activities show that Bangkok citizens use energy-efficient air conditioners the most, as well as household appliances with a higher energy efficiency rating. When making a decision to buy a household appliance, they emphasize durability in the first place, followed by energy efficiency and the price of the product, with 2-4 years as the expected investment return period (Jareemit & Limmeechokchai, 2017).

When looking at investments in energy efficiency, it is relevant for Bangkok citizens to consider investment costs that affect perception significantly, which is in line with the results showing that most respondents applied activities with lower investments (painting the outer wall of the house in a light color, planting trees to increase amounts of shade). The greatest interest in future activities is for the upgrade of canopies, roof insulation and the installation of insulated glass windows (Jareemit & Limmeechokchai, 2017).

Aboltins & Blumberga (2018) state that energy prices have an impact on households in Latvia, but to a lesser extent, primarily due to stable energy consumption habits, relatively cheap energy and low energy consumption per capita, in contrast to more economically developed countries, where energy consumption increases with the growth of well-being.

The Norwegian government introduced economic support for alternative heating systems (pellet and heat pump) in 2003 due to the high dependence on electric heating

combined with the high price of electricity. The financial support of the state led to the rapid growth of the heat pump market, while in the case of pellets the result was not achieved as expected. In the paper, the authors study the factors that influence the choice of household heating systems in Norway (Sopha, Klöckner, Skjevrak & Hertwich, 2010). The conclusion of the research is that the state should implement special strategies for different groups of households. For example, households where younger people dominate, should promote heating systems based on new technologies. Also, ensuring a stable fuel supply and low operating costs appear as two relevant factors when making a decision on choosing a sustainable heating system in Norway, which the state must pay attention to when creating a marketing strategy.

2. Subjective norms and energy efficient behavior

Subjective norms represent an important psychological variable that influences the energy-efficient behavior of consumers. Many academics confirm the significant influence of subjective norms on consumer behavior (Sun, Liu & Zhao (2018); Wang, Zhang & Li (2014); Gadenne, Sharma, Kerr & Smith (2011); Thøgersen & Grønhøj (2010); Nakamura (2016); Inhoffen, Siemroth & Zahn (2018)).

Nikolic-Ristic & Djokic (2021) based on Gadenna et al. (2011) conclude that the influence of environmental pressures (subjective norms) is very significant for the acceptance of environmental protection behavior with a pronounced impact on the development of people's values. A sense of belonging arises when people accept behaviors that are considered the norm in the group.

Thøgersen & Grønhøj (2010) emphasize the importance of perception of how much other household members care about energy saving and communication between family members about energy saving efforts and the influence of social norms. In their research, they conclude that subjective norms influence an individual's electricity saving goals directly and indirectly, that is, that men put more pressure on women to save energy.

Analyzing one of the largest subsidized renewable energy support programs in the European Union for the installation of photovoltaic systems in Germany, Inhoffen et al. (2018) state that in municipalities with more solar radiation and less unemployment, social interaction has a stronger effect, which affects the probability of increasing the number of new installation up to 50%. On the other hand, in the northern areas of the country, with minimal solar potential, the positive influence of environmental pressure was confirmed.

Also, Wang et al. (2014) state the great influence of national culture in China, the importance of relationships with family members, close friends and colleagues, and conclude that subjective norms represent the most important factor in household behavior regarding energy saving in Beijing.

Gaspar & Antunes (2011) suggest that shopping together with family members or friends affects a greater tendency to consider the relationship between cost and quality, water and energy consumption, in contrast to the situation of respondents who were alone while shopping.

In his research, Nakamura (2016) shows that households are motivated to replace appliances more because of the social pressure they feel, than because of the willingness to save energy.

Although somewhat weaker, the influence of subjective norms (friends, family and media) on the online purchase of tourist services is also very important, which especially applies to younger respondents and can partly be interpreted as their consumer socialization, according to Djokic & Milicevic (2017).

On the contrary, the results of the research by Li, Li, Jin & Wang (2019) show that there is no statistically significant influence of subjective norms on the intention to purchase energy-efficient appliances.

3. Research design

3.1. A sample

Field marketing research was conducted using a structured personal survey on a purposive and convenience sample of 208 respondents in August 2019 on the territory of the Republic of Serbia. The average level of total income in the respondent's household was 93,075 dinars.

Sociodemographic characteristics of the respondents are shown in Table 1.

Table 1: Sociodemographic characteristics of respondents

Characteristic		Percentage	Characteristic	Percentage	Standard deviation
Gender	Male	52.9%	***Age***	*43.4*	*11.96*
	Female	47.1%			
Marital status	Married	76%	***Years of education***	*14.5*	*2.4*
	Single	24%			
Work status	Employed	83.2%	***Number of children in the household***	*0.7*	*0.9*
	The others	16.8%			
Total income	Up to 100.000 RSD	67.3%			

	From 100-450.000 RSD	32.7%	***Income rating***	*0.7*	*1.03*

Source: the author's research

Through the descriptive analysis of the respondents, it can be concluded that the majority of the respondents were male, with an average age of 43, college or university education, predominantly married and employed, with less than one child under the age of 18 in the household, the majority with a relatively low income rating and low income up to 100,000 dinars.

3.2. Questionnaire

The questionnaire was designed in two parts, where the first part of the questionnaire referred to the socio-demographic characteristics of the respondents. Thereby, gender, age, years of education, marital status (married, not married), number of children under the age of 18 in the household, work status (employed, unemployed, pensioners, students), self-assessed household income (from 1 to 5 – 1 the lowest, 5 the highest rating) and total income in the household were investigated.

The second part of the questionnaire was related to the research of subjective norms towards the use of heat pumps in the household. Subjective norms were measured using six statements:

1. People whose opinion we value support the use of heat pumps.
2. People we care about encourage the use of heat pumps.
3. We feel pressure from society to start using a heat pump.
4. People close to us would approve of using a heat pump.
5. Most households similar to ours will start using heat pumps.
6. Most people who are important to us will use heat pumps.

In doing so, respondents expressed subjective norms using a five-point Likert scale (from "I do not agree at all" to "I completely agree"). The questions in the questionnaire about subjective norms were adapted from the research conducted by Ajzen, Joyce, Sheikh & Gilbert (2011).

3.3. Procedures

Subjective norms of the respondents regarding the use of heat pumps in the household are expressed by the average rating of the answers to the 6 described questions. The T test of

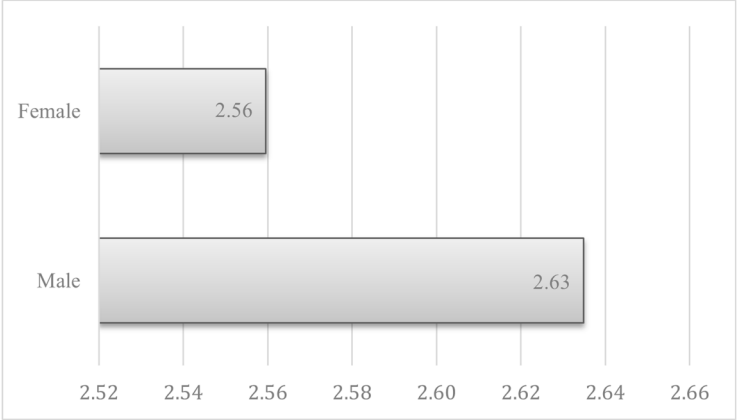
independent samples was used to compare respondents of different gender, marital and work status. Pearson's correlation was used to determine the existence of a correlation between age, education and the number of children under 18 in the household, income and household income with the subjective norms of the respondents according to the heat pump used in the household.

4. Research results

The average rating of the respondents' subjective norms according to the use of heat pumps in the household is 2.60 (standard deviation 0.74). At the same time, the respondents mostly agree with the statement that people whose opinion they value support the use of a heat pump, while they disagree, i.e. they gave the lowest average rating that they feel pressure from society in this sense.

Graph 1 presents the average rating of respondents of different genders.

Chart 1: Subjective norms of respondents of different genders towards the heat pump

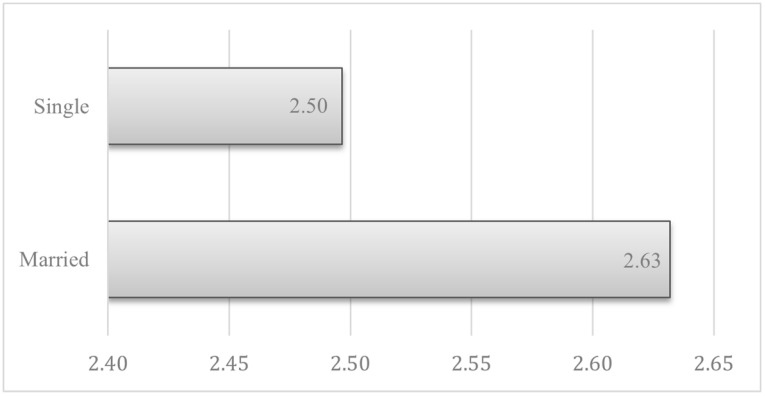


Source: the author's research

Results of the T test: $t(206) = 0.737$; $p=0.462>0.05$ show that men and women do not statistically significantly differ in subjective norms according to the use of heat pumps.

Graph 2 shows the average rating of respondents of different marital status.

Chart 2: Subjective norms of subjects of different marital status according to the heat pump



Source: the author's research

Results of the T test: t(206)= 1.134; p=0.258>0.05 show that respondents who are married and respondents who are not married statistically do not differ significantly in subjective norms according to the use of heat pumps.

Results of the T test: t(184) = 0.188; p=0.851>0.05 show that respondents who are employed and respondents who are not employed (unemployed, retired, students) do not statistically significantly differ in terms of subjective norms regarding the use of heat pumps.

Pearson's correlation results: r=-0.100; p=0.151>0.05 show that there is no correlation between the age of the respondents and the subjective norms according to the use of the heat pump in the household.

The average education of the respondents in relation to the introduction of the use of the heat pump is at the level of college/university degree. Pearson's correlation results: r=-0.031; p=0.656>0.05 show that there is no correlation between the respondents' years of education and subjective norms regarding the use of heat pumps in the household.

Pearson's correlation results: r=0.200; p=0.004<0.05 show that there is a positive and statistically significant correlation between the number of children under the age of 18 in the respondent's household and subjective norms regarding the use of a heat pump in the household.

The results of the Pearson correlation in relation to the subjective norms according to the use of the heat pump are for income rating r= 0.150; p=0.031<0.05 and for total income r= 0.127; p=0.068>0.05. The above results show that there is no correlation of total household income with subjective norms according to the use of a heat pump in the household, while

when it comes to self-assessed household income there is a weak, positive and statistically significant correlation with subjective norms.

In general, the Pearson's correlation results show that there is a positive and statistically significant correlation between the number of children under the age of 18 in the respondent's household and subjective norms, as well as a positive, weak and statistically significant correlation between the respondent's self-assessed income and subjective norms regarding the use of heat pumps in the household. On the other hand, the influence of subjective norms on the use of the heat pump cannot be statistically significantly explained by the sociodemographic characteristics of the respondents such as gender, age and education, marital and work status and total household income.

The results obtained based on the respondents' ratings indicate that the influence of subjective norms on the introduction of the use of the heat pump is neutral (closest to rating 3 on a five-point Likert scale). This is partially in line with Irfan, Elavarasan, Hao, Feng & Sailan (2021), who state that it is noticeable that environmental pressure has an insignificant effect on the intention to use solar energy. In contrast, the obtained results are not in agreement with the researches of Li et al. (2019) who indicate that the influence of subjective norms on the intention to purchase energy-efficient devices is not significant, and Lundheim, Vesely, Nayum, & Klöckner (2020) that subjective norms do not have a significant influence on the use of solar panels, nor with the aforementioned researches which confirm the importance of subjective norms (Sun et al. (2018); Wang et al. (2014); Gadenne et al. (2011); Thøgersen & Grønhøj (2010); Nakamura (2016); Inhoffen et al. (2018)).

When looking at the context of the sociodemographic characteristics, the results are consistent with the results of Wang et al. (2014) who conclude that the age of the respondents is not a significant variable influencing energy-saving behavior. Sopha et al. (2010) confirm our results and state that household education does not show a significant effect when it comes to the use of a heat pump for heating, as well as Wang et al. (2014) who point out that education does not significantly affect the intention to adopt energy-saving behaviors. Dieu-Hang, Grafton, Martínez-Espiñeira & Garcia-Valiñas (2017) confirm that income as a socio-demographic characteristic of the household has a positive effect on the probability of investing in energy-efficient water devices, while Sopha et al. (2010) state that income has a marginally significant effect on the probability of pellet heating. Also, the obtained results are partially in accordance with Djokic & Milicevic (2016), who state that one of the aims of the work is to investigate the profile of organic food consumers in the context of their sociodemographic characteristics and conclude that actual and potential consumers of organic food can be linked to higher incomes , and especially with a higher level of education, and the results of Niamir et al. (2020) who emphasize economic comfort as a factor influencing household behavior in the sense that economically vulnerable households are more motivated to save energy.

On the contrary, the obtained results are not in accordance with the research results of Sun et al. (2018) who states that income has no significant direct or indirect impact on green

consumption, while Niamir et al. (2020) and Jareemit & Limmeechokchai (2017) indicate the importance of gender on energy-saving behavior and confirm that women have a greater tendency towards energy-saving than men. When looking at the probability of making a decision on energy-efficient investments in households, Niamir et al. (2020) as key determinants they state the level of education of the citizens (95%), personal norms (90-99%), type (99%) and size of the apartment (90–95%), noting that a higher level of personal norms also increases the probability of investment in energy efficiency, energy conservation and transition to green suppliers. The results of Sopha et al. (2010) showed that the age variable is statistically significant for the choice of electric heating, heat pump and pellets and that education has a marginally significant effect on the probability of pellet heating.

Conclusion

The results of the research conducted in the Republic of Serbia in this paper showed that the influence of subjective norms on the use of heat pumps is neutral, and when the mentioned question is observed by segments, it can be concluded that subjective norms can be statistically significantly explained by self-assessed household income and the number of children under the age of 18 as sociodemographic characteristics.

Also, the impression of the research is the low standard of living of the respondents, which is reflected in the low income rating and low average incomes at the level of the entire household of the respondents. The fact that the influence of subjective norms, in addition to the variable of the number of children under the age of 18, can be statistically significantly explained and the income refers to the importance of the respondent's income for making a decision on the introduction of the use of a heat pump and the possibility of financing the purchase. On the other hand, it is necessary to mention that there is still not enough information among citizens about the advantages of using a heat pump, and therefore the environmental pressure, i.e. the influence of subjective norms, is very low.

The obtained results of this research can be useful to the state in order to improve the information and education of the population regarding the use of renewable energy sources, as well as the use of the heat pump as a product in the function of energy efficiency. If we look back at the current energy situation in our country and the world, which was caused by the crisis in Ukraine, the focus on promoting products that use renewable energy sources comes to the fore. In this way, the state can achieve a reduction in energy consumption from traditional (fossil) sources and increase the use of renewable energy sources, and citizens can reduce their bills for consumed energy and thereby make their contribution to sustainable development.

Future researches should include new bases, larger and more representative samples, as well as a larger number of products in terms of energy efficiency.

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The influence of barriers on entrepreneurial intentions: student entrepreneurship in Western Balkan countries

Утицај баријера на предузетничке намере: студентско предузетништво у земљама Западног Балкана

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Abstract: The paper is based on the findings of the research of students of business administration in the countries of the Western Balkans and aims to identify the impact of entrepreneurial barriers on their intentions to start entrepreneurial ventures. Barriers are classified into four categories. The first category is knowledge and skill barriers. The second group of barriers includes financial barriers. Subjective circumstances represent the third, and administrative procedures and fiscal burdens are the fourth groups of barriers. The research was conducted with 910 respondents, which consists of 71 questions. For the analysis, 6 questions related to the demographic profile and general information were used, while for the second part, 14 were used, which belong to the categories of barriers. The SPSS program was used for the empirical analysis of the results. The results showed that financial barriers, administrative procedures, and fiscal burdens harm entrepreneurial intentions. Within the group of barriers of knowledge and skills, the lack of business plan development skills and the lack of financial skills harm entrepreneurial aspirations, while the other barriers are not statistically significant. It was confirmed that statistically significant barriers to entrepreneurial intentions belong to subjective circumstances: lack of support from the environment and fear of failure.
Keywords: Student entrepreneurship, entrepreneurial intentions, barriers to entrepreneurship, students in Western Balkan countries
JEL classification: L26, M13, O19

Сажетак: Рад је заснован на налазима истраживања студената пословне администрације у земљама Западног Балкана и има за циљ да идентификује утицај предузетничких баријера на њихове намере за

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покретање предузетничких подухвата. Баријере су разврстане у четири категорије. Прва категорија су баријере знања и вештине. Другу групу баријера обухватају финансијске баријере. Субјективне околности представљају трећу, а административне процедуре и фискална оптерећења четврту групу баријера. Истраживање је реализовано са 910 испитаника, путем који чини 71 питање. За потребе анализе је коришћено 6 питања везаних за демографски профил и опште информације, док је за други део коришћено 14 која припадају претходно наведеним категоријама баријера. За емпиријску анализу резултата коришћен је програм СПСС. Резултати су показали да финансијске баријере, административне процедуре и фискална оптерећења утичу негативно на предузетничке намере. У оквиру групе баријера знања и вештине, недостатак вештина израде бизнис плана и недостатак вештина из области финансија утичу негативно на предузетничке аспирације, док остале баријере нису статистички значајне. Потврђено је да су за предузетничке намере статистички значајне баријере које припадају субјективним околностима: недостатак подршке из окружења и страх од неуспеха.
Кључне речи: Студентско предузетништво, предузетничке намере, баријере за предузетништво. Студенти земаља Западног Балкана
ЈЕЛ Класификација: L26, M13, O19

Introduction

Entrepreneurship is seen to achieve economic progress in developed and developing countries (Temetime et al., 2004). Differences in the macroeconomic environment influence the fact that the contribution of entrepreneurship to economic development is different in countries at different levels of development (Lepojević et al., 2016). For maintaining a knowledge-based economy, and strengthening innovation and competition, entrepreneurship is a decisive factor (Gorji & Rahimian, 2011; Sarri & Trihopoulou, 2005). Hatala (2005) states that an individual's decision to start a business is a complex, multifaceted process. From the perspective of the individual, it tends to focus on the orientation, attitude, and behaviour of the entrepreneur (Miles et al., 1993). The propensity towards entrepreneurship, i.e., the intention of an individual to engage in business, is a key issue addressed by De Pillis & Reardon (2007). Students can be great resources and strong drivers of entrepreneurial activities. The solution to the problem of unemployment of graduates can be to start their entrepreneurial venture, on the way of which there are numerous limitations and aggravating circumstances recognized as potential barriers. Getting to know the barriers and finding ways to overcome them is the only way to increase an entrepreneur's chances of success. Barriers were divided into four groups. The first group refers to the lack of knowledge and skills. The second group consists of financial barriers. Subjective circumstances are the third group of barriers, and administrative procedures and fiscal burdens form the fourth group. With this work, the authors want to examine the entrepreneurial intentions of business administration students in the countries of the Western Balkans and see what their perception is of the set of barriers that stand in the way of starting a business venture.

1. Theoretical background

The creation of new enterprises has been highlighted as an innovative instrument in the economy, which generates development and provides salvation from the general unemployment of any economy (Teixeira & Davey, 2010). Entrepreneurship affects people's lives through the introduction of new technologies, products, and services. Entrepreneurs overcome failure with their approach and creativity, improve the world, and help build a

richer, more socially capable, and technically advanced society (Gautam et al., 2015). The world's biggest entrepreneurs are among the most influential and most followed people in the world. They are often role models for young generations. Students' decision to become entrepreneurs is conditioned by many factors that influence their entrepreneurial intention. Pihie (2009) points out two ways to measure entrepreneurship. The first involves the measurement of entrepreneurial initiative, which includes established entrepreneurial ventures. The second relates to the measurement of entrepreneurial activity by considering entrepreneurial intentions. The authors opted for another way, which is also called latent entrepreneurship. Researchers claim that entrepreneurial intention is the main indicator of entrepreneurial behaviour (Sitaridis & Kitsios, 2019; Wong & Choo, 2009; De Pillis & Reardon, 2007; Van Gelderen et al., 2008). The development of entrepreneurship is a complex, long-term and comprehensive process, the goal of which is to increase the inclination to undertake entrepreneurial actions. Entrepreneurial intention means the percentage of people who will support or establish a business in the next 12 months (Nawaser et al., 2011). The entrepreneurial intention of students is determined by the motives and barriers they encounter during their studies. Constraints and motivations faced by students have different relative importance on entrepreneurial intentions (Sitaridis & Kitsios, 2019). Barriers are an extremely important factor in the entrepreneurial process (Schlaegel et al, 2015). Kolvereid & Isaksen (2006) point out that the realization of intentions and entrepreneurial activities becomes complicated when entrepreneurial barriers are present. By eliminating certain barriers, stronger entrepreneurial activity can be encouraged, by observing them concerning certain incentives (Sarasvathy, 2004). During all stages of an entrepreneurial career, barriers act and increase the entrepreneur's uncertainty (Iakovleva et al., 2014; McMullen & Shepherd, 2006). Entrepreneurial barriers can hinder or prevent entrepreneurial activities altogether (Sitaridis & Kitsios, 2019). Pittaway & Cope (2007) also confirmed the negative relationship between individuals' perceptions of barriers to the creation of new ventures. Khanin et al. (2022) defined barriers to entrepreneurship as conditions that prevent opportunity seeking and opportunity recognition.

Due to the importance and negative impact that entrepreneurial barriers can create, it is necessary to identify them and eliminate their challenges. In this way, the background for the development of entrepreneurial activity is provided. Hatala (2005) points out that identification begins with the individual who is faced with them, and often reacts to them uncontrollably. Effective formulation of policies requires a thorough understanding of the barriers that affect entrepreneurial propensity. This will assist policymakers in formulating strategies to mitigate or remove barriers, thereby enabling entrepreneurial activity (Sandhu et al., 2011). Based on the analysed literature, the authors classify the barriers into four categories. Barriers related to knowledge and skills are the first. They consist of human resource management skills, operational skills, and business plan development skills, from the fields of management, finance, and marketing. Financial barriers, which include lack of savings and lack of financial resources, are another category. The third category includes subjective circumstances. These include finding an adequate business partner, lack of support from the environment, and fear of failure. The last category consists of administrative procedures and fiscal burdens. In the following, attention will be paid to each category individually.

1.1 Knowledge and skills barriers

Starting an entrepreneurial venture requires skills from various disciplines. Knowledge, skills and other abilities are the main element that guarantees the success of the organization (Amidžić et al., 2022). Skills can be provided through practice, training, education, or engagement of third parties as needed (Hatala, 2005). In their research, Sitaridis & Kitsios (2019) conclude that the lack of entrepreneurial knowledge and skills has a great impact on the entrepreneurial intentions of students. The vital role of knowledge is emphasized by Caraiannis et al. (2003). The importance of education as a barrier that stands out from others is also found in other authors (Scott & Twomey, 1998; Wang et al., 2020). For students, in addition to academic knowledge, the acquisition of practical skills, which are acquired in cooperation between universities and employers, is very important (Kurczewska et al., 2022). Personal investments, such as acquiring new skills or improving existing ones, remain the smartest entrepreneurial decisions one can make (Robinson, 2018). Knight (1996) writes that financial planning, marketing, and operations management are required business skills. An entrepreneur should have the managerial capacity for the day-to-day management of the organization. Practical skills are necessary to manage an entrepreneurial venture. These skills include setting operational goals, planning, organizing, decision-making, and directing day-to-day tasks. These skills are most easily mastered through practice, working with mentors, or successful entrepreneurs. Gorji et al. (2011) emphasize the importance of marketing skills, because today there is no problem with the lack of goods or customers, but with the arrival and successful transmission of the message to the customer. In the research conducted by Elango et al. (2007), many students agreed that they lack the knowledge to start a business and develop a business plan, which immediately excludes the possibility of accessing finance and support from formal institutions. Maintaining billing systems, accounting, and financial records, supervisory skills, and tools at lower management levels are just added to the list of barriers to starting an entrepreneurial venture. The authors list the following as key skills that can influence entrepreneurial aspirations: human resource management skills, operational skills, business plan development skills, business process control skills, financial skills, and marketing skills. Based on the previously stated views, the first hypothesis was put forward:

H1: The lack of knowledge and skills has a negative impact on the entrepreneurial intentions of students from Western Balkan countries.

1.2 Financial barriers

Access to capital is a critical resource for the success of an entrepreneurial venture (Sriram et al., 2007; Ramayah & Harun, 2005). The lack of standardized measures for evaluating the results of entrepreneurs make it difficult to attract capital into their hands (Talić et al., 2022). Smith and Beasley (2011) state that finance is a limiting factor and is necessary for capital equipment and paying bills in the earlier stages of a start-up. In his research, Birdthistle (2008) concludes that the lack of debt capital is related to starting a new business. Credit constraints are one of the main obstacles to the growth of small and medium enterprises (Pissarides, 1998). In most countries, an underdeveloped capital market forces entrepreneurs to rely on self-financing or borrowing from friends and relatives. Small businesses are doomed to expensive short-term financing. Financial barriers affecting entrepreneurs include

the high cost of credit, relatively high bank fees, and high collateral (David & June 2001; Bartlett & Bukvič, 2001; Cressey, 2002). Supplier credits are an important aid to entrepreneurship (Klapper et al., 2004).

H2: Financial barriers have a negative impact on the entrepreneurial intentions of students from Western Balkan countries.

1.3 Subjective circumstances

Under subjective circumstances such as barriers, the authors mean finding an adequate partner, lack of support from the environment, and fear of failure. Fini et al. (2016) point out that entrepreneurs and budding entrepreneurs have significant difficulties in finding the right partners. It is of great importance for success to have close friends around you, from whom an adequate team is created. Support from various stakeholders, such as family, community, and business partners, helps foster entrepreneurship (Soluk et al., 2021). Ashwin et al. (2015), Adjei et al. (2019) showed in their research a positive relationship between family support and entrepreneurship. The lack of support, which consists of the difficulty of convincing others of the viability of a business idea, is a barrier that can hinder the launch of a venture. The challenge is to match the process with the characteristics of the idea, environment, and people. Matching the elements with the process will lead to a reduction in uncertainty. It is important to take small steps, to ensure that the price of a mistake is paid less (Mathews & Moser, 1995). There is no unique recipe for this, but the ability to evaluate the idea and the environment implies a planned, systematic, iterative, and flexible approach (Davidsson, 2005). Entrepreneurship requires persuasive skills to influence other firms and gain support or investment in joint ideas. The lack of entrepreneurial networks can be an obstacle to starting a venture (Matthews & Moser, 1995). Bartlett & Bukvič (2001) state the following obstacles, which are a consequence of the external position: business sector, degree of competition and their behaviour, the extent of the network, and support alliance. Fear of failure is at the top of the barrier scale in many studies (Choo & Wong, 2007, Sandhu et al., 2011). It is common for entrepreneurs to encounter an aversion to risk, fear of failure, aversion to stress, and hard work when deciding. Failure and entrepreneurship go hand in hand (Sandhu et al., 2011). Starting a business is a big commitment, which is not easy to commit to when there is uncertainty (Hatala, 2005). According to the Global Entrepreneurship Monitor (GEM), many aspiring entrepreneurs cite the fear of failure as the main reason for entrepreneurial passivity, since most can experience failure as a shame. (Lepoutre et al., 2007).

H3: Subjective circumstances have a negative impact on the entrepreneurial intentions of students from Western Balkan countries.

1.4 Administrative procedures and fiscal burdens

The simpler and shorter the administrative processes and procedures in a country, the greater the propensity of entrepreneurs to start a business (Gorji & Rahimian, 2009). This is why counter-regulations are considered obstacles to entrepreneurship. Laws and regulations represent limitations due to the complexity or inconsistency of the legal framework. Constant

changes in regulations and procedures are perceived by students as obstacles (Iakovleva et al., 2014). Government legislation related to taxation has a negative impact on entrepreneurial activities. Increasing costs of starting a business and related regulations lead to the rejection of entrepreneurship (Georgiou, 2010). Complicated laws, rules, and regulations can be especially tough on small and growing companies. Bureaucracy, administrative burdens, and difficulties in complying with regulations stand as obstacles between entrepreneurs and the state (Martins et al., 2004). Over-regulation of the business sector can be a reason for entrepreneurs to seek ways to avoid regulations, leading to the growth of the shadow economy. An inappropriate tax system and various discriminatory legal regulations can be a heavy burden for entrepreneurs (Bartlett & Bukvič, 2001). This leads to the creation of financial and psychological barriers for future entrepreneurs (Choo & Wong, 2006). Regulations that hinder the creation of new firms are especially found in industries that should naturally have high entry. When these regulations are effectively enforced, they are not benign and do not improve well-being. Finance regulations, unlike entry regulations, improve welfare. Regulations that protect intellectual property, and labour regulations lead to reduced entry. Higher corporate taxes act much like regulatory barriers (Klapper et al., 2004). The absence of some regulations can be an effective barrier to the entry of new entrepreneurs (Rajan & Zingales, 2003).

H4: Administrative procedures and fiscal burdens have a negative impact on the entrepreneurial intentions of students in Western Balkan countries.

2. Methodology

The work aims to identify the barriers to starting entrepreneurial ventures and their influence on the entrepreneurial intentions of business administration students in the countries of the Western Balkans. For the research, a questionnaire consisting of two groups of questions was conducted. The first group refers to the demographic profile of the respondents. These are data on gender (1. male; 2. female), age (1. up to 22 years; 23+), and education (1. Undergraduate studies; 2. Master's studies; 3. Doctoral studies), citizenship (1 Serbia; 2. Bosnia and Herzegovina; 3. Montenegro; 4. Croatia; 5. Macedonia), work experience (1. No, I have no work experience; 2. 0-3 months; 3. 3-6 months; 4. 6-12 months; 5. 12+ months), entrepreneurial experience (1. No, I have no work experience; 2. 0-3 months; 3. 3-6 months; 4. 6-12 months; 5. 12+ months). The second group consists of 14 questions, which make up of four groups of barriers: Knowledge and skills barriers: 1. Lack of financial skills 2. Lack of operational skills (organization and delegation of daily tasks) 3. Lack of business plan development skills 4. Lack of skills in areas of management (establishing control over business processes) 5. Lack of skills in the area of finance 6. Lack of skills in the area of marketing (sales and promotion of products); financial barriers: 7. Lack of savings 8. Lack of financial resources; Subjective circumstances: 9. finding an adequate business partner 10. Lack of support from the environment 11. Fear of failure; Administrative procedures and financial burdens: 12. High taxes and contributions for employed workers 13. Administrative procedures (bureaucracy). Answers were presented on a symmetrical Likert scale from 1 to 7, where respondents indicated their level of agreement or disagreement. The questionnaire was filled out partly online in the form of a Google questionnaire, and partly in paper form.

The software package for statistical analysis - SPSS - was used for data analysis. Logical regression was used to determine the statistical significance of motives and their relationship to intentions to start entrepreneurial ventures. The dependent variable is the question: Have you seriously considered the option of becoming an entrepreneur? Answers are marked as follows: 1. No; 2. Yes. The independent variables are the 13 questions above about barriers to starting entrepreneurial ventures. The questionnaire was filled out by 910 students who come from the countries of the Western Balkans and are predominantly business administration majors. Table 1 and Table 2 provide an overview of the research sample and descriptive statistics.

Table 1. Research sample

Gender		Age range		Level of education		Nationality		Work experience		Entrepreneurial experience	
Male	261	Until the 22nd	602	BSc	813	Serbia	204	None	464	None	772
Female	649	From the 23	308	MA	88	Baha	181	0-3 months	112	0-3 months	51
				PhD	8	Montenegro	147	3-6 months	71	3-6 months	16
						Croatia	193	6-12 months	68	6-12 months	14
						North Macedonia	185	12+ months	195	12+ months	57

Source: the authors' analysis, 2022.

Table 2. Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Gender	910	1	2	1.71	0.453
Age range	910	1	2	1.34	0.473
Level of Education	910	1	3	1.11	0.345
Nationality	910	1	5	1.36	1.013
Work experience	910	1	5	2.36	1.640
Entrepreneurial experience	910	1	5	1.39	1.057
Valid N (list wise)	910				

Source: the authors' analysis, 2022.

3. Results

Binary logistic regression was used to examine the impact of barriers to starting entrepreneurial ventures on the entrepreneurial intentions of students from the Western Balkan countries. Estimates of the logistic coefficient, which were identified as independent variables in block one (column B), can be seen in Table 3. In column S.E. asymptotic standard errors for individual logistic coefficients are shown. The "Wald" column contains the results of the Wald statistic and the chi-square test, the "do" column shows the degree of freedom, and the "Sig" column represents the probability from the Wald test hypothesis when the

logistic coefficient for the dependent variable is equal to zero. In the column "Expo (b)" there are exponential logistic coefficients, which are important for the interpretation of logistic regression.

Table 3. Variables in the equation

Variables in the equation									
		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1a	Lack of human resource management skills	-0.010	0.071	0.021	1	0.884	1.010	0.879	1.162
	Lack of operational skills (organization and delegation of daily tasks)	-0.082	0.078	1.110	1	0.292	0.921	0.791	1.073
	Lack of business plan creation skills	-0.076	0.060	1.595	1	0.021	1.079	0.959	1.215
	Lack of skills in the field of management (establishing control over business processes)	-0.056	0.072	0.598	1	0.439	1.057	0.918	1.217
	Lack of financial skills	-0.089	0.063	2.012	1	0.026	0.915	0.809	1.035
	Lack of marketing skills (sales and promotion of products)	-0.064	0.059	1.189	1	0.275	1.066	0.950	1.196
	Lack of savings	-0.057	0.051	1.271	1	0.026	0.944	0.855	1.043
	Lack of financial resources	-0.076	0.061	1.553	1	0.013	0.927	0.823	1.044
	Finding an adequate business partner	-0.032	0.053	0.376	1	0.540	1.033	0.931	1.145
	Lack of support from the environment	-0.122	0.048	6.355	1	0.012	0.885	0.805	0.973
	Fear of failure	-0.152	0.051	9.010	1	0.003	1.164	1.054	1.286
	High taxes and contributions for employed workers	-0.085	0.082	1.084	1	0.030	0.918	0.782	1.078
	Administrative procedures (bureaucracy)	-0.061	0.065	0.875	1	0.035	0.941	0.828	1.069
	Constant	-0.632	0.299	4.458	1	0.035	1.881		

a. Variable(s) entered on step 1: Lack of human resource management skills, Lack of operational skills (organization and delegation of daily tasks), Lack of business plan development skills, Lack of management skills (establishing control over business processes), Lack of financial skills, Lack of marketing skills (sales and promotion of products), Lack of savings, Lack of financial resources, Finding an adequate business partner, Lack of support from the environment, Fear of failure, High taxes and contributions for employed workers, Administrative procedures (bureaucracy).

Source: Authors' analysis, 2022.

Omnibus Tests of Model Coefficients consider the independent variables and based on the data (Sig.=0.000), ($p<0.0005$) predict the results better than in the situation where it is predicted that all students seriously considered the option of starting an entrepreneurial venture. The chi-square indicator is 39,799 with 14 degrees of freedom.

According to the Hosmer-Lemesh test, the chi-square is 10.100 with a significance of 0.258, which shows that the model is supported.

Cox & Snell R Square and Nagelkerke R Square indicators show that the model explains between 14.2% and 15.7% of the variance of the dependent variable. The reason for

this is that in the research questions related to motivation were singled out. A greater percentage of the variance of the dependent variable would be explained if the other segments of the questionnaire were considered. Nagelkerke R Square is a modification of Cox & Snell R Square, so in this research, we report on Nagelkerke R Square. Therefore, the model explained 14.2% of the variance in the intentions to start entrepreneurial ventures of students, and correctly classified 59.2% of the cases. The conclusion is that the sensitivity of the model is 82%, which means that the model correctly recognized this percentage of students who did not consider the option of becoming entrepreneurs. The certainty of the model is 28.6%, which means that the model recognized exactly this percentage of students who considered the option of becoming entrepreneurs.

The contribution and importance of each independent variable were analysed. First of all, it is necessary to look at the variables, i.e., barriers that are statistically significant for the model. These are barriers that significantly affect whether a student will answer whether he seriously considered the option of becoming an entrepreneur. These are lack of business plan development skills (p=0.021), lack of financial skills (p=0.026), lack of savings (p=0.006), lack of financial resources (p=0.013), lack of support from the environment (p=0.012), fear of failure (p=0.003), high taxes and contributions for employees (p=0.030) and administrative procedures (bureaucracy) (p=0.041). Barriers that are not statistically significant: lack of skills in the field of human resource management (0.885), lack of operational skills (organization and delegation of daily tasks) (0.292), lack of skills in the field of management (establishing control over business processes) (0.439), lack of skills in areas of marketing (sales and promotion of products) (0.275), finding an adequate business partner (0.540).

Since the coefficient B for each barrier has a negative sign, it can be concluded that the increase in the rating of the significance of the barrier will affect the increase in the answer "No", i.e., that the intention of students to start an entrepreneurial venture will decrease.

Further analysis of the results can lead to the following conclusions:

The probability of a student answering that they have seriously considered becoming an entrepreneur is 1.079 times higher for students who say that their lack of business plan skills is not significant, all other factors being equal. This also means that when the importance of the barrier of lack of business plan-making skills increases by one unit, the probability of a student answering that he seriously considered becoming entrepreneur decreases by 1.079.

The probability of a student answering that they have seriously considered becoming an entrepreneur is 0.915 times higher for students who say that their lack of financial skills is not a barrier, all other factors being equal. This also means that when the importance of the lack of financial skills barrier increases by one unit, the probability of a student answering that they have seriously considered becoming entrepreneur decreases by 0.915.

The probability of a student answering that they have seriously considered becoming an entrepreneur is 0.944 times higher for students who say that their lack of savings is not a significant barrier, all other factors being equal. This also means that when the significance of the lack of savings barrier increases by one unit, the probability of a student answering that he seriously considered becoming entrepreneur decreases by 0.944.

The probability of a student answering that they have seriously considered becoming an entrepreneur is 0.927 times higher for students who say that lack of financial resources is not a significant barrier for them, all other factors being equal. This also means that when the importance of the barrier of lack of financial resources increases by one unit, the probability of a student answering that he seriously considered becoming entrepreneur decreases by 0.927.

The probability of a student answering that (s)he seriously considered becoming an entrepreneur is 0.885 times higher for students who say that the lack of support from their environment is not a significant barrier when all other factors are equal. This also means that when the importance of the lack of environmental support barrier increases by one unit, the probability of a student answering that he seriously considered becoming entrepreneur decreases by 0.885.

The probability of a student answering that they have seriously considered becoming an entrepreneur is 1.164 times higher for students who say that fear of failure is not a significant barrier for them, all other factors being equal. This also means that when the importance of the fear of failure barrier increases by one unit, the probability of a student answering that he seriously considered becoming an entrepreneur decreases by 1.164.

The probability of a student answering that they have seriously considered becoming an entrepreneur is 0.918 times higher for students who say that high taxes and contributions for employed workers are not a significant barrier for them, all other factors being equal. This also means that when the importance of the barrier of high taxes and employee contributions increases, the probability of a student answering that he seriously considered becoming entrepreneur decreases by 0.918.

The probability of a student answering that he has seriously considered becoming an entrepreneur is 0.941 times higher for students who say that administrative procedures are not a significant barrier for them, all other factors being equal. This also means that when the importance of administrative barriers increases, the probability of a student answering that he seriously considered becoming entrepreneur decreases by 0.941.

4. Discussion

The findings of the study largely support the literature and conclude that the mentioned barriers faced by students of the Western Balkan countries affect their entrepreneurial intentions. 910 business administration students from Serbia, Bosnia and Herzegovina, Montenegro, Croatia, and Macedonia participated in the research. The questionnaire was predominantly filled out by students of basic studies, which is 89% of the surveyed students. More than 50% of students answered that they do not have any work experience, and an interesting fact is that 15% say that they have entrepreneurial experience.

The work is based on the presentation of barriers that affect entrepreneurial intentions and determining their impact. Knowledge and skill barriers are presented as a real group of barriers that have a negative relationship with entrepreneurial intentions. The significance of the lack of knowledge and skills was confirmed in their work by Sitaridis & Kitsios (2019), where they state that entrepreneurial knowledge and experience are the basis for individual success. Based on the presented results, it can be concluded that hypothesis H1 is partially

confirmed. The lack of business plan and financial management skills are knowledge and skills barriers that are statistically significant and affect the entrepreneurial intentions of students. Analysing their results, Elango et al. (2007) point out that many respondents commented that they lacked knowledge on how to develop a business plan, manage reimbursement, maintain a billing system and keep financial records. According to the results, other barriers to knowledge and skills mentioned in the paper are not statistically significant, so hypothesis H1 is partially confirmed.

Hypothesis H2 was fully confirmed, stating that financial barriers have a negative effect on entrepreneurial intentions. Financing is one of the keys to success and progress in starting a business (Gorji & Rahimian, 2011). Poor economic indicators are generally cited as the biggest obstacle to starting a business (Choo & Wong, 2006). Lack of financial resources and lack of savings were seen as barriers in the research, and both are statistically significant and have a negative relationship with entrepreneurial intentions. Financing has been confirmed in many works as the most significant barrier to entrepreneurship (Bartlett & Bukvič, 2001; Hatala, 2005; Choo & Wong, 2006; Li, 2007; Sandhu et al., 2011; Sitaridis & Kitsios, 2019).

Hypothesis H3 is partially confirmed. The lack of support from the environment and the fear of failure are barriers that the research results confirm as statistically significant for the entrepreneurial intentions of students from the Western Balkan countries. Other authors have also recognized the importance of institutional support. (Giacomin et al., 2011; Purett et al., 2019). Uncertainty or the unknown creates anxiety in people, which leads to stress. Many view failure as a shame and want to avoid that feeling. The importance of stressing the fear of failure as a barrier has been confirmed by other authors (Fatoki, 2014; Şeşen, & Pruett, 2014; Iakovleva et al., 2014). One of the possibilities for mitigating the impact of the fear of failure, as the biggest barrier to starting an entrepreneurial venture, is the second chance program. This program would require not only institutional support in the process of starting the next entrepreneurial venture, but also the support of the social community. According to the results, finding an adequate partner as a barrier is not statistically significant. Jakubczak (2015) in his research emphasizes that over 70% of respondents agree that their lack of business connections is an obstacle to entrepreneurial activity, which is not in agreement with our research. Sandhu et al. (2011) in their work points out that a face-to-face approach is needed to discover how social networks hinder entrepreneurial propensity. Our research did not go that deep into the analysis of respondents.

Administrative barriers and tax restrictions are the fourth group of barriers observed in the paper. The results showed that hypothesis H4 was fully confirmed since according to them, high taxes and contributions for employees and administrative procedures are barriers that affect entrepreneurial intentions. An inadequate tax system and different legal regulations can be a heavy burden for potential entrepreneurs (Bartlett & Bukvič, 2001). Klapper et al. (2004) confirm in their work that entry regulations hinder the creation of new firms in industries that should have high entry. In the framework of research carried out in the United Kingdom, it was shown that regulation and taxation are the factors that inhibit the start of a business (Robertson et al., 2003). Georgiou (2010) confirms that countries with strict regulations deter people from entrepreneurship. It recommends that regulations should be simple and protect the interests of entrepreneurs.

Conclusion

Entrepreneurship is one of the choices when looking for a job. Encouraging and directing students to start a business can contribute to solving the unemployment problem. The entrepreneurial intentions of students are determined by the degree of positive entrepreneurial activity. The strength of entrepreneurial intentions affects entrepreneurial activity, which is the basis and assumption of entrepreneurial behaviour. Entrepreneurial barriers are forces that hinder entrepreneurial activity. Therefore, the authors decided to examine the individual importance of barriers and determine the relationship between entrepreneurial intentions and barriers that prevent students from starting their ventures. The research was conducted on students of business administration, who attend studies in the countries of the Western Balkans.

The work analysed four groups of barriers: knowledge and skills barriers, financial barriers, subjective circumstances, administrative procedures, and fiscal burdens. The goal was to determine the importance of the mentioned groups of barriers to entrepreneurial aspirations. For the research, a questionnaire was conducted on a sample of 910 business administration students. The first and third hypotheses were partially confirmed, while the second and fourth were fully confirmed. Within the group of barriers of knowledge and skills, the lack of business plan development skills and the lack of financial skills have a negative effect on entrepreneurial aspirations, while the other barriers are not statistically significant. The results showed that statistically significant barriers to entrepreneurial intentions belong to subjective circumstances: lack of support from the environment and fear of failure. Barriers made up of groups of financial barriers, administrative procedures and fiscal burdens have a negative impact on the entrepreneurial intentions of students from the Western Balkan countries.

The research comes with certain limitations. Individual barriers were analysed based on only one question. The research approach used is not able to reveal more details about the barriers. A more detailed discussion with the students might have raised awareness or reduced the importance of certain barriers. The contribution of the work is in increasing the literature in the field of student entrepreneurship, entrepreneurial intentions, and barriers that affect entrepreneurial intentions. The paper can serve policymakers as a guideline for the selection of barriers, whose influence is to be eliminated, to encourage student entrepreneurship. Students who intend to engage in entrepreneurship can use the work to raise awareness and familiarize themselves with the risks that exist on the entrepreneurial path. The work provides a broader picture of the obstacles, which allows an understanding of the current position and targets them, to waste resources as little as possible.

Future research could go in the direction of expanding the questionnaire, to examine in more detail, the attitude toward the defined barriers. It is possible to expand the list of barriers by adding e.g., other resources needed for the undertaking or analysis of the personality and characteristics of the respondents. The direction of research could also be towards determining ways to overcome barriers. It would be good to examine the attitudes of students who already have entrepreneurial experience and compare it with the attitudes of students who intend to engage in entrepreneurship. The questionnaire could cover a larger geographical area, thus comparing the results between different territorial units.

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Residential real estate analysis in Serbia

Анализа тржишта стамбених непокретности у Србији

"*No other macroeconomic segment has been more closely linked to financial stability than residential real estate*."
European Central Bank, Financial Stability Review, November 2016

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Abstract: The analysis of Serbia's residential real estate market is the main goal of this paper. Price movements in that part of the market affect price and financial stability equally, which are thus the main goals of most central banks. Prior to the highly contagious COVID-19 pandemic, there was a gradual increase in the number of transactions involving real estate and prices, with oscillations observed throughout the second quarter of 2020. In this paper, we will present the available databases from the Serbian residential real estate market, as well as regulations that have been in place since the 2000s. By analyzing the trajectory in the long run of the housing credit share to GDP by using a Hodrick-Prescott one-sided filter with the parameter set to 400,000 and correlation and regression analysis, the paper's concluding part will determine whether there is a price bubble in this market segment. According to the analysis, there is currently no price bubble in Serbia's residential real estate market.
Keywords: residential real estate, housing loan, financial stability, legal framework, price bubble
JEL classification: L85, R31, R38

Сажетак: Циљ овог рада је анализа тржишта стамбених некретнина у Србији. Кретања цена на том делу тржишта подједнако утичу на ценовну и на финансијску стабилност, што су и главни циљеви већине централних банака. У претходном периоду забележено је постепено повећање броја прометованих некретнина, као и раст цена некретнина, уз осцилације које су забележене током другог квартала 2020. године услед пандемије вируса Covid-19. У овом раду представићемо доступне базе података са тржишта стамбених некретнина у Србији, као и прописе који су на снази од 2000-их. Анализом одступања дугорочног тренда стамбених кредита у бруто домаћем производу применом филтера Hodrick-Prescott са параметром постављеним на 400.000, корелационом и регресионом анализом, завршни део рада ће утврдити да ли постоји балон цена у овом сегменту тржишта. Анализа је показала да тренутно не постоји ценовни балон на тржишту стамбених непокретности у Србији.
Кључне речи: тржиште стамбених непокретности, стамбени кредити, финансијска стабилност, правни оквир, ценовни балон
ЈЕЛ класификација: L85, R31, R38

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Introduction

As changes in the market for real estate can have a significant influence on both the financial and real sectors, inadequately secured mortgage loans were among the main reasons for the worldwide crisis of 2007-2008.To alleviate the effects of the crisis, central banks implemented a variety of unconventional monetary policy measures at the time (Martin, 2019). The significance of the residential real estate sector for financial stability stems from its significant role in the economy, as the majority of household assets are invested in residential real estate, and the financial sector plays a primary role in financing real estate investments (Duca et al., 2019). The investment's primary capability is to contribute to several manufacturing cycles (Petković, Krstić & Rađenović, 2021).

This paper's purpose is to present the Serbian residential real estate market. In this paper, we will present the regulatory framework that has been in place for this segment of the market since the 2000s, as well as the databases that are currently available. Because banks use real estate as collateral when approving housing loans, residential real estate is a crucial element of financial stability. A database for real estate market that contains information on both residential as well as commercial properties is kept up to date by the National Bank of Serbia (hereinafter: NBS). These figures are based on first-time real estate valuations and do not include cash purchases. The National Mortgage Insurance Corporation (hereinafter: NMIC) maintains a database of residential real estate purchases financed by mortgages from banks that have signed contracts with this corporation. The building, the certain portion of the building and the parcel, are all listed in the Republic Geodetic Authority's real estate database. In the final section of this paper, based on the analysis of various variables, we will determine whether there is a price bubble in residential the real estate in Serbia's market. The price bubble is examined by analyzing the trajectory in the long run of the housing credit share to GDP by using a Hodrick-Prescott one-sided filter with the parameter set to 400,000 and correlation and regression analysis.

The following is the order in which the paper is organized: Part one of the paper will be a review of the literature, followed by a discussion of the legal framework and an examination of numerous Serbian residential real estate statistics. The fourth section of the paper investigates whether this market segment is experiencing a price bubble, and the final section outlines all of the main points of the paper.

1. Literature preview

Because residential property is used as collateral when granting mortgage loans, a significant variation in its value can contribute to a reduction in the quality of banks' loan portfolios. As was the case during the global economic downturn of 2007–2008, this would put financial stability in danger and increase the likelihood that volatility would spread to the real estate market (Olszewski, 2012). The majority of these housing loans are foreign currency and currency-indexed loans with lower interest rates than domestic currency housing loans, which are common in most Eastern European countries (Vilenica et al., 2021). Adequate macroprudential policy measures must be implemented to prevent potential risks from the residential real estate market from materializing and to avoid pro-

cyclical effects (Lagarde, 2021). Debt service-to-income (DSTI), loan-to-value (LTV), countercyclical capital buffer (CCyB), debt-to-income caps (DTI), loan-to-income caps (LTI), and many other macroprudential instruments are important for limiting real estate market risk (Carrasco-Gallego, 2020). To be effective, these instruments must be used in a timely manner, taking into account the early warning model (Ciocchetta et al., 2016). The International Monetary Fund has developed core and encouraged sets of soundness indicators with the goal of preserving financial stability. Encouraged sets include real estate market indicators such as real estate prices, residential real estate loans to total loans, and commercial real estate loans to total loans (Houben et al., 2004). According to Heath (2005), financial soundness indicators are indicators of the current financial health and stability of the country's financial institutions, as well as their corporate and household counterparts.

In addition to its importance and impact on financial stability, the residential real estate market has implications for economic growth because the construction sector contributes significantly to GDP growth. To determine that contribution, the residential real estate market must be properly evaluated. In an examination of the method used by hotel companies in the Republics of Serbia and Croatia to measure property, plant, and equipment, Milašinović, Obradović and Krapavlović (2022) came to the conclusion that these companies favor the cost model over the revaluation model. According to Nikolaos et al. (2011), it is necessary to include not only economic and production factors in the analysis, but also various qualitative characteristics of the natural and human environment, such as air pollution (which is a significant problem in larger cities), noise, and natural disasters (floods, fires). Furthermore, population transitions affect the value of residential real estate, which are influenced by social and cultural differences between countries (Stanojević & Tomašević, 2021). Momentum data on housing can be used to better assess the future value of collateral for mortgage lenders (Beracha & Skiba, 2011), but also buyer purchasing power, which is related to real estate characteristics (Mironiuc et al., 2021).

In the consideration and analysis of that sector of the market, the possibility of a price bubble in the market for residential real estate must be taken into account. Any burst of that bubble will undoubtedly cause instability and long-term consequences in the financial and real estate sectors. As a result, the challenge is to detect the price bubble early and minimize its negative consequences (Malović et al., 2021). Various models, such as Growth at Risk (GaR), which is based on the assessment of financial conditions and the cyclical dimension of systemic risk (O'Brien & Wosser, 2021), are used to detect the price bubble early and prevent its impact on financial stability in a timely manner. This methodology allows us to understand how financial conditions and financial vulnerability may contribute to future periods of weak economic growth. Ribeiro et al. (2017) use a fuzzy cognitive map (FCM) developed to identify determinants of investment risk in the market for residential real estate in their risk assessment analysis, which contributes to reducing the number of criteria omitted in decision making and provides a better understanding of risk determinants. The next section of the paper is based on a presentation of the legal framework of Serbia's residential real estate market.

2. Legal framework

In order to establish a modern institutional framework consisting of fiscal policy and incentive measures of the government and other state bodies, an efficient market environment must be created. Such an environment should help to accelerate transaction procedures, allowing Serbia to develop a reliable real estate management system (Vasovic, Gospavic, and Cirovic, 2012). The legal framework after the 2000s will be the focus of this analysis.

The Mortgage Law was passed in 2005, and amendments were made to it in 2015. With the passage of this law, it became possible to establish a lien on real estate and thus approve mortgage loans (Mortgage Law, p. 1). As a result, commercial banks were given the opportunity to establish a mortgage on real estate, and mortgage loan placement reduced the amount of cash on the real estate market. In 2011, the NBS adopted a decision for keeping and enhancing financial system stability. In order to encourage long-term dinar lending, this decision "created an 80% LTV (loan-to-value) cap for mortgage loans. This cap applies solely to loans denominated in foreign currencies and loans with foreign currency indexes; dinar loans are exempt from its applicability. In addition, this ruling restricts the indexation of loans to the euro alone. The NBS implemented this measure, which allows banks to approve loans to natural persons that are indexed to a foreign currency, as long as the currency of indexation is the euro. The purpose of this strategy was to reduce the systemic foreign exchange risk brought on by the usage of currencies other than the euro. The third element of this decision is the establishment of a 30% down payment requirement for all foreign currency loans that are not secured by mortgages or credit cards. All dinar loans are exempt from this requirement" (Decision on measures for safeguarding and strengthening financial system stability, p. 1-2).

On a regular basis, banks are required to evaluate the real estate market value used to secure the bank's receivables in order to manage the credit risk effectively and efficiently. The banks are required to "monitor the value of real estate property on a regular basis and, except in the case of mortgaged residential real estate property where the amount of outstanding bank exposure does not exceed 40% of its value less the sum of all higher priority claims over such property, to determine the market value of such property at least once every three years, or more frequently if significant changes in property market conditions occur" (Decision on the Classification of Bank Balance Sheet Assets and Off-Balance Sheet Items, p. 14). The current year's property tax decision, which is regarded as a document providing an evaluation of the valuation of a specific piece of real estate on which the mortgage is secured, satisfies the requirement of the decision as well.

The Law on Legalization was passed in 2015 in order to bring all illegally constructed buildings into the legal flow because legalization of buildings is in the public interest of Serbia (Law on Legalization, p. 1). Legalization contributes to the increase of public revenues at the state level through the collection of legalization fees, the increase of public revenues in local self-government units through the collection of legalization fees and the collection of property taxes, the creation of conditions for spatial planning and rational use of construction land, the ability of owners of buildings to register in the real

estate cadaster, which contributes to further regulation of the residential real estate market through better determination real estate market value and the possibility of mortgaging the building if necessary to the owner. According to data from the Ministry of Construction, Traffic, and Infrastructure, there were over two million illegally built facilities in Serbia as of November 19, 2022, with nearly a million of them related to residential real estate.

3. Residential real estate database in Serbia

Accurate and trustworthy databases are needed to analyze the residential property market. Residential real estate data in Serbia are held by the NBS, the NMIC, and the Republic Geodetic Authority.

In January 2014, the NBS launched the Real Estate Valuations Database project, which includes data on real estate valuations used as collateral in loan approval. This database contains appraisal values provided by certified valuers for mortgage loans, not transaction values stated in contracts, implying that it does not include cash-financed real estate. The NBS adopted a decision in November 2015 requiring banking institutions to send pricing data to the NBS on a monthly basis (Decision on Submission of Valuation Data on Mortgaged Real Estate and Loans Secured by Mortgage, p. 1). In order to improve real estate appraisal, the NBS created a mortgage valuation database according to the data gathered. The Real Estate Valuers Law was passed at the end of December 2016 (Real Estate Valuers Law, p. 1). In accordance with this law and decision ("Decision on the Content, Deadlines, and Manner of Submission of Data on the Valuation of Mortgaged Real Estate and Loans Secured by Mortgage", p. 2) adopted in 2017, the NBS granted licensed appraisers access to the NBS Real Estate Valuations Database (hereinafter: the Database). The Database includes residential and commercial real estate valuations (National Bank of Serbia, Access to the Real Estate Database).

	Average estimated value per EUR/m^2 in 2021	Average estimated value per EUR/m^2 in 2020	Number of estimated real estate in 2021
Serbia	1,067	973	12,524
Belgrade	1,611	1,430	5,388
Vojvodina	751	729	3,719
Šumadija and Western Serbia	692	653	2,199
Southern and Eastern Serbia	690	671	1,218

Table 1: Estimated residential real estate values in 2021

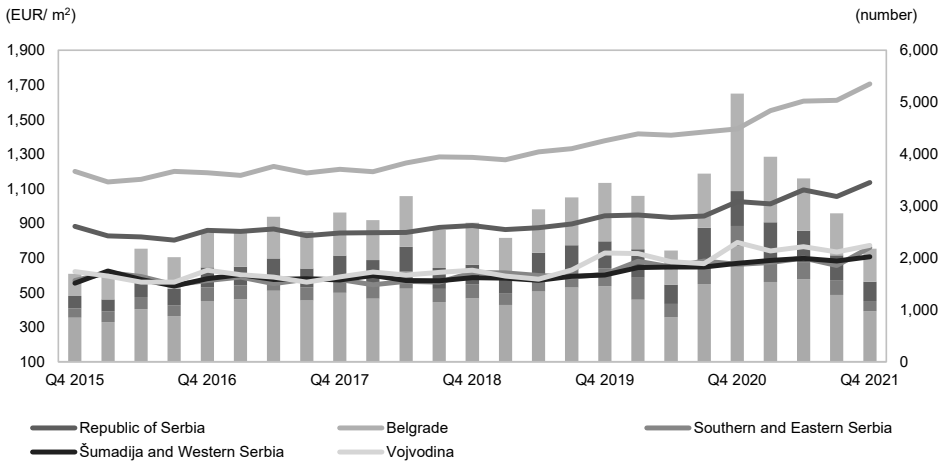
Source: National Bank of Serbia

"Banks are required to submit data on real estate appraisals no later than the 20th of the current month for newly approved loans on the basis of which funds were disbursed in the previous month" ("Decision on the Content, Deadlines, and Manner of Submission of

Data on the Valuation of Mortgaged Real Estate and Loans Secured by Mortgage", p. 1). A full set of all appraisals takes more than a quarter because they can be conducted more than a month before loan release. The NBS will provide valuation of real estate data from the database upon request from banks and qualified valuers. According to Ministry of Finance data, there are 251 licensed appraisers and three accredited associations in Serbia as of November 20, 2022 (Ministry of Finance).

According to Table 1, the average estimated value in the Belgrade region in 2021 is 1,611 EUR, which is more than double the average appraised value per m^2 in other regions of the Republic of Serbia (Vojvodina (751 EUR), Šumadija and Western Serbia (692 EUR), and Southern and Eastern Serbia (690 EUR). Belgrade has the most appraised real estate (5,388), while Southern and Eastern Serbia have the least (1,218). Given the total number of entered estimates (12,524), it is reasonable to conclude that the average value of the estimate of 1,067 EUR for the Republic of Serbia is predetermined in major part by the fact that 43% of the entered estimates for 2021 refer to the Belgrade, which has the highest average price per m^2.

Chart 1: Estimated values of real estate and the number in each region

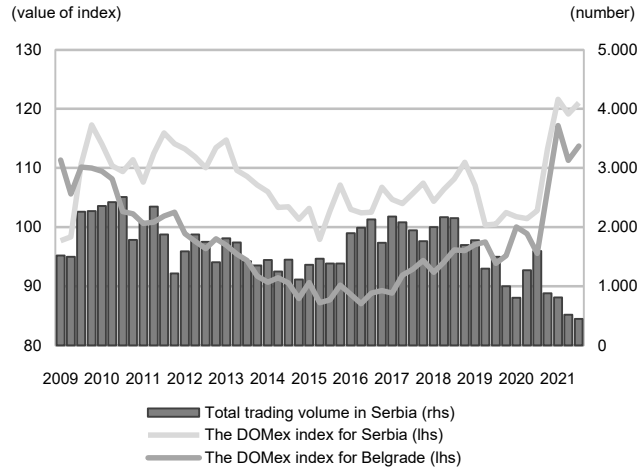


Source: National Bank of Serbia

Data from the Database are a good starting point for analyzing the factors that influence the movement of the average estimated value in the market for real estate. According to the dynamics of the average estimated value of real estate per m^2 from Q4 2015 to Q4 2021, there is a 7.7% QoQ increase in real estate value in Q4 2021 at the Serbian level (5.9% QoQ in the Belgrade, 5.3% QoQ in the Vojvodina region, 3.7% QoQ in

Šumadija and Western Serbia, and 15.8% in Southern and Eastern Serbia). The average estimated real estate value decreased in Q2 2020, while the total number of estimates rose because of the pandemic, according to Chart 2. Such changes in the real estate industry are consistent with changes in both this market segment and other states.

Chart 2: The DOMex index and total trading volume in Serbia



Source: National Mortgage Insurance Corporation

Data from the NMIC include only real estate that is insured with this corporation and whose purchase is financed by mortgage loans from banks that have signed contracts with this corporation, so the presented real estate price movements cover a smaller portion of total turnover and do not necessarily reflect developments in the overall real estate market. As a result, this database does not include data on realized prices for properties financed with funds or unsecured debt. The insured residential property price in average at the Republic of Serbia level in Q4 2021 was 1,019 EUR/m^2 (in the same period in 2020, the price was 866 EUR/m^2). In Belgrade, the average price of insured residential property in Q4 2021 was 1,443 EUR/m^2 (it was 1,212 EUR/m^2 in the same period in 2020). DOMex was founded in order to provide the public with more transparent information about the residential real estate market. The DOMex for that period (which can be a month, quarter, or year) is determined by comparing the mean of all prices per square meter realized in that period in the specified territory to the average value of all prices per m^2 realized in the base period in the specified territory (National Mortgage Insurance Corporation, *DOMex)*. (Chart 2)

The real estate cadaster, according to Article 2 of the Law on the Registration Procedure with the Cadaster of Real Estate and Utilities, is a basic and public register that contains spatial and descriptive data on real estate, data on its propriety interests, and other rights and facts whose registration in the cadaster is required by law (Law on the Registration Procedure with the Cadaster of Real Estate and Utilities, p. 2). The Republic Geodetic Authority registers real estate by recording data on the parcel, the building, and a special part of the building. According to Article 4 of the Law on State Survey and Cadaster, real estate includes land, above ground and underground construction facilities, and special parts of buildings (Law on State Survey and Cadaster, p. 3). According to contracts recorded with the Republic Geodetic Authority, the total amount of money invested in Serbian real estate in the first half of 2022 was 3.6 billion euros, which is 25% more than the amount invested in the same period of 2021. The real estate market in Belgrade had the greatest portion of funds (52%), followed by Vojvodina (27%). The median price of a residence in an old building in the Republic of Serbia was 1,260 EUR/m^2 in the first half of 2022, up 19% from comparable time frame from the preceding year, while the average price of an apartment in a new building was 1,617 EUR/m^2, up 11% from the same period the previous year. The areas with the highest prices for apartments in old buildings in the first half of 2022 are Stari Grad, Vračar, Savski Venac, and Novi Beograd (Report on the situation of the market real estate for H1 2022, p. 2 and 25) - (Table 2).

Table 2: Statistical parameters of apartment prices in H1 2022

Municipality	Old building			New building		
	Average value (EUR/m^2)	Minimum value (EUR/m^2)	Maximum value (EUR/m^2)	Average value (EUR/m^2)	Minimum value (EUR/m^2)	Maximum value (EUR/m^2)
Stari Grad	2,488	833	4,902	3,078	1,010	4,047
Vračar	2,345	850	3,953	2,353	1,250	4,780
Savski Venac	2,142	833	3,500	2,497	875	3,982
Novi Beograd	1,980	693	3,857	2,458	875	3,982
Zvezdara	1,877	600	3,125	1,972	625	3,298
Palilula	1,752	765	3,300	2,507	1,087	3,585
Zemun	1,752	750	2,887	1,900	705	3,063
Voždovac	1,667	635	3,000	2,065	737	3,022
Čukarica	1,570	610	2,620	1,695	682	2,970
Stara Rakovica	1,342	780	2,000	1,655	875	2,090

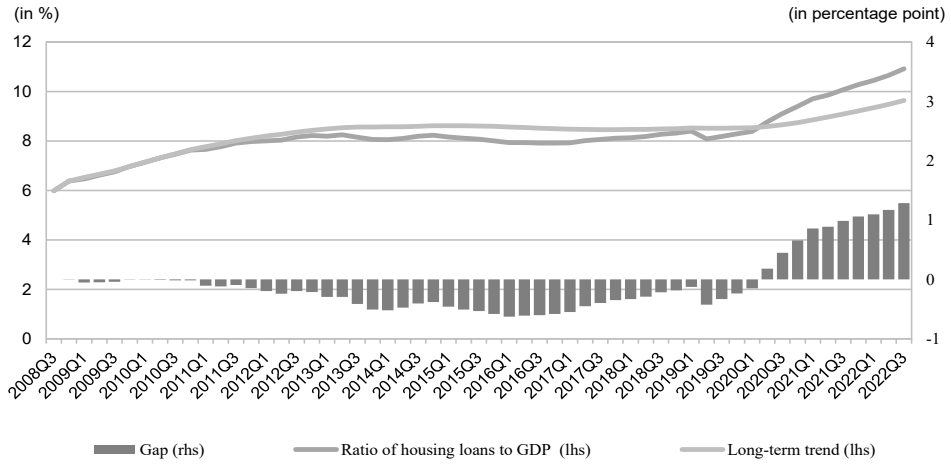
Source: Republic Geodetic Authority

4. Is there a price bubble?

To answer the question of whether the residential real estate market in the Republic of Serbia is currently experiencing a price bubble, it is necessary to first define what a price bubble is. The most basic definition of price bubble in real estate market is a rise in real

estate prices, often significantly above their fundamental values, due to the expectation of high future returns. After a period of time, investors estimate that yields have fallen below expectations, resulting in a large-scale real estate sales, a significant drop in price, and the bursting of the price bubble.

Chart 3: Ratio of housing loans to GDP and long-term trend



Source: the author's calculation.

To show that there is a price bubble in the residential real estate market, we need to look at which levels of turnover are financed by loans and which by cash. Furthermore, it must be determined whether credit activity in the form of housing lending is sustainable. According to Republic Geodetic Authority data, 28% of all apartments were purchased with loans in the first half of 2022 (36% in the first half of 2021), indicating that the majority of apartments (72% in the first half of 2022) were purchased with cash (Report on the situation of the market real estate for H1 2022, p. 17). When the proportion of credit activity in gross domestic product exceeds its long-term trend by at least 2 percentage points, excessive credit growth is present. In order to evaluate whether excessive credit growth is the outcome of housing lending, we will look at the share of housing loans in GDP by examining the trend in the long run. For this calculation we will use Hodrick-Prescott one-sided filter with the value of the parameter 400,000. In Q3 2022, the housing credit-to-GDP ratio deviated by 1.3 percentage points from its long term trend, which was less than benchmark of the 2 percentage point. Based on the foregoing, one can conclude that housing lending in Serbia is sustainable and does not jeopardize financial stability (Chart 3).

We will use multiple regression analysis variables that represent the ratio of regression coefficients to independent variables to evaluate the relationship between the selected independent variables and the price of residential real estate in Serbia. To identify the variables that are statistically significant in affecting the estimated worth of residential

property in Serbia, as well as their contribution to the future residential real estate price movement, multiple regression analysis is utilized. We investigated the relationship between selected macroeconomic factors (Serbia DOMex-*SD*, average gross earnings-*AGE*, unemployment rate-*UR*, interest rates on housing loans-*IR*, number of building permits issued in new construction-*BP*, and headline inflation-*HI*) and the mean assessed residential real estate value in euros per m^2 in Serbia. The dependent variable is the mean assessed residential real estate value in Serbia (RS) in euros per m^2, as determined by data from the NBS's Real Estate Database. The data used in the analysis ranged from the fourth quarter of 2015 to the fourth quarter of 2021, and quarterly data were used in the analysis. The Statistical Office of the Republic of Serbia provides data on average gross earnings, the unemployment rate, and the number of building permits issued for new construction (Statistical Office of the Republic of Serbia); interest rates on housing loans are derived from the NBS statistics; and Serbia DOMex is derived from the NMIC. We will use multiple linear correlation to determine the degree of correlation between the variables (Table 3).

Table 3: Correlation between variables

Indicators	RS	SD	AGE	UR	IR	BP	HI
RS	1						
SD	0.666	1					
AGE	0.951	0.543	1				
UR	-0.605	-0.129	-0.665	1			
IR	-0.636	-0.371	-0.668	0.827	1		
BP	0.741	0.376	0.744	-0.798	-0.825	1	
HI	0.554	0.709	0.479	-0.256	-0.358	0.468	1

Source: the author's calculation.

According to the data in Table 3, the strongest positive correlation exists between the mean assessed residential real estate value in Serbia and the average gross salary (0.951), while the strongest negative correlation exists between the mean assessed residential real estate value in Serbia and housing loans interest rates (-0.636). The above findings are consistent with economic expectations because an increase in the average gross salary increases purchasing power and the potential rise in residential property prices, whereas a surge in the interest rate on housing loans has the opposite effect. This conclusion is consistent with previously reported findings from other pertinent study in this area (Bansal, Narang, Sachdeva, Kashyap, & Panda, 2021), which revealed a significant relationship between changes in real estate prices and salaries. Serbia DOMex is statistically significant and influences the movement of the mean assessed residential real estate value per square meter in Serbia, according to regression statistics (Table 4). The mean assessed residential real estate value in Serbia increased by 3.9 euros per square meter as a result of the increase in Serbia's DOMex. This result is consistent with the research

done by Spasenić, Benković and Dmitrović (2019). The coefficient of determination (0.94) is quite high, indicating that the model has a high level of explanatory power.

Table 4: Regression Statistics

Regression Statistics	
Multiple R	0.971647756
R Square	0.944099362
Adjusted R Square	0.925465816
Standard Error	24.47555626
Observations	25

	Coefficients	*Standard Error*	*t Stat*	*P-value*
RS	-121.8934662	179.60154	-0.6786883	0.5059684
SD*	3.879866145	1.4523851	2.6713756	0.0155687
AGE	0.006476493	0.0008533	7.5898613	5.143E-07
UR	-1.959098025	3.7759146	-0.5188407	0.6101921
IR	36.02409943	32.458421	1.1098537	0.2816697
BP	0.022124159	0.0173244	1.2770493	0.2178133
HI	-2.311864518	5.4685021	-0.4227601	0.6774777

* Connection between variables is statistically significant (p<0.05)

Source: the author's calculation.

The NBS carefully supervises residential property market developments and considers the implications for financial stability. If it is determined that certain developments may jeopardize stability of the financial system, the NBS has various instruments (such as debt service-to-income, loan-to-value ratio, and countercyclical capital buffer) at its disposal, as well as the option of introducing new measures to limit the accumulation of potential risks in this market segment.

Conclusion

The residential real estate market is a fundamental source of well-being for the national economy, as well as a leading indicator of economic and social strength and financial stability. The residential real estate market's critical role in business and financial cycles necessitates regular monitoring and assessment of the impact on monetary policy and financial stability. This is especially significant given that this market has the potential to be a source of instability with serious and long-term consequences for economic and financial

development. Because this market has significant macroeconomic implications for the Serbian economy, an examination of its current state is critical.

When banks approve housing loans, they use residential real estate as collateral. The change in the value of real estate used as collateral for loans has a significant impact on the loan portfolio quality of banks. If their value is not properly assessed, financial system instability may occur, which is why the 2007–2008 global financial crisis was erased. The unpredictability of the financial market can therefore be extended to the real estate market. To avoid this, the movements of the residential real estate market have to be examined carefully. To accomplish this, a reliable and accurate database of all the properties' characteristics (square footage, number of floors, heating method, date, method, and currency of assessment, and so on) is required.

In Serbia, there are currently three databases available for analyzing the residential real estate market. The NBS maintains a database on residential and commercial real estate, which contains information on the initial estimates of these properties. This database does not include information on cash purchases of real estate. The following database is housed within the NMIC and contains information on residential real estate purchases financed by mortgage loans from banks that have signed contracts with this corporation. The Republic Geodetic Authority owns the most comprehensive database, which contains information on the cadastral plot, the building, and a specific part of the building.

A price bubble in that market sector must be explored in order to ascertain whether changes in the market for residential properties can have an impact on stability of the financial system. A price bubble is a rapid increase in real estate prices, often far in excess of their fundamental value, caused by expectations of high future returns. In order to determine the sustainability of housing credit, we looked at the trajectory in the long run of the housing loans share of GDP by using a Hodrick-Prescott one-sided filter with a parameter value of 400,000. In Q3 2022, the share of housing loans in GDP deviated from its trend in the long run by 1.3 percentage points, which was less than the benchmark of 2 percentage points. This suggests that housing lending in Serbia is sustainable and does not threaten financial stability at the moment. Furthermore, the majority of apartments are paid for in cash rather than with loans, according to the Republic Geodetic Authority's database. This suggests that, despite rising residential real estate prices in Serbia, there is no price bubble in that segment of the market at the moment.

The consequences of the worldwide economic downturn of 2007-2008 necessitate constant caution in assessing the value of residential real estate in order to avoid a financial market collapse. Adequate and timely measures by the NBS helped to ensure that price and financial stability were not jeopardized even during the Corona virus pandemic. The NBS has a number of current measures as well as the option of introducing new measures that can impact the limits of the accumulation of possible threats in this market segment if it is believed that certain developments could endanger financial sustainability. All of this necessitates closer monitoring of developments in the residential real estate market as well as all other variables affecting this market segment.

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Can the Phillips curve be applied in selected European countries today?

Да ли се Филипсова крива може применити у одабраним европским земљама данас?

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Abstract: The Phillips curve is one of the most important economic postulates, which indicates inversion between inflation rate and unemployment rate. Even though it has been empirically confirmed many times, in past research there has been evidence of rejecting it in some countries. The aim of this research is to analyse whether the Phillips curve exists in selected European countries: Bulgaria, Greece, Slovenia and Romania, during time period Q1 2009–Q3 2021 and to conclude if there are any differences between countries that are using Euro as national currency and those that are not. Panel analysis and choosing the appropriate model has led to the conclusion that there is a statistically significant inverse correlation between these two variables, which confirmed the presence of the Phillips curve. When analysing countries separately, results differ between them – the strongest inverse correlation is present in Greece and it is followed by Bulgaria. In Slovenia, correlation is slightly negative and in Romania slightly positive, pointing to the conclusion that correlation in these two countries is so weak, that it can be considered that it does not exist. Since obtained results differ between observed countries, this makes correlation between inflation rate and unemployment rate an important indicator for policy makers of individual countries to take into consideration when making decisions for future economic policy.
Keywords: the Phillips curve, inflation rate, unemployment rate
JEL classification: E00, E24, E52, E60, C33, J64

Сажетак: Филипсова крива је један од најзначајнијих економских постулата, који указује на инверзију између стопе инфлације и стопе незапослености. Иако је много пута била емпиријски потврђена, у спроведеним истраживањима се појављују и докази о њеном одбацивању у појединим земљама. Циљ овог истраживања је анализирати да ли Филипсова крива постоји у одабраним европским земљама: Бугарској, Грчкој, Словенији и Румунији, у периоду од К1 2009 до К3 2021 и утврдити да ли постоје значајне разлике између земаља које користе евро као националну валуту и оних које не користе. Панел анализа и избор одговарајућег модела су довели до закључка да постоји статистички значајан инверзан однос између ове две варијабле, што потврђује присуство Филипсове криве. Када се државе анализирају појединачно, резултати се разликују међу њима – најјача инверзна корелација је присутна у Грчкој, коју прати Бугарска. У Словенији је корелација једва негативна, док је у Румунији једва позитивна, што указује да је корелација у ове две државе толико слаба, да се може сматрати да не постоји. Пошто се добијени резултати разликују између посматраних земаља, корелација између стопе инфлације и стопе незапослености је важан индикатор за креаторе економске политике и мора се узети у обзир приликом доношења одлика о будућој економској политици појединачних земаља.
Кључне речи: Филипсова крива, стопа инфлације, стопа незапослености
ЈЕЛ класификација: E00, E24, E52, E60, C33, J64

Introduction

Inflation rate and unemployment rate are known to be important macroeconomic indicators, regardless of the development level of the country or observed time frame. They are strongly connected and influence one another; therefore, they should be considered seriously when making decisions for short-term or long-term economic policy directions.

The postulate which connects inflation rate and unemployment rate is known as the Phillips curve, which indicates negative correlation between these two variables. In the past, there has been numerous studies which have confirmed the existence of the Phillips curve, but on the other hand, it has been empirically rejected in some of them.

The aim of this research is to validate the existence of the Phillips curve in 4 selected European countries: Bulgaria, Greece, Slovenia and Romania during Q1 2009-Q3 2021. These four countries have been selected since all of them are members of the European Union and belong to Balkan countries. Greece and Slovenia use euro as national currency, whereas Romania and Bulgaria use Romanian lei and Bulgarian lev, so the aim is to determine whether there is a difference in correlation between inflation rate and unemployment rate between countries that are using euro as national currency and those that are not.

This paper is divided into 5 parts: the theoretical background of the Phillips curve and previously conducted research analysing the existence of Phillips curve or correlation between inflation rate and unemployment rate are presented in the first part. The second part of the paper presents the data source and methodology of this research. The third part presents empirical data for 4 analysed countries for 2 analysed macroeconomic variables, descriptive statistics and tests obtained for checking existence of normality, heteroscedasticity, autocorrelation and multicollinearity. Fourth part of the paper is panel analysis and choosing of the correct model from OLS, Fixed Effects Model and Random Effects Model. Discussion of results is presented in part 5 of this paper.

1. Theoretical background

Unemployment is one of the most important issues that countries can face. Developed countries are affected by this problem the same way as emerging and poor countries. Unemployment can be defined as a state where the working age population has no job and they are actively searching for one (Chowdhury & Hossain, 2014).

According to McConell, Brue & Flynn (2009), inflation is a rise in general level of prices, which leads to decrease in purchasing power. The main measure of inflation is CPI (Consumer Price Index), which represents the market basket for typical consumers. According to Mishkin, CPI is calculated based on the group of prices of listed goods and services that are used by an average household (Mishkin, 2016).

Correlation between inflation rate and unemployment rate is explained by the Phillips curve. As a theoretical concept, Phillips curve was presented in 1958, when Alban Phillips published a paper in *Economica* where he pointed to indirect correlation between

unemployment rate and wages inflation in United Kingdom. He observed the following periods separately: 1861-1913, 1913-1948 and 1948-1957. The hypothesis that was tested and later confirmed indicated that in a year with high economic output and rising business activity, the demand for labour would increase and both employees and employers would bid on higher wages, compared to years with low unemployment rate, but with labour demand which is not increasing and *vice versa*. In other words, in years with increasing employment, since the demand for labour is high, wages would be defined on a higher level compared to periods with increasing unemployment rate, where labour force would even lower their wages expectations (Phillips, 1958).

Study performed by Phillips has faced some empirically based criticism, but nevertheless, this has remained one of the most important postulates in economics theory. However, after the 2008 financial crisis, the Phillips curve did not apply any longer in many countries, since unemployment rate increased, and this was not followed by expected inflation rate decrease. Even though it has been researched many times, the Phillips curve is not applicable to all countries and all time periods. Statistical relationship that appears strong during one decade or country, may be weak during the next one or in another country (Sovbetov & Kaplan, 2019).

Bulligan & Viviano (2017) presented correlation between unemployment rate and annual nominal wage growth in the euro area in the period Q1 1999–Q4 2015. The OLS model that corresponds points to the conclusion that coefficient on unemployment rate is statistically significant and -0.25 (analysed model was $\Delta w_t = c + \beta \Delta w_{t-1} + \gamma U_t + \varepsilon_t$, where Δw_t is y-o-y nominal hourly wage growth in private sector and U_t = unemployment rate). This model has been estimated first for the period Q1 1999-Q4 2007, and later, one by one observation has been added until Q4 2015. Results point to negative, but unstable correlation between unemployment rate and inflation rate. After the euro area analysis, authors referred to Italy, Germany, France and Spain, and concluded the following: pattern of unemployment and inflation rate correlation closely resembles to the one of Germany until 2012; the correlation became more negative in Italy and less negative in Germany during the time, in Spain it reached its peak in 2010, after which decline followed and in France, the correlation moved from being positive to negligible. The same conclusion was obtained by Hindrayanto, Samarina & Stanga (2019), who tested the existence of Phillips curve in the euro area and its five strongest economies (Germany, France, Italy, Spain and Netherlands) - negative correlation between unemployment rate and inflation rate was present in all five economies and the euro area during 1985-2017.

Shaari et al. (2018) used simple panel regression ($IR_t=\beta_1+\beta_2 UR_{t-1}+\varepsilon_t$) to test the existence of Phillips curve in 10 high-income countries during 1990-2014. FMOLS test was used and obtained results are statistically significant and point to negative correlation between unemployment rate and inflation rate. DiNardo & Moore (1999) tested the presence of the Phillips curve's presence in 9 OECD countries with simple OLS equation: $\pi_t^j = \alpha_j + \beta U^j_{t-1}$, where π stands for inflation, U unemployment rate, j represents the country and t the quarter. The following countries were examined: Belgium, Canada, France, Germany, Italy, Japan, the Netherlands, the United Kingdom and the United States during

Q2 1970–Q1 1996. The OLS point estimate of the coefficient on unemployment is: -0.82 for the whole sample; -0.13 for period before 1983 and -0.42 for period after 1982. Coefficient of determination is 34%, 26% and 34% respectively.

Ho & Njindan Iyke (2018) tested the existence of Phillips curve in 11 Eurozone countries from January 1999 to February 2017 (Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxemburg, Netherlands, Portugal and Spain). Obtained results pointed to different conclusions depending on unemployment rate – correlation between inflation and unemployment rate is negative when unemployment rate is lower than 5%. When the unemployment rate is within the range 5-6.54%, correlation becomes positive. Once the unemployment rate exceeds 6.54%, there is no correlation between inflation and unemployment rate. Sovbetov & Kaplan (2019) researched the existence of the Phillips curve in 41 countries for period 1980-2016, and they have confirmed that relationship between these two variables differs over time: the Phillips curve is more present in developed countries than in emerging countries; but the Phillips curve relationship is not applicable during periods of recession, even for developed countries.

McLeay & Tenreyro (2020) analysed US CPI inflation and unemployment gap (provided by Congressional Budget Office estimate) during Q1 1957-Q2 2018. The OLS model which was analysed points to slightly negative correlation between these two variables. Data was divided into 6 periods which were analysed separately: (1) Q1 1957-Q2 1971: negative correlation; (2) Q3 1971-Q4 1980: slightly positive correlation, affected by large cost shocks due to the oil disruption; (3) Q1 1981-Q4 1983: negative correlation; (4) Q1 1984-Q4 1988: correlation between inflation rate and unemployment gap was close to zero; (5) Q1 1989-Q2 2007: slightly positive correlation; (6) Q3 2007-Q2 2018: slightly negative correlation.

Hooper, Mishkin & Sufi (2019) tested correlation between inflation rate (nominal wage inflation) and unemployment rate in all 50 US states and the District of Columbia, from 1981 to 2017. The estimated coefficient on the unemployment rate is negative and it is -0.41. Results point to the conclusion that a state with a negative deviation from its normal unemployment rate has a larger than average increase of nominal wage inflation. Osadcha (2014) examined the existence of Phillips curve in the US based on state-level data during 1976-2007. Time series models which were conducted are OLS Model, Fixed and Random Effects Models. Majority of states showed a negative relationship between current unemployment rate and the future inflation rate (28 states out of 50) and on national level, existence of the Phillips curve has been empirically confirmed with high level of significance.

Milenković et al. (2020) researched impact that independent variables gross domestic product, government expenditures, unemployment, real interest rate, savings and value-added tax have on inflation rate in following Balkan countries: Albania, Bosnia and Herzegovina, Croatia, Montenegro, North Macedonia, Serbia and Slovenia from 2008-2016. Results showed that GDP and government expenditure have a positive impact on inflation rate, whereas unemployment, real interest rate, savings and VAT have negative effects on inflation. Impact of GDP, unemployment rate and VAT is statistically significant,

which is not the case with other variables. Furtula, Durkalić & Simionescu (2018) confirmed low and positive correlation between inflation rate and unemployment rate in Serbia and Romania by using Bayesian linear regression models.

Positive, but insignificant relationship between inflation and unemployment rate was confirmed in Romania during the period 1990-2009 (Herman, 2010), which has pointed out that the Phillips curve cannot be applied in Romania in the long run (20 years as subject of analysis). The same conclusion has been reached by Melian (2021) during 1991-2013.

Ciupac-Ulici & Beju (2014) tested the existence of the Phillips curve in some Eastern European countries during the period January 1998–May 2013 and negative correlation was present in the Czech Republic, Poland, Romania and Slovakia, which was not the case with Hungary and Slovenia. For two countries which showed positive correlation, the authors introduced a dummy variable to present the appearance of financial crisis and these results showed that the correlation before the crisis was negative, whereas and after the crisis it is positive.

Karahan, Çolak & Bölükbaşı (2012) confirmed negative correlation between unemployment rate and inflation rate when investigating impact unemployment rate has on inflation rate in Turkey (data analysed on monthly basis from January 2006-October 2011) - ARDL results point to negative relationship between these variables in the short run and absence of causation in the long run.

2. Data and methodology

The analysis in this research was conducted in order to validate inverse correlation between inflation rate and unemployment rate in Bulgaria, Greece, Slovenia and Romania. These two macroeconomic variables were analysed on a quarterly level during Q1 2009–Q3 2021. The number of observations was 51 for each country and 204 in total.

Data source for inflation rate was Bank for International Settlements (BIS bank) and analysed inflation rate was measured by Consumer Price Index (CPI). Unemployment rate was analysed in percentages and calculated based on unemployment between 15 and 74 years. Unemployment rate data was obtained by Eurostat.

Methodology of this research contains presenting and comparing empirical data for analysed 4 countries, descriptive statistics, testing existence of normality, heteroscedasticity, autocorrelation and multicollinearity, panel analysis and graphic presentation of correlation between these 2 variables. Panel analysis consists of Ordinary Least Squares Model (OLS Model), Fixed Effects Model (FE Model) and Random Effects Model (RE Model). For conducting econometric analysis, software that was used is STATA and data was analysed on significance level of 5%.

The analysed model can be defined as:

$$Yit = \alpha + \beta xit + \mu it$$

Where Y stands for dependent variable inflation rate, α is constant, β is coefficient of independent variable unemployment rate, μ is residual, i represents the number of countries which were part of the analysis (i=4), t=time frame of analysis (Q1 2009–Q3 2021).

Two hypotheses are defined and tested in this paper:

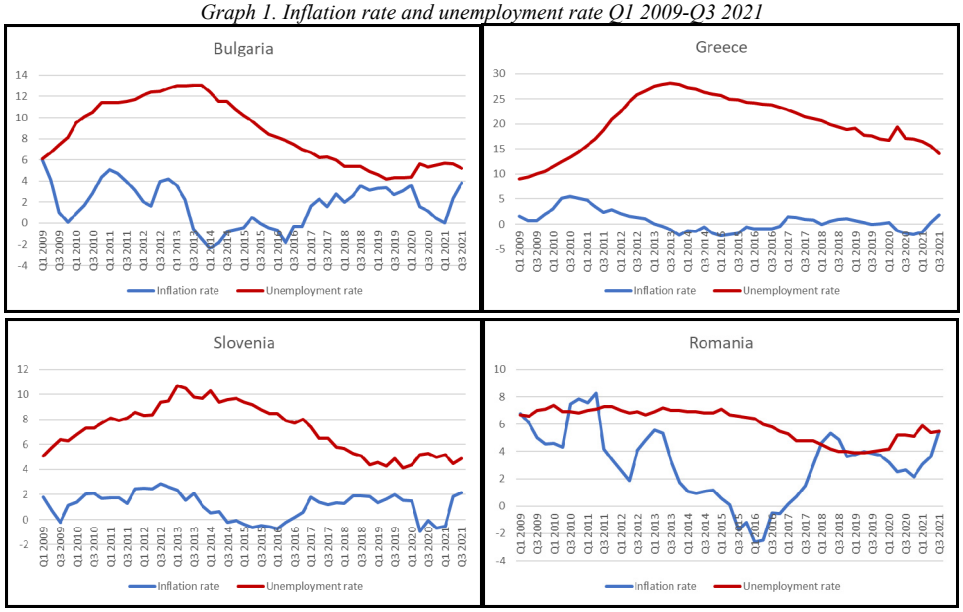
Hypothesis 1: Phillips curve, which points to inverse correlation between inflation rate and unemployment rate, can be applied in Bulgaria, Greece, Slovenia and Romania during the period Q1 2009-Q3 2021.

Hypothesis 2: Existence of the Phillips curve differs between countries that are using Euro and other currencies as national currency.

3. Inflation rate and unemployment rate in selected countries – empirical data

In order to determine the existence of Phillips curve in selected Balkan countries, unemployment rate and inflation rate were analysed quarterly, in order to get more insight on movement of these macroeconomics variables during a year. Inflation rate and unemployment rate for Bulgaria, Greece, Slovenia and Romania from Q1 2009-Q3 2021 are presented in Graph 1.

Graph 1. Inflation rate and unemployment rate Q1 2009-Q3 2021



Source: the author's calculation based on BIS bank and Eurostat data

When analysing empirical data for inflation and unemployment rate, results point to highest (8.27% in Q2 2011) and lowest recorded inflation rate in Romania (-2.62% in Q1 2016), which means that Romania had the largest deviations when it comes to inflation rate during the observed period. For the unemployment rate, the highest rate was recorded in Greece (28.10% in Q3 2013), whereas the lowest was noted in Romania (3.9% in Q1 2019 and Q2 2019). When it comes to comparing average data for all 4 countries for both inflation and unemployment rate, the highest average inflation rate was in Romania (3.08%) and the lowest in Greece (0.54%), whereas Greece (20.2%) noted the highest average unemployment rate and Romania (6.01%) the lowest.

Another thing which can be noticed is the rise in inflation rate in the last 3 quarters of 2021, which is a product of consequences corona virus has left on the world economy – rise in prices of energy sources, oil, higher demand, delayed cross-border transport etc.

When European Zone (EZ) countries are divided into the core and the periphery countries, they can be observed as developed European countries, older EZ countries which joined the monetary union during 1999/2001 (EZ12) and newer members which have joined after 2007 (EZ19). The unemployment rate during 2007-2018 has been the highest in EZ12 countries and is followed by EZ19 and core EZ countries (Beker-Pucar & Glavaški, 2020). These results are in accordance with analysed data in this paper, since Greece is part of the EZ12 countries and has the highest unemployment rate and Slovenia is part of EZ19 and unemployment rate is on a lower level.

The inverse movement of these two indicators can be noticed in the graphic overview – when inflation rate increases, unemployment rate decreases and *vice versa*. Depending on the country, this regularity is more or less noticeable, but the Phillips curve cannot be confirmed or rejected just by looking at graphic overview – econometric analysis is conducted, which will lead to confirmation or rejection of Hypothesis 1.

Table 1 and Table 2 present descriptive statistics (both basic and more detailed) for analysed 4 variables: Countries, Quarters, Inflation rate (dependent variable) and Unemployment rate (independent variable). Besides the total number of observations, which is 204 (51 observed quarters for 4 countries), the basic descriptive statistics presents mean, standard deviation, minimum and maximum for each of these variables. Apart from these indicators, dependent and independent variables are analysed *"overall"* (considering all data), *"between"* (considering data between different countries) and *"within"* (considering data for analysed period, not considering different countries). For inflation rate, *"within"* standard deviation is higher than *"between"*, meaning that differences are more significant within the analysed period, which is not the case with unemployment rate, where higher importance is given to differences between countries. In Table 2, results for the number of observations, analysed countries and analysed time frame (number of observed quarters) are presented in absolute numbers, whereas the remaining data is presented in percentage.

Table 1. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Country	204	2,5	1,120784	1	4
Quarter	204	26	14,75581	1	51
Inflation rate	204	1.616765	2.20183	-2.62	8.27
Unemployment rate	204	10.47598	6.574444	3.9	28.1

Source: the author's calculation in STATA

Table 2. Detailed descriptive statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
Inflation rate	Overall	1.616765	2.20183	-2.62	8.27	N=204
	Between		1.0935	.5376471	3.080784	n=4
	Within		1.986664	-4.08402	6.80598	T=51
Unemployment rate	Overall	10.47598	6.574444	3.9	28.1	N=204
	Between		6.561063	6.007843	20.2	n=4
	Within		3.283079	-.6240196	18.37598	T=51

Source: the author's calculation in STATA

Before starting the panel analysis, the following tests were completed to determine presence or absence of:

1. normality – Skewness/Kurtosis test
2. heteroscedasticity – White's test
3. multicollinearity – VIF test
4. autocorrelation – Durbin-Watson test

The observed data is not normally distributed, since Skewness/Kurtosis test indicates p=0.0000 (Table 3).

Table 3. Skewness/Kurtosis test – testing normality

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	ajd chi2(2)	Prob>chi2
residuals	204	0.0000	0.1135	32.04	0.0000

Source: the author's calculation in STATA

When it comes to testing heteroscedasticity, using White's test has proven the presence of heteroscedasticity – p-value is lower than 0.05 (Table 4).

Table 4. White's test – testing heteroscedasticity

White's test for Ho: homoskedasticity			
Against Ha: unrestricted heteroskedasticity			
Chi(2) = 7.57			
Prob > chi2 = 0.0227			
Cameron & Trivedi's decomposition of IM-test			
Source	**Chi2**	**df**	**p**
Heteroskedasticity	7.57	2	0.0227
Skewness	7.22	1	0.0072
Kurtosis	0.45	1	0.5046
Total	15.24	4	0.0042

Source: the author's calculation in STATA

Absence of multicollinearity is proven with VIF test (Table 5), since results from STATA point to: VIF=1.00<10.

Table 5. VIF test – testing multicollinearity

Variable	VIF	1/VIF
Unemployment rate	1.00	1.000000
Mean VIF	1,00	

Source: the author's calculation in STATA

For testing the presence of autocorrelation, Durbin-Watson test was used. Obtained results from STATA are: *Durbin-Watson d-statistic (2.204)=0.2643769*. This result was compared with results from the Durbin-Watson significance table and observed specifications were: number of observations (200); k=1; range dU (1.664)-dL(1.684). Since d=0.2643769 is lower than dL in the Durbin-Watson significance table, null hypothesis is rejected and autocorrelation is present.

4. Panel analysis of interdependence of unemployment rate and inflation rate

In order to determine interdependence of unemployment rate and inflation rate in selected countries, panel data was created and the following models were analysed: OLS (Ordinary Least Squares Model), Fixed Effects Model and Random Effects Model. Results of the OLS Model are presented in Table 6.

Table 6. OLS model

Source	**SS**	**df**	**MS**	**Number of obs = 204**		
Model	147.449071	1	147.449071	**F(1.202) = 35.60**		
Residual	836.706594	202	4.14211185	**Prob > F = 0.0000**		
Total	984.155665	203	4.84805746	**R-squared = 0.1498**		
				Adj R-squared = 0.1456		
				Root MSE = 2.0352		
Inflation rate	**Coef.**	**Std. Err.**	**t**	**P > | t |**	**[95% Conf. Interval]**	
Unemployment	-.1296325	.0217272	-5.97	0.000	-.1724737	-.0867913

rate						
_cons	2.974792	.2685377	11.08	0.000	2.445296	3.504289

Source: the author's calculation in STATA

The OLS Model is statistically significant (p-value=0.0000<0.05) and 14,98% of inflation rate movements are explained by unemployment rate changes. P-values that correspond to constant and independent variable (unemployment rate) are statistically significant (0.0000<0.05) which makes OLS model corresponding and that increase of unemployment rate for 1% leads to decrease of inflation rate by 0.1296325% (OLS Model: *Inflation rate=2.974792-0.1296325*Unemployment rate*). Negative coefficient next to the independent variable points to indirect correlation between unemployment and inflation rate.

The second model that was analysed was the Fixed Effects Model (Table 7). As for the OLS model, it was proven to be statistically significant (model p-value is 0.0002<0.05; p-values for constant and dependent variable are 0.0000<0.05) and indirect correlation variable is confirmed. This model is corresponding and it reads: *Inflation rate=3.249615-0.1558661*Unemployment rate*.

Table 7. Fixed effects model

Fixed-effects (within) regression					**Number of obs = 204**	
Group variable: Country					**Number of groups = 4**	
R-sq: within = 0.0663					**Obs per group: min = 51**	
Between = 0.5264					**Avg = 51.0**	
Overall = 0.1498					**Max = 51**	
Corr(u_i, Xb) = -0.2525					**F (1,199) = 14.14**	
					Prob > F = 0.0002	
Inflation rate	**Coef.**	**Std. Err.**	**t**	**p>|t|**	**[95% Conf. Interval]**	
Unemployment rate	-.1558661	.0414486	-3.76	0.000	-.2376008	-.0741313
_cons	3.249615	.4549382	7.14	0.000	2.352496	4.146733
Sigma_u	.78671604					
Sigma_e	1.9388257					
Rho	.14137203	(fraction of variance due to u_i)				
F test that all u_i=0:		F(3,199) = 7,86		Prob > F = 0,0001		

Source: the author's calculation in STATA

Last Model that was analysed as part of the panel analysis is the Random Effects Model (Table 8). Conclusion is the same as for two previous models: statistically significant model (p=0.0001<0.05) with indirect correlation between inflation rate and unemployment rate. Random Effects Model can be presented as: *Inflation rate=3.173797-0.1486288*Unemployment rate.*

Table 8. Random effects model

Random-effects GLS regression					Number of obs = 204	
Group variable: Country					Number of groups = 4	
R-sq: within = 0.0663					Obs per group: min = 51	
Between = 0.5264					Avg = 51.0	
Overall = 0.1498					Max = 51	
Corr(u_i, X) = -0 (assumed)					Wald chi2(1) = 16.29	
Theta = .70544379					Prob > chi2 = 0.0001	
Inflation rate	**Coef.**	**Std. Err.**	**z**	**p>|z|**	**[95% Conf. Interval]**	
Unemployment rate	-.1486288	.0368302	-4.04	0.000	-.2208147	-.0764428
_cons	3.173797	.6002909	5.29	0.000	1.997248	4.350345
Sigma_u	.88079972					
Sigma_e	1.9388257					
Rho	.17107679 (fraction of variance due to u_i)					

Source: the author's calculation in STATA

In order to choose between Fixed Effects and Random Effects Model, Hausman test was performed and obtained results point to p=0.7035 (p>0.05), which means that Null Hypothesis is confirmed and that corresponding Model is Random Effects Model (Table 9).

Table 9. Hausman test

Coefficients				
	(b) fixed	**(B) random**	**(b-B) Difference**	**Sqrt (diag(V_b-V_B)) S.E.**
Unemployment rate	-.1558661	-.1486288	-.0072373	.0190136
b = consistent under Ho and Ha; obtained from xtreg B = inconsistent under Ha, efficient under Ho; obtained from xtreg Test: Ho: difference in coefficients not systematic chi2 (1) = (b-B) '[(V_b-V_B) ^ (-1)] (b-B) = 0.14 Prob>chi2 = 0.7035				

Source: the author's calculation in STATA

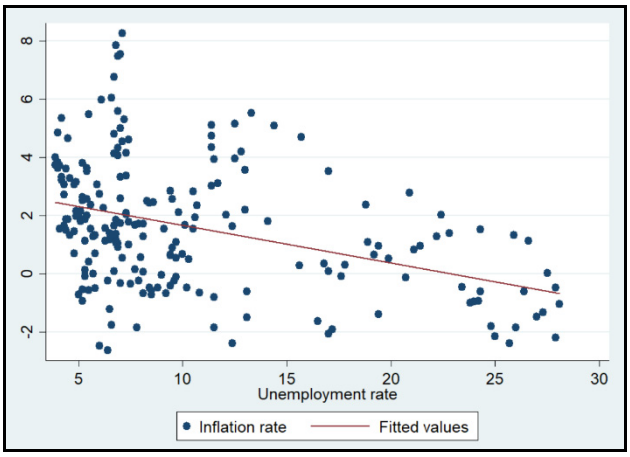
5. Discussion of results

Panel analysis has led to the conclusion of indirect correlation between inflation rate and unemployment rate. The most appropriate model is Random Effects Model:

*Inflation rate = 3.173797 – 0.1486288 * Unemployment rate*

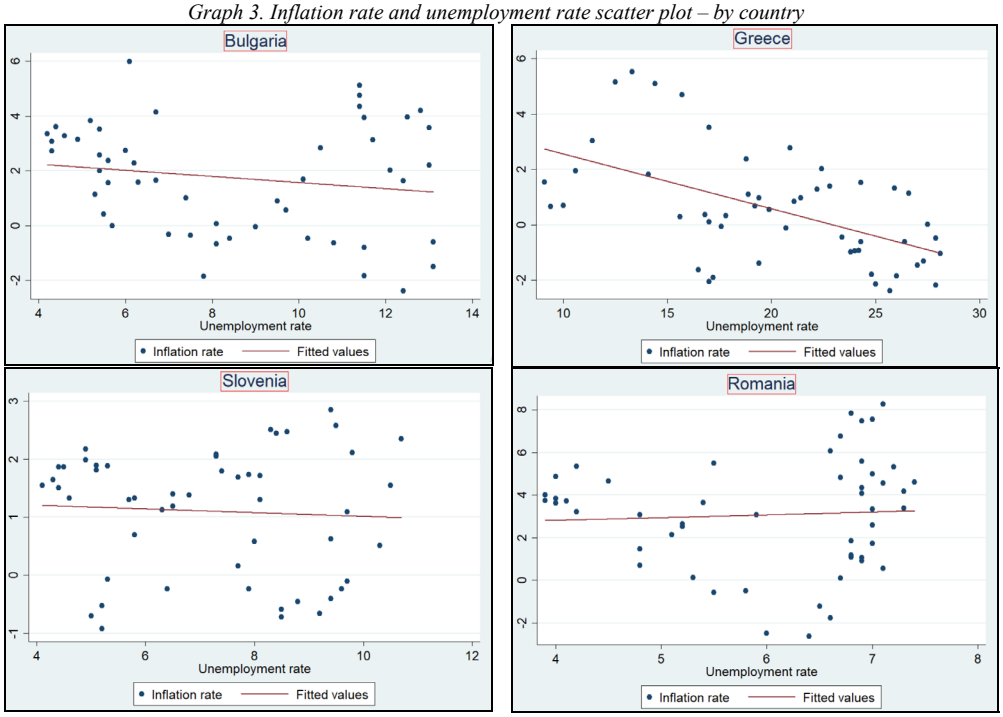
This model indicates that an increase of unemployment rate for 1% leads to decrease of inflation rate for 0.1486288%. If unemployment rate was 0%, inflation rate would be 3.173797%. Graph 2 presents a scatter plot of unemployment rate and inflation rate, which can graphically confirm negative correlation between these two variables in observed 4 countries, whereas Graph 3 presents separate scatter plots for each of the analysed countries.

Graph 2. Inflation rate and unemployment rate scatter plot



Source: the author's calculation in STATA

Graph 3. Inflation rate and unemployment rate scatter plot – by country



Source: the author's calculation in STATA

The negative correlation is the strongest in Greece, and is followed by Bulgaria, where the inverse relationship between inflation and unemployment rate is significantly

lower. In Slovenia, the correlation is barely negative and in Romania correlation is slightly positive. By separating these four countries as those that use euro as national currency (Greece and Slovenia) and those that do not (Bulgaria and Romania), a unique conclusion cannot be drawn. Negative correlation is present in Greece and Slovenia, but negative impact of unemployment rate on inflation rate in Slovenia is close to zero. For countries which are not using euro as national currency, the results are opposite: slightly negative correlation in Bulgaria compared to slightly positive correlation in Romania. Since differences are present between correlations of these two countries, but in both of them correlation is close to zero, the conclusion which can be drawn is that in countries that do not use euro as national currency, correlation between inflation rate and unemployment rate is so weak, that it can be considered that it does not exist.

What can be observed is that Greece, as a country with the highest negative correlation between inflation rate and unemployment rate, had the lowest average inflation rate and the highest average unemployment rate during the analysed period, and Romania, which marked highest average inflation rate and lowest unemployment rate, had slightly positive correlation between the two observed variables.

Results obtained in this paper are in accordance with findings of Bulligan & Viviano (2017), Hindrayanto, Samarina & Stanga (2019), Shaari et al. (2018), DiNardo & Moore (1999), Hooper, Mishkin & Sufi (2019), who have confirmed the existence of the Phillips curve in developed countries. When it comes to Balkan countries, negative correlation between inflation rate and unemployment rate was confirmed by Milenković et al. (2020), whereas low and positive correlation in Romania was confirmed by Furtula, Durkalić & Simionescu (2018), Herman (2010) and Melian (2021).

When analysed countries as observed as panel data, the existence of the Phillips curve during period Q1 2009–Q3 2021 is empirically confirmed. But these results differ between countries and some of them present higher, some lower negative correlation, whereas positive correlation is present in Romania. These results represent important guidelines and directions for policy makers and should be taken into account when deciding on the course of economic policy. If the aim is to increase employment rate and encourage economic growth, what needs to be considered is the impact this will have on inflation rate and *vice versa.*

Conclusion

Low and stable inflation rate and unemployment rate are some of the main goals for every economic policy – keeping the rise of prices on low level, but also unemployment rate on as close to natural unemployment rate – but as theoretically confirmed by Phillips curve, which points to inverse movement of these two variables, often this cannot be the case. Lowering the unemployment would lead to higher production, GDP growth, wages, purchasing power, which will eventually lead to price increase and inflation rate rise.

Even though Phillips curve is highly appreciated in economics theory, it is empirically confirmed that it cannot be applied in all countries, so the aim of this research

was to test existence of Phillips curve in 4 European countries: Bulgaria, Greece, Slovenia and Romania, during the period Q1 2009–Q3 2021.

After conducting panel analysis, the most adequate model was chosen, which is Random Effects Model: *Inflation rate=3.173797-0.1486288*Unemployment rate.* These results confirm inverse correlation between inflation rate and unemployment rate, which confirmed the existence of Phillips curve and accepted Hypothesis 1 of this research.

However, results differ between countries. Differences between countries that use euro as national currency and those that do not are not pointing to unique conclusion – Greece and Slovenia have negative correlation, but for countries that are not using euro as national currency, results suggest both positive and negative correlation, but it is so weak that is can be considered as it does not exist – so Hypothesis 2 cannot be rejected.

As this research analyses only 4 European countries, within a period of almost 13 years, suggestions for further econometrics analysis would include all European countries and a broader time frame, in order to determine the existence of the Phillips curve. Since the model in this research is simple, and it analyses only the impact of unemployment rate on inflation rate, further research should include more macroeconomic variables, in order to analyse the influence of all independent variables on inflation rate.

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The impact of low interest rates on the insurance companies' portfolio composition in EU countries

Утицај ниске каматне стопе на структуру портфолија осигуравајућих компанија у земљама Европске уније

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Abstract: The paper deals with the impact of low interest rate environment on the insurance companies' portfolio composition in EU countries. The aim of the research is to show that continuously low interest rates could influence insurance companies to become more exposed to risky asset classes, but there is also possibility that insurance companies remain mainly exposed to fixed income assets. The secondary data analysis is carried out to further examine the potential portfolio dynamics in Q4 2017-Q4 2021 period. The results of the analysis show that in most EU countries insurance companies remain invested in fixed-income assets. However, in eight countries (mostly Nordic countries) insurance companies have become significantly more exposed to equity and equity mutual funds, which suggests that portfolio reshaping has taken place in these countries.
Keywords: insurance companies, portfolio composition, low interest rates, fixed-income assets, equity.
JEL classification: E43, G11, G22, O16

Сажетак: Рад се бави анализом утицаја амбијента ниских каматних стопа на структуру портфолија осигуравајућих компанија у земљама Европске уније. Циљ истраживања је да покаже да континуирано ниске каматне стопе могу утицати на то да осигуравајуће компаније постану изложеније ризичним класама финансијске активе, али постоји и могућност да осигуравајуће компаније остану углавном изложене финансијским инструментима са фиксним приносом. Анализа секундарних података је спроведена ради даљег испитивања потенцијалне динамике структуре портфолија у периоду Т4 2017-Т4 2021. године. Резултати анализе показују да су у већини земаља ЕУ осигуравајуће компаније задржале претежни део

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портфолија инвестиран у хартије од вредности са фиксним приносом. Међутим, у осам земаља (углавном скандинавске земље) осигуравајуће компаније су постале знатно изложеније акцијама и акцијским инвестиционим фондовима у посматраном периоду, што сугерише да је у овим земљама дошло до преобликовања структуре портфолија.

Кључне речи: осигуравајуће компаније, структура портфолија, ниске каматне стопе, дужничке хартије од вредности, акције.
ЈЕЛ класификација: E43, G11, G22, O16

Introduction

Insurance companies are one of the three most important types of institutional investors and play an important role in the global financial market. Given the fact that insurance companies invest primarily in long-term asset classes, they provide the largest part of long-term financing of the economy. The insurance sector has grown considerably in the previous decades and has become inextricably linked with banks and other financial intermediaries in the process of offering insurance products. Total gross premium in the global insurance sector has grown from 3.9 trillion dollars in 2010 to approximately 6 trillion dollars in 2021 at a compound annual growth rate of 4% (McKinsey & Company, 2022). Funds placed by insurance companies on the financial market in 2020 amounted to 35.1 trillion dollars, compared to the amount of 21.2 trillion dollars in 2007 (PwC, 2020). For the sake of comparison, the assets that open-end investment funds invest in the financial market in 2020 amounted to 43 billion dollars, and the assets of pension funds were around 55 billion dollars (IOSCO, 2022).

Traditionally, insurance companies are considered to be financial market stabilizers. As long-term investors, they conventionally hold assets until maturity and are indifferent to short-term price movements. Therefore, they are expected to react countercyclically to price changes, i.e., they buy those assets whose prices are falling and vice versa. The reason why insurance companies can act countercyclically in the financial market is the relative stability and predictability of their financial liabilities, which makes them more resistant to short-term movements of economic and financial indicators. In this way, insurance companies are able to absorb short-term losses (Timmer, 2018, 269).

Life insurance products usually include a savings component, which means that in addition to the insurance, the policyholder is also entitled to a certain return after the expiration of a defined period of time. Given that life insurers traditionally provide coverage solely against death, whose probability can be relatively precisely calculated by using mortality tables, life insurers are able to accurately estimate future financial obligations stemming from the life insurance contract payouts. On the other hand, non-life insurance products protect policyholders against many different events whose probability is much more difficult to predict, such as fire, flood, burglary or car theft. Therefore, from the perspective of unexpected losses occurrence, non-life insurance is riskier than life insurance (Grundl, Dong and Gal, 2016, 6).

Regarding implications concerning the investment process, life insurance companies should invest in long-term securities that bring stable financial inflows in defined time

intervals, due to the long-term nature and predictability of their future liabilities. In addition to harmonizing future financial outflows and inflows in a quantitative sense, it is also important for the insurance companies to match the duration of liabilities and the assets. By doing this, the insurers become capable of responding at any time to claims for servicing contractual obligations. However, this only applies in relatively stable economic conditions without significant external shocks.

Bonds are securities that meet the above-mentioned requirements of insurance companies in most satisfying manner. In 2021, in 23 out of 40 OECD member countries, bonds made up 50% of the total portfolio of insurance companies, and in two countries their share was more than 90% (OECD, 2021, 17). Given the relatively straightforward predictability of financial outflows, the liquidity needs of life insurers are not large, so the share of money market in portfolio is relatively low (around 5% in most countries). On the other hand, the liquidity needs of non-life insurance companies are larger compared to life insurance, due to the greater uncertainty in predicting financial outflows. Hence, the money market instruments account for a greater share of non-life insurers' portfolio.

In the last decade the global financial market and, especially, Eurozone have been characterized by the presence of low interest rates. Although low interest rates increase investment spending by making it cheaper, from the perspective of long-term investors, such as insurance companies, this trend carries some specific implications. How do low interest rates affect the financial position of insurance companies? Due to the high exposure of the insurance sector to fixed-income securities, their investment returns decrease with lowering market interest rate, since the net cash flow stemming from premiums collected and maturing bonds has to be reinvested at lower interest rates (European Central Bank, 2015, 134). Also, it is important to point out that many life insurance products include a guaranteed minimum rate of return. If in the past this rate of return was set at a relatively high level, in the presence of long-term low interest rates insurers may face problems in servicing guaranteed contractual obligations. Low interest rates affect not only the value of fixed-income securities, but also the value of the anticipated future liabilities. The valuation of assets and liabilities, in accordance with the fair (market) value principles, implies that when market interest rates go down this leads to the reduction in the discount rate used to calculate the present value of liabilities, and, consequently, the increase in the value of financial liabilities occurs.

With respect to the previously highlighted features that reflect the European financial market position in the past ten years, the subject of the paper is the impact of low interest rates on the investment position of insurance companies. The aim of the paper refers to the analysis of dynamics of the life insurers' portfolios in EU countries triggerred by the low return rates of fixed-income securities. Consequently, two research hypotheses are defined in the paper:

H1: Insurance companies in EU countries remain primarily invested in debt securities in conditions of low interest rates.

H2: An upward trend in equity and equity funds exposure of insurance companies in EU countries is present in Q4-2017 - Q4-2021 period.

In order to prove/reject the defined hypotheses, the analysis of secondary data obtained from publicly available databases is conducted. The database of the European Insurance and Occupational Pensions Authority (EIOPA) is primarily used, which refers to the portfolio composition of insurance companies in 22 countries of the European Union. The data was collected for the Q4-2017 - Q4-2021 period, with a quarterly frequency. The insurance sectors in the remaining member countries were not taken into account, considering the negligible share in total assets of the EU insurance sector.

In addition to the introduction and conclusion, the paper consists of three logically connected parts. In the first part of the paper, an overview of trends in EU insurance sector in the period immediately before, during, and after the COVID-19 pandemic is given. The second part deals with analysis of key features of insurance companies investing in conditions of low interest rates. In the third part of the paper, the movements in the insurers' portfolio composition are examined for each of the observed countries and at the level of the entire sample of countries. The last part of the paper refers to drawing appropriate conclusions.

1. The overview of European insurance market

The European Commission forecasted that by the end of 2022 and in 2023, a significant expansion of economic activity in EU countries of the European Union could be expected, with an annual GDP growth rate of 4% and 2.8%, respectively. In the third quarter of 2021, the EU GDP reached the level recorded immediately before the COVID-19 pandemic onset, and by the end of 2022 this result is expected for all individual member countries (European Commission, 2022). Economic growth is still shaped by the adverse pandemic effects, but also by new challenges stemming from the Russian-Ukrainian conflict, the energy crisis and rising food prices, coupled with protracted increase in public expenditures and budget deficits in almost all EU economies (Vladušić, Živković and Pantić, 2020, 66).

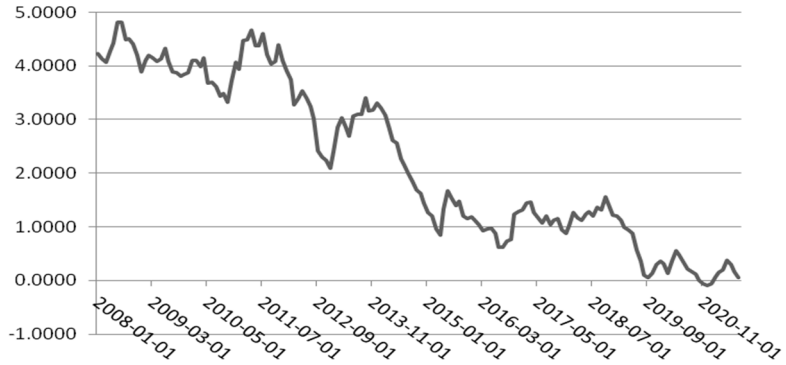
The insurance sector in EU countries entered 2020 with good indicators in all aspects of business activities. In 2019, life and non-life insurance gross premiums increased by 6% and 12%, respectively, the average return on the excess of assets over liabilities reached 9%, and the sector was well capitalized with an average value of SCR (solvency capital requirement) of 213% (EIOPA, 2021a, 23). However, the unexpected COVID-19 outbreak in Q1-2020 led to European countries closing their borders to contain the pandemic. Financial markets suffered huge short-term losses, and institutional investors reoriented themselves to invest in safe asset classes.

This situation represents a serious challenge for the insurance sector, and especially for the life insurance business, which previously faced difficulties due to the prolonged period of low interest rates. During 2020, the life insurance sector suffered a decline in gross premiums of around 7%. On the other hand, non-life insurance sector recorded an increase of approximately 8%. Most countries reported a decline in gross insurance premiums, and in some countries, such as France, Finland and Portugal, the annual percentage decrease was in

double digits (EIOPA, 2021b, 8). However, already in 2021 the life insurance premium has increased by as much as 14% compared to the end of 2020, while an increase of 8% was reported for non-life insurance. Considering the relatively quick recovery, it can be pointed out that the EU insurance sector has shown significant resistance to the adverse pandemic effects, so projections show that as of the mid-2022 total insurance premium will reach the level of 7 trillion dollars globally for the first time (SwissRe Institute, 2021, 23).

Investment profitability of insurers in 2020 deteriorated mainly due to unfavorable financial market movements in the first half of 2020, with insurance profitability improving considerably in the second half of 2020. Average return on assets (ROA) decreased from 0.59% in 2019 to 0.38% in 2020, while return on excess assets above liabilities decreased from 7.9% in 2019 to 5.5% in 2020 (EIOPA, 2021a, 29). The negative impact on the insurers' assets was caused by the sharp decline in stock market indices in March 2020, but was partially offset by the stock market recovery in the second half of 2020. On the other hand, the reduction of the risk-free interest rate, which is used as a discount rate when calculating the present value of the insurers' liabilities, affected the liabilities side adversely in 2020.

Figure 1: Trends in the rate of return on long-term government bonds in the Eurozone, 2008-2021



Source: FRED Database (2022). Long-Term Government Bond Yields: 10-year: Main (Including Benchmark) for the Euro Area Federal Reserves Economic Data, St. Louis FED.

The non-life insurance solvency position remained relatively stable in the wake of the COVID-19 pandemic, while the life insurance solvency deteriorated in the first half of 2020, and then recovered slightly in the second half. Already in the first half of 2021, the median solvency ratio (SCR) increased to 236%, which is higher than 229% recorded at the end of 2020 (EIOPA, 2022, 48). Also, in most EU countries, there was no significant decrease in solvency during 2021.

The most significant characteristic of the European financial market in the previous decade is the perennial presence of low interest rates. As shown in Figure 1, the period from 2008 to 2021 was marked by a significant decline in the long-term government bonds yield in the Eurozone, from 4.5% in 2008 to a level approximately equal to zero in 2021. However, starting from January 2022, government bond yield entered an upward trend for the first time

since 2018. In October 2018 the yield on government bonds in the Eurozone was at the highest level since the middle of 2015. This was followed by a prolonged period of decline, so that the end of 2020 and the beginning of 2021 were marked by the presence of negative nominal rates of return. In 2021, the yield on government bonds became stagnant, and starting from January 2022, the already mentioned growth has occured. The rising trend of the yield on government bonds in the Eurozone in the first half of 2022 can be attributed to the rise of the expected medium-term inflation rate, but also to the rise of the investors' exposure to stocks.

Also, the rate of return on corporate bonds increased in 2022, which can be explained by positive expectations regarding economic recovery prompted by a significant coverage of the European population with vaccines (EIOPA, 2021a, 14). The corporate bond yields reached the highest level in the previous 5 years in April 2022, and the highest level in the previous ten years of approximately 2.7% in June 2022. The yield on corporate bonds in the Eurozone rose starting from the end of 2021, with a significant upward trend in 2022. In June 2022, the rate of return was already at a significantly higher level compared to March 2020, when the COVID-19 impact on the EU financial market became alarming. This growth comes after a multi-year period of low interest rates that culminated in 2020 and 2021, and can be attributed to a gradual tightening of monetary policy in Eurozone.

When it comes to stock market movements, the European stock market responded very quickly to the negative effects of the pandemic in 2020. After the drastic fall that occurred in the first half of March 2020, the slight recovery of the stock market indices began already in April of the same year, since the benchmark indices of the European stock market, Stoxx 600 and Euronext 500, reached the pre-pandemic levels already in April 2021 (Euronext, 2022). In January 2022, both indices reached historical highs, and then in the rest of 2022, the value of both indices fell, due to fluctuations in global energy market, the Russian-Ukrainian conflict and the rise in food prices.

2. Investment activity of insurance companies in the low interest rate environment

Given that the primary insurers' objective is to increase their own market value, they will tend to create a portfolio composition that generates the highest return for the chosen measure of risk (Gatzert & Kosub, 2014, 352). In this regard, the insurance companies' investments must meet two contradictory goals: providing a high level of protection against the risks assumed and obtaining a high return on the invested funds (Kočović, Paunović and Jovović, 2015, 387). The overall insurers' investment policy is based on the principles of safety, profitability and liquidity. Due to its basic function of providing insurance, every insurer must primarily take into account the security when making investment decisions. Accordingly, the primary direction of investing the insurer's assets should be less risky asset classes. Additionaly, the principle of security is realized through diversification of investments, as well as maintaining the solvency margin at the prescribed level when investing funds (Kočović & Jovović, 2013, 13).

Various asset classes assume different risk-return profiles (Wilcox & Fabozzi, 2013, 275). The access to the entire range of asset classes is purely theoretical, since, in practice, regulatory restrictions are imposed concerning exposure to some of the asset classes, usually risky ones. Also, insurers may not have sufficient expertise in some asset classes or a required security is not available at a certain time, as is often the case with indexed government bonds (InsuranceEurope and Oliver Wyman, 2013, 15).

Bearing in mind that the current market environment is marked by low rates of return on fixed-income asset classes and fluctuations in the prices of other asset classes, the security principle may become difficult to follow, due to the uncertainty in estimating future return rates (Horing, 2013, 254). This problem becomes particularly important when fixed-income asset classes do not bring sufficient rates of return, which has been the case for many years in EU countries. Insurance companies account for the largest share of the European long-term bond market, especially for bonds with a maturity of more than 10 years. In the total turnover of bonds with these maturities, insurance companies participate with approximately 40% (Rousova & Giuzio, 2019, 4). Consequently, the presence of low interest and coupon rates and reinvestment risk significantly burden the process of investing insurers' assets.

In the past decades, the global economy was affected by numerous financial crises with detrimental economic ramifications (Kostin, Runge and Adams, 2021, 34). Hence, after the Global financial crisis, new regulatory frameworks were put in place to prevent insurance companies from excessive risks taking. The harmonized regulatory framework for the insurance sector, established in EU with the introduction of the Solvency II directive at the beginning of 2016, does not favor or hinder long-term investments of insurers, but rather emphasize responsible financial assets and liabilities management by introducing mechanisms that allow determining the objective risk exposure of each insurer.

The investment risk is reflected, in the first instance, in prescribing the required level of capital. The Solvency Capital Requirement (SCR) is set so that the insurer can meet its liabilities in the next 12 months with a probability of at least 99.5%, i.e. in 199 out of 200 possible cases (Kouwenberg, 2018, 447). In this way, Solvency II links the marginal contribution of each investment to the required solvency capital, in order to provide insight into risk allocation and the relationship between expected return and additional investment risk. Based on the defined SCR criteria, the insurers are expected to design an optimal strategic asset allocation that maximizes the expected return on assets, up to the limit of the SCR for market risk determined by the standard formula.

In response to the global financial crisis and recession starting in 2007, central banks of the most developed economies, namely the United States, the United Kingdom, the Eurozone and Japan, lowered short-term interest rates through quantitative easing programs to stimulate investment activity. The expansionary monetary policy led to the movements of interest rates similar to the Japan scenario starting in the 90s, with entering the negative real interest rates zone. Monetary policy aimed to stabilize the financial system and accelerate economic recovery, but on the other hand, an environment of long-term low interest rates was created. A downvard trend in interest rates affected both the insurer's assets and liabilities

side and caused the insurer's financial position to deteriorate in the short term as well as in the long term (Grundl, Dong and Gal, 2016, 28).

The question arises which effect is more pronounced, an increase in the value of assets or an increase in the value of liabilities. In general, it can be pointed out that the financial liabilities increase is greater than the financial assets increase, due to the fact that fixed-income assests make up only one part in the portfolio composition. Also, an important factor is the question of the sensitivity of portfolio value and the liabilities value to interest rate changes. As a measure of this sensitivity, bond duration is used, which represents the number of years required for the bond to repay the amount that the investor paid for its purchase. The practical application of duration refers to measuring the change in the bond price if interest rate went up or down by one percent. The longer the duration, the more sensitive the bond price or the entire portfolio value to interest rate changes is. The duration can also be calculated for the liabilities side, and in the case of life insurance it is common that the liabilities duration is greater than the assets duration, since duration is greater when the maturity period is longer, which is specific for life insurance policies concluded in multi-year and even multi-decade time periods. By doing so, the so-called negative duration gap occurs, where duration, that is, the sensitivity to interest rate changes, is greater on the liabilities side compared to the assets side. In the falling interest rates scenario, the liabilities increase is greater than the assets increase in the presence of the negative duration gap (Mohlmann, 2021, 587).

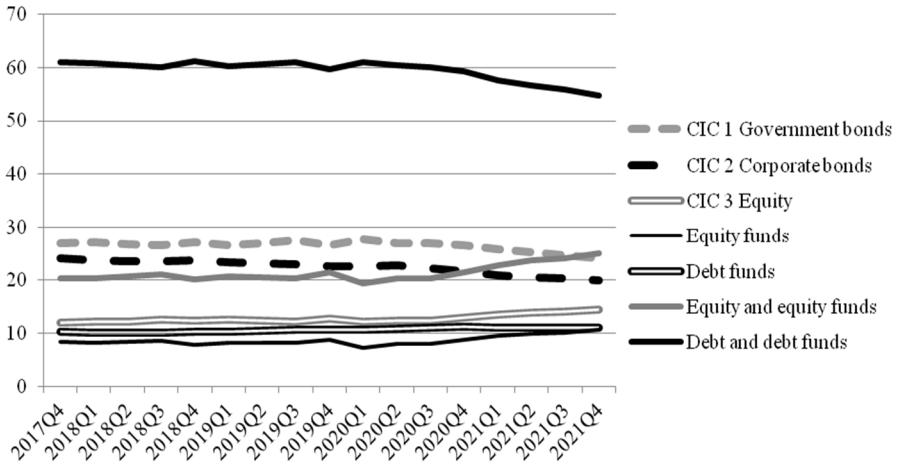
In practice, matching the cash flows of financial assets and financial liabilities is much more demanding than simply subtracting the expected outflows stemming from payouts to policyholders from the expected cash inflows of the financial assets (Babbel, 2001, 10). Even if all cash flows are perfectly matched, insurers may still face unexpectedly high payout claims (for example, events such as 9/11, Hurricane Katrina, etc.). On the other hand, the duration mismatch can be an intentional choice of insurance company managers because they prioritize the high returns seeking rather than maturity matching. Also, insurance policies are usually of a very long-term nature and precise maturity adjustment over such a long period could be practically impossible.

As a reaction to the downward trend in interest rates, insurers' investments had become more diversified during the second decade of the 21st century. In search of higher returns, some insurance company managers have opted for alternative assets, primarily long-term, illiquid forms of investments, or emerging markets investments. Others have chosen a strategy of de-risking by increasing exposure to short-term assets and more frequent reinvestment to cope with changing regulations and unfavorable financial market trends. However, given that fixed-income asset classes account for major share in the insurers' portfolios, low interest rates have led to lower investment returns that may become insufficient to cover the investment guarantees that are often an important feature of life insurance contracts, especially in European countries.

3. Analysis of changes in portfolio composition of insurance companies in EU countries

In this part of the paper, a detailed analysis of insurance companies portfolio composition movements in 22 EU countries is given. The data used in the analysis cover a four year period, i.e., from the last quarter of 2017 to the last quarter of 2021. Although it is a relatively short period, the reason why data taken from the EIOPA agency database were used is the straightforward positioning of the asset classes that are included when looking at the insurers'portfolio composition in the observed countries, which is not the case with other publicly available databases of various international organizations. The portfolio composition is clearly defined by prescribing nine asset classes, the so-called CIC (complementary identification code) codes, of which CIC 1 class - government bonds, CIC 2 - corporate bonds, CIC 3 - shares and CIC 4 - investments in investment units and shares of investment funds, are used. Investments in other classes were not analyzed in detail. Given that investments in CIC 4 class are further classified into investments in equity funds, debt funds (fixed-income funds) and alternative funds, the analysis includes data on investments in equity funds and debt funds as an indirect way of investing funds in stocks and fixed-income asset classes.

Figure 2: Portfolio composition in the sample of EU countries, 2017Q4-2021Q4, in percentage



Source: the authors'calculation based on EIOPA, (2022), Insurance Statistics – Asset Exposures.

The countries included in the sample account for 92% of the total assets of EU insurers, which makes this sample representative in looking at developments at the level of the entire European Union. As can be seen in Figure 2, portfolio composition for the entire sample was relatively stable in the observed period, with some minor changes. In the insurers' portfolio composition debt securities prevail, with a share of approximately 60%, although there is a trend of decreasing a share recorded in 2020 and 2021. The share of equity and equity funds was around 20% at the beginning of the period with a slight rising tendency,

starting from the first quarter of 2020. In the same period, the share of government bonds gradually decreased (from 27% at the beginning of the period to 24% at the end of the period).

Although, based on Figure 2, it could be concluded that there were no significant changes in portfolio composition in the observed period, Table 1 provides more specific information.

Table 1: Changes in insurers'portfolio composition in sample countries, in 2017Q4-2021Q4 (in %)

		Gov. bonds	Corp. bonds	Equity	Mutual funds	Equity funds	Debt funds	Equity and equity funds	Debt and debt funds
1	Austria	-1.27	-4.54	2.24	2.49	0.79	-0.36	3.02	-6.17
2	Belgium	-5.84	-2.91	2.03	5.59	1.52	2.11	3.55	-6.64
3	Bulgaria	-6.15	-2.03	1.81	7.50	3.07	1.36	4.88	-6.81
4	Czech Republic	0.94	-2.06	0.44	6.36	1.65	1.29	2.09	0.17
5	Denmark	-0.27	-3.03	3.24	-0.11	1.74	-1.31	4.97	-4.61
6	Finland	-1.24	-4.21	-0.44	5.73	3.42	0.64	2.98	-4.82
7	France	-2.32	-3.94	1.75	3.95	1.52	0.71	3.27	-5.55
8	Greece	-5.43	0.13	0.78	3.84	1.79	1.63	2.57	-3.68
9	The Netherlands	-4.92	2.62	2.21	2.89	-1.36	0.13	0.85	-2.17
10	Croatia	-7.80	3.07	3.12	1.87	0.66	0.98	3.78	-3.75
11	Ireland	-3.09	-0.28	4.15	1.16	2.82	0.33	6.98	-3.05
12	Italy	-3.02	-0.90	-0.32	5.72	3.25	1.62	2.93	-2.30
13	Hungary	-3.89	-0.77	0.69	5.09	8.54	-2.19	9.23	-6.85
14	Germany	-0.44	-6.76	3.32	4.03	1.18	0.72	4.50	-6.48
15	Norway	-3.82	-3.22	1.64	5.67	5.79	-2.50	7.43	-9.54
16	Poland	4.63	3.09	-1.78	-3.75	-1.44	-2.09	-3.22	5.63
17	Portugal	-6.94	-1.58	0.65	10.07	3.12	6.12	3.77	-2.39
18	Romania	0.87	0.11	-0.79	3.13	2.26	-1.10	1.47	-0.12
19	Slovakia	-3.26	2.13	-0.04	1.61	3.26	-0.02	3.23	-1.14
20	Slovenia	2.14	-6.27	1.97	4.64	2.87	0.53	4.84	-3.59
21	Spain	-1.81	-1.66	1.50	4.69	2.62	0.71	4.11	-2.75
22	Sveden	-1.68	-6.05	4.14	4.65	7.55	0.24	11.69	-7.49

Source: the authors' calculations, based on EIOPA, (2022), Insurance statistics – Asset Exposures.

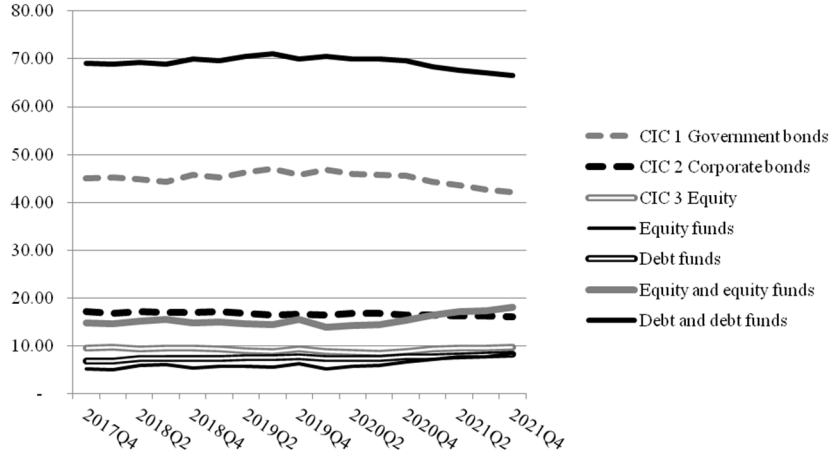
Namely, in most countries, some level of decrease in the share of government bonds occurred. Namely, in as many as 18 countries a decrease in the share of government bonds is reported. Also, in 16 countries the share of corporate bonds decreased. On the other hand, in 17 countries there was an increase in the equity share, and in 20 countries there was an increase in the share of equity funds. It is also important to point out that the share of investment funds increased in 20 countries, the only exceptions being Poland and Denmark. Increases/decreases are usually not large, but there are exceptions. For example, the share of government bonds in Croatia decreased by approximately 8%, and the share of corporate

bonds in Germany decreased by almost 7% in the observed four years. The share of equity funds increased by 7.5% in Sweden, and the share of debt funds increased by 6% in Portugal. Given the short period of time, these are significant changes in the insurer's portfolio composition.

Given that the Table 1 reveals significant movements in the portfolio composition in many sample countries, the question arises whether certain conclusions can be drawn concerning certain subgroups of countries within the observed sample. Based on the analysis of the available data, two subgroups of countries were singled out, which are located at the end points of the spectrum of possible portfolio compositions. Namely, in the environment of the multi-year presence of low interest rates in the European financial market, it is logical to assume that insurance companies would sooner or later reduce the share of fixed-income asset classes and shift to other high-yielding asset classes, such as stocks or alternatives. Considering that alternatives are not included in the analysis, due to large variability of their share in portfolio composition from country to country, only stocks and stock funds are included in the analysis.

The second course of action refers to the possibility for insurers to maintain a high share of government and/or corporate bonds in the portfolio composition, due to regulatory restrictions imposed on alternative asset classes, or managers' perseverance in pursuing a conservative investment policy regardless of current trends. Figure 3 shows the dynamics of the portfolio composition in 8 EU countries (Spain, Italy, Bulgaria, Romania, Croatia, Greece, the Czech Republic and Slovakia) with the most conservative portfolio compositions. As can be seen, the share of debt securities is at an extremely high level of approximately 70%, and the share of government bonds is approximately 45%. On the other hand, the share of equity is very low, approximately 10%.

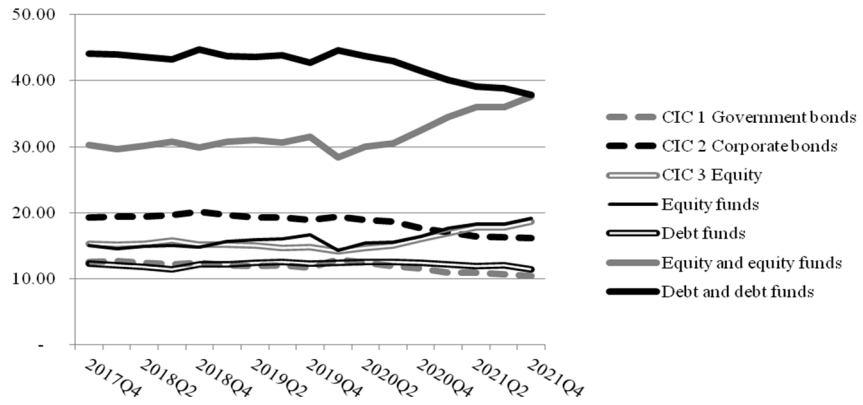
Figure 3: Portfolio composition in eight EU countries with the most conservative portfolio of insurance companies, period 2017Q4 - 2021Q4



Source: the authors' calculations, based on EIOPA (2022), Insurance Statistics – Asset Exposures.

On the other hand, there are also countries where insurers have implemented the reorientation in the investment process. In these countries a trend of rising exposure to stocks and stock funds is reported. Figure 4 shows the dynamics of the portfolio composition in the observed time period in 8 EU countries (Sweden, Poland, Denmark, Hungary, Slovenia, Norway, Austria and Ireland), with the most aggressive portfolio composition. As can be seen, in this sub-sample of countries, a significant increase in the share of equity and equity funds classes occurred, from 30% to 38%. Equity and equity funds had an approximately similar trajectory of increase in the observed period. In the same period, there was a decrease in the share of debt securities and debt funds, from 44% to 38%. At the end of 2021, the share of equity and equity funds was approximately the same as the share of debt and debt funds.

Figure 4: The portfolio composition of insurance companies in 8 EU countries with a rising trend in exposure to equity and equity funds



Source: the authors' calculations, based on EIOPA (2022), Insurance Statistics – Asset Exposures.

Based on the conducted analysis, it can be concluded that the national insurance markets in EU countries differ greatly in terms of the insurer's portfolio composition. In general, at the level of the entire insurance market in the observed 22 EU countries, it can be concluded that in Q4-2017 - Q4-2021 period, debt securities and debt funds were the prevailing asset classes, with a total share of 61% at the end of 2017, but which gradually decreased to the level of 55% at the end of 2021. In this way, it can be claimed that Hypothesis 1 is proven.

On the other hand, it is important to point out that this situation is not present in all countries, considering that there is a group of eight countries in which the share of debt securities has been continuously decreasing in the observed four years, while simultaneously the share of equity and equity funds has been rising. In these countries, the share of debt securities was 14% higher than the share of equity and equity funds at the end of 2017 (44% versus 30%), but by the end of 2021, their shares became practically equal at approximately 38%. With regard to a short period of time, these are significant adjustments in the insurers'

portfolio composition. Therefore, in these countries, in the low interest rates environment, insurers reoriented their investment policy towards equity in search of higher yield rates. In this way, the second research hypothesis was partially confirmed.

Conclusion

In this paper, an analysis of trends in the insurers' portfolio composition in EU countries was carried out by using data that covered the Q4-2017 - Q4-2021 period. This period was marked by the presence of low interest rates, which affected the financial position of insurance companies. Given that debt securities represent the dominant asset class in the European insurance sector portfolio composition, the prolonged period of low interest rates impacted the investment performances of insurance companies. The analysis was conducted with the aim of determining whether EU insurance companies responded to the perennial presence of low interest rates by adjusting the portfolio composition or whether they kept the portfolio composition unchanged, in accordance with the previously defined strategic asset allocation. By looking at the data available at the level of the entire sample of 22 EU countries (countries with a very small insurance market were excluded from the analysis, that is, Malta, Estonia, Lithuania, Latvia and Cyprus), it can be concluded that debt securities remain the dominant asset class in EU insurers'portfolio composition, with a share of approximately 55% in 2021 (government bonds 24%, corporate bonds 20% and debt funds 11%). This portfolio composition remained relatively unchanged in the observed period. In this way, it can be argued that European insurers in conditions of low interest rates tend to keep conservative portfolio compositions. Moreover, a subgroup of eight countries was singled out in the analysis, which are predominantly Mediterranean countries (Italy, Spain, Croatia, Greece, Bulgaria, Romania, the Czech Republic, Slovakia) in which the insurers' portfolio is extremely conservative, with the share of debt securities of 66.5% at the end of 2021 (government bonds 42%, corporate bonds 16% and debt funds 8%).

However, a more comprehensive analysis of individual countries data shows that this conclusion cannot be applied to the entire insurance market, but that there is a subgroup of countries in which the portfolio composition dynamics are different. Namely, in the Scandinavian countries (Denmark, Sweden, Norway), but also in five other countries (Poland, Hungary, Ireland, Slovenia and Austria), the trend of a gradual decrease in the share of debt securities and simultenous increase in the share of equity and equity funds is noticeable. In these countries, the share of debt securities decreased from 44% to 38% in the observed period, while the share of equity and equity funds increased from 30% to 38%. The share of equity increased from 15% to 19% in the same period, while the share of equity funds increased from 15% to 19%. Therefore, at the end of 2021, the share of equity and equity funds was approximately equal to the share of debt securities in this subgroup of countries.

As a final conclusion, it could be stated that the insurers' portfolio composition in the European Union varies significantly from country to country and that there are no general conclusions that can be applied to all observed countries. However, it can be pointed out that EU insurers are still primarily exposed to fixed income securities, while the share of equity

is much smaller. Also, Mediterranean countries have extremely conservative portfolio compositions, while, on the other hand, the insurers' portfolio composition in Scandinavian countries is much more aggressive.

The main limitation of the analysis lies in the very short time period for which the data were collected. By considering a longer period for which the data would be collected in a consistent manner, conclusions with a significantly higher level of theoretical applicability could be drawn. Also, in the analysis of the insurers' portfolio composition, only debt securities and equity were considered as traditional asset classes, while alternatives were ignored. Given that the rise of the importance of the alternatives represents one of the directions in which insurers have been reorienting their strategic asset allocation in the past few years, the inclusion of alternative classes in portfolio composition would increase the quality of the conducted analysis and the practical applicability of the obtained results.

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Effects of the NPL on the banks' profitability during the COVID-19 pandemic: the case of the Republic of Serbia

Ефекти проблематичних кредита на профитабилност банака током КОВИД-19 пандемије: случај Републике Србије

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Abstract: During the pandemic caused by the new SARS-COV2 virus, the country's economic performance is lower than before the health crisis. The global health crisis has directly and indirectly affected the economic and financial indicators of almost all countries. Regardless of state financial aid, which inevitably prevented the collapse of the national economy and financial markets, certain economic sectors are still facing the consequences of the crisis. One of the reasons for the lower financial performance of countries in this period is the insufficient readiness of banks to deal with non-profitable loans. This study aims to consider the profitability of the banking sector concerning non-profitable loans in Serbia during the pandemic, using the methods of description, deduction, and regression. In addition, a comparison method was used to assess the ability of banks to deal with non-profitable loans during the previous global financial crisis. For statistical data processing, the official data of the National Bank of Serbia was extracted from the statistical section, as well as from annual and periodic reports. A linear regression model was used to measure the effect of the NPL on the banks' profitability in the period 2008-2021, after the regression assumptions had been successfully tested (such sample adequacy, distribution symmetry, and multicollinearity). Non-profitable loans, income from interest, ROA, and ROE are the variables used in regression modelling. The results showed that non-profitable loans do not have a statistically significant effect on banks' profitability.
Keywords: NPL, ROA, ROE, loans, regression analysis
JEL classification: C1, C40, C58, G21, G32

Сажетак: Током пандемије изазвне новим корона вирусом, економски учинак земље је нижи у односу на период пре настанка здравствене кризе. Глобална здравствена криза изазвана овим вирусом је утицала директно и индиректно на економске и финансијске показатеље готово свих земаља. Без обзира на државну финансијску помоћ, која је неминовно спречила колапс националне привреде и финансијских тржишта, одређени привредни сектори се још увек суочавају са последицама кризе. Један од узрочника нижег финансијског учинка земаља у овом периоду је недовољна спремност банака у суочавању са проблематичним кредитима. Ова студија има за циљ да размотри профитабилност банкарског сектора у односу на проблематичне кредите у Републици Србији током пандемије, коришћењем методе дескрипције, дедукције и регресије. Осим тога, коришћена је метода компарације за процену способности банака у суочавнању са проблематичним кредитима током претходне глобалне финансијске кризе. За статистичку обраду података коришћени су званични подаци Народне банке Србије естраговани из статистичког одељка, годишњих и периодичних извештаја. Након што су претпоставке регресионог моделирања (као

што су адекватност узорка, симетрија дистрибуције и мултиколинеарност) успешно тестиране, коришћен је линеарни регресиони модел за мерење утицаја проблематичних кредита на профитабилност банака у периоду 2008-2021. Проблематични кредити, приход од камата, ROA и ROE су варијабле које се користе у регресионом моделирању. Резултати су показали да проблематични кредити немају статистички значајан утицај на профитабилност банака.
Кључне речи: НПЛ, ROA, ROE, кредити, регресиона анализа
ЈЕЛ класификација: C1, C40, C58, G21, G32

Introduction

Banks have a significant role in a country's economic growth as they are mediators between the investor or the borrower and the country's industry (Christaria & Kurnia, 2016; Jakšić, 2021). After the global financial crisis, significant attention was paid to studying banks' creditworthiness and the accumulation of non-profitable loans, and their impact on economic growth (Serrano, 2020). The creditworthiness of the banking sector has weakened since the beginning of the pandemic caused by the SARS-COV2 virus in many countries around the world and the region (Slijepčević, 2021). Banks' low creditworthiness, inter alia, was caused by non-profitable loans (hereinafter: NPLs). NPLs are one of the determinants of banks' profitability as high levels of these loans have a negative impact on a bank's net income, which is determined by analysing doubtful debts and writing off bad debts. This affects not only net income (profitability) but also bank's equity (Ombaba, 2013). When a bank is unable to collect loans that exceed the bank's equity, this results in a banking crisis, which often escalates into a financial crisis (Biabani et al., 2012). The last global financial crisis occurred around 2008.

Empirical research, such as those conducted by Psaila, Spiteri & Grima (2019), and other research covered in the literature review, pointed to a possible or determined link between high levels of NPLs and banks' low profitability. On the other hand, studies have shown that NPLs are poorly managed by the banks' management, in the form of inappropriate NPL monitoring. If the bank's management additionally saves on NPL monitoring resources to reduce operating costs, this points to poor control of the loan portfolio and, consequently, to poor bank management (Louzis, Vouldis & Metaxas, 2010). During the last period, investments in bank management operations, especially in digital technologies, are crucial for the banks' profitability growth potential (Musabegović et al., 2021).

Theoretical bases, empirical research, and new circumstances caused by the pandemic prompted the author of this paper to develop hypotheses on the analysis of the relationship between NPLs and banks' profitability in the Republic of Serbia (hereinafter: the RS). Banks' profitability parameters used in this paper are: return on assets (hereinafter: ROA) and return on equity (hereinafter: ROE). Considering the prevalence of empirical research results that show NPLs' negative impact on banks' profitability, a negative relationship is expected between these indicators. According to the findings of the author of this paper, no research has been conducted on NPLs' impact on banks' profitability in the RS which is grounded on the methodological basis of this paper during the pandemic. Therefore, the aim of this research is to make up for this shortcoming in the scientific literature.

For the purpose of clarity of this paper, it is organized into sections and sub-sections. The following section of the paper looks into the interdependence of NPLs and the profitability of the banking sector and includes the literature published before the pandemic. The second section of this paper reviews literature related to NPLs and banks' profitability published during the pandemic, as well as the trends analysis in our country. The third section of this paper presents the data used for statistical analysis, and the models used for measuring the relationship between variables. The fourth section discusses research results, whereas the last section of the paper presents conclusions and recommendations for further research.

1. Interdependence of non-profitable loans and banking sector profitability

In the empirical analysis of Ranjan & Dhal (2003), the authors conducted research related to the link between NPLs and commercial banks' profitability in India. For the purposes of the (panel) regression analysis, these authors took into account parameters such as the size of banks, macroeconomic indicators, interest rates, and credit cultures in this country. The outcome of their research showed that NPLs' growth has a negative effect on banks' profitability.

After reforms that covered the banking sector in Nigeria, research was conducted on examining NPLs' impact on the banks' profitability in this country. Based on annual data for the period 2006-2012 and applying the regression analysis, the outcome of Adebisi & Matthew (2015) showed that NPLs have a double impact on banks' profitability. Namely, it was determined that NPLs affect ROA, while they do not affect ROE of the banks in this country. In both cases, the regression coefficients are negative, pointing to the negative impact that NPLs had on both ROA and ROE, whereas the regression model for ROE did not show statistical significance. The credibility of both models is moderately high (R-Square for the ROA model = 69%, and R-Square for the ROE model = 68%).

The research conducted by Christaria & Kurnia (2016) included an analysis of the impact of capital adequacy ratios, loan and deposit ratios, and NPLs on ROA in Indonesian listed banks. Using banking sector data for the period 2012-2014 and applying multiple linear regression, the results indicated that all independent variables have a significant impact on banks' ROA, with the model credibility of 49.3%.

In their analysis of NPLs' impact on the profitability of 35 listed commercial banks, Psaila, Spiteri & Grima (2019) took into consideration seven countries in the Euro-Mediterranean region. For the purpose of determining whether the change in NPL levels affects the ROA of listed commercial banks, these authors used secondary data (official data sources and data from banks' annual reports) for the period 2013-2017. Their econometric approach consisted of applying four regression models in which control variables were the liquidity and solvency ratios of these banks. Built on the results of the data analysis, they found that NPLs have a negative effect on the ROA of these banks, while the solvency ratio significantly explains variations within the dependent (ROA) and independent (NPL) variables.

Serrano (2020) measured the NPLs' impact on credit activities in banks in European countries. For this purpose, he used the data collected from 75 banks for the period 2014-2018. For the purpose of measuring this impact, he conducted the regression analysis showing that NPLs' growth has an impact on a decline in credit growth, which affects the real economy. In addition, it was noticed that in crisis periods banks have a higher growth rate of lending to the economy compared to the rate of lending to individuals.

2. Non-profitable loans during the pandemic caused by SARS-COV2

After the global financial crisis, the balance sheets of European banks showed that the NPL levels increased significantly, which reduces the capacity of these banks to lend to economic activities (Thornton & Di Tommaso, 2020). This condition of banks led European policymakers to create an NPL reduction strategy with the aim of restoring the stability of the banking system in Europe (Council of the European Union, 2017). Similar balance sheet figures in banks were recorded outside Europe, i.e. in other developed and less-developed countries, during the pandemic. There has been strong government support to maintain stability during the COVID-19 pandemic in Serbia as well (Čavlin, Đokić & Miletić, 2022).

Based on a sample of 10 Indonesian banks and based on the information used from their reports, Irwan et al. (2022) examined the impact of NPLs on ROA during the pandemic. Using the Wilcoxon test and descriptive analysis, the authors found that NPLs are one of the most important indicators that influence ROA performance. In addition, they found that the pandemic was the main cause of a decline in the performance of the banking sector, which is reflected in the negative relationship between NPLs and ROA, i.e. in the NPLs' negative impact on ROA. In this regard, the Wilcoxon test of NPLs proved to be statistically significant for ROA (value amount = 0.02%, p-value < 0.05). Using the qualitative approach to scientific research, Agustin & Solikin (2021) studied the effects of the implementation of SMEs (small and medium-sized enterprises) credit restructuring policies in Indonesia during the pandemic. Relying on the results of previous research, as well as on NPL regulations in that country, these authors found that SMEs efficiently implemented credit restructuring policies. In addition, they found that the efficient implementation of these policies requires cooperation between different institutions, industrial sectors, and regulations of the government of that country.

Concerning the effects of the pandemic on the banks' profitability in Europe, a study was conducted with the purpose to find and measure the connection between the effects of the pandemic and ROA and ROE (Haider & Mohammad, 2022). The sample consisted of 500 banks from Europe (Germany, England, France, Italy, and Spain) and South Asian countries (India, Bangladesh, Pakistan, and Sri Lanka). Data were collected on a quarterly basis for the period 2016-2021, and the regression model was used to evaluate the impact of variables (for both developed and developing countries). The results of the research of these authors showed that the impact of the pandemic on banks' ROA and ROE has been statistically significant and that there is a difference in the results obtained for developed and developing countries. The difference is reflected in the size of banks and their liquidity, which

takes precedence over other determinants such as banks' efficiency and credit quality. Namely, the pandemic caused a ROA and ROE decline in European banks, whereas profitability increased in South Asian banks.

Grubišić, Kamenković & Kaličanin (2022) studied the relationship between profitability and market power in the banking sector in Serbia. Using the data for the period 2010-2019, collected from banking reports, and the regression analysis, their results showed that variations in the concentration ratio may explain ROA and ROE changes, and claimed that banks' profitability may largely be the result of banks' efficiency. The credibility of the regression models of these authors varies from 39 to 61%.

In the research conducted by Vesić (2021), the author conducted an NPL analysis in the banking sector in the RS with the intention to make a prediction for the period 2020-2025. This author made two types of predictions for an optimistic and pessimistic scenario. The optimistic scenario assumes a CAR (capital adequacy ratio) increase by 30%, and the pessimistic scenario assumes a reduction also by 30%. The results of the optimistic scenario showed that NPLs in Serbia will shoot up in the relevant period. In this regard, this author claims that it can be expected that the Government of this country will take various measures to support the sustainability of the national economy during the pandemic. However, the banking sector will have unfavourable conditions because the capital adequacy ratio will be significantly above the minimum (it will increase from 8% to 12%). In terms of the pessimistic scenario, the results showed that NPLs will increase by more than 3 times, which will significantly affect the movement of NPLs in Serbia. This last could lead to the bankruptcy of a number of banks in this country. In case certain banks go bankrupt, certain companies may stop operating, and the final result may be an economic crisis.

Based on empirical research, the theoretical frameworks, and the goals of this paper, the following hypotheses have been formulated:

H1: NPLs have a negative and significant impact on ROA in the RS for the period 2008-2021;

H2: NPLs have a negative and significant impact on ROE in the RS for the period 2008-2021.

The following section of this paper presents an analysis of the NPL trend in the RS in relation to ROA and ROE and a review of the new situation caused by the SARS-COV2 pandemic. This analysis seeks to validate, invalidate or complement previously conducted research, as well as to point to potential future trends of defined indicators.

2.1. The current NPL trend in the RS

Before presenting the data and the methodological framework, the author of this paper presents the NPL trend in the RS for the period of the global health crisis. This trend is presented for a more efficient understanding of the current situation in terms of the goal of this research and the situation in the domestic credit market, as well as a more credible interpretation of the results.

Ten banks make up half of the total assets of the RS banking sector (NBS, 2021a). The total loan balance consists of loans to the corporate sector and loans to the retail sector. To be more accurate, total domestic placements are the sum of receivables from loans, securities, interests, fees, and other receivables. An overview of the credit activity and NPL indicators are presented in Table 1.

Table 1: The credit activity trend in the RS: 2020-2021

		Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022
Share in total loans*	Corporate sector	8.4	20	49.1	59.8	64.1
	Retail sector	22.5	44.8	37.8	28.8	23.3
NPLs share in total loans**	Corporate sector	3.1	2.9	2.9	2.8	2.4
	Retail sector	4.1	4	3.9	4	4.2
* billion RSD, ** %						

Source: the author's calculation. Adjusted according to NBS quarterly reports

In Q1 2021, total domestic placements indicated a slowdown in year-over-year growth by an average of 9.7%. In this period, part of the total loans were loans to the corporate sector (investment loans) in the amount of RSD 8.4 billion, while loans to the retail sector increased by RSD 22.5 billion (1.8%). With regard to total NPLs, their share in total loans amounted to 3.9% in March 2021, of which 4.1% accounted for the retail sector, and 3.1% for the corporate sector. The data were calculated in relation to the end of 2020 (NBS, 2021a, p. 6-15).

In Q2 2021, total domestic placements indicated an accelerated year-over-year growth by an average of 6.3% compared to the previous year. In this period, loans to the corporate sector increased by RSD 20 billion, while loans to the retail sector increased by RSD 44.8 billion. The share of NPLs in total loans amounted to 2.9% for the corporate sector, and 4% for the retail sector in June 2021. The data were calculated in relation to March 2020 (NBS, 2021b, p. 6-13).

In Q3 2021, loans to the corporate sector increased by RSD 49.1 billion, and loans to the retail sector increased by RSD 37.8 billion. In terms of total NPLs, their share in total loans amounted to 2.9% for the corporate sector, and 3.9 for the retail sector. The data were calculated in relation to June 2020 (NBS, 2021c, p. 6-15).

In Q4 2021, total domestic loans recorded high growth (one of the highest in Europe). Lending was predominantly directed toward the corporate sector than toward the retail sector, which confirms the economic crisis caused by the health crisis. Part of the total loans were loans to the corporate sector which increased by a record RSD 59.8 billion compared to the beginning of 2021. Loans to the retail sector increased by RSD 28.8 billion (mainly housing loans). Regarding total NPLs, their share in total loans amounted to 3.5% in December compared to September 2021, of which 4.0% accounted for the retail sector, and 2.8% for the corporate sector. The data were calculated in relation to September 2021 (NBS, 2021d, p. 6-14).

In Q1 2022, total loans grew slowly but continuously. The share of loans to the corporate sector in total loans increased by RSD 64.1 billion, while NPLs' share in this sector decreased compared to the previous period and amounted to 2.4%. On the other hand, loans to the retail sector increased by RSD 23.3 billion, while NPLs' share in this sector amounted to 4.2% in March 2022. The data were calculated in relation to December 2021 (NBS, 2022a, p. 6-15).

From the beginning of 2021 to the end of Q1 2022, the year-over-year growth of credit activity increased rapidly. Investment loans and loans for helping the economy during the health crisis made the dominant share. The goal of increased lending to the corporate sector and decreased lending to the retail sector in order to maintain the national economy has been partially achieved. On the other hand, the dominant share in loans to the retail sector was housing loans (60% in Q1 2022), which matches the market logic of investing in real estate during crisis periods. NLPs' share in total loans had a decreasing trend until Q3 2021, following a slight increase until Q1 2022 for the retail sector, while it is continuously decreasing for the corporate sector largely due to the measures taken by the RS Government during the pandemic.

3. Data and methodology

3.1. Definition and description of data

According to the definition and methodological explanation of the National Bank of Serbia (hereinafter: the NBS), NPL is a credit balance of the total remaining debt of an individual loan. The total remaining debt includes loans whose settlement by the debtor is delayed (interests or principals) by more than 90 days or less in the event the bank makes an assessment that the debtor's creditworthiness is risky. The debtor's risk capacity is estimated by analysing the debt repayment trend when it is considered that it has been called into question. In addition, the loans for which it has been calculated that the interest rate is equal to or higher than the quarterly amount of debt are also included (NBS, 2021a).

ROA and ROE indicators are defined according to Petersen & Schoeman (2008), whose definition matches the general definition of these indicators. Bank performance is determined by measuring ROA indicators, i.e. return on assets. The return on assets is calculated using the following equation:

$$ROA = \frac{net\ income}{bank's\ assets} \quad (1)$$

ROA, as a profitability indicator, shows how efficient the bank's management is in using the banks' resources (investments, interests, fees) to generate profit. ROE, as another banks' profitability indicator, represents the return on banks' equity and is calculated using the following equation:

$$ROE = \frac{net\ income}{bank's\ equity} \quad (2)$$

This indicator represents the return on equity (principal). ROE indicates the level of banks' earnings based on the value of investments according to the bookkeeping system of that bank. In other words, ROE measures the earnings of a bank based on the carrying amount of its investments (assets) and indicates the bank's efficiency in operational, financial, and tax terms.

According to NBS (2022b), income from interest is measured by applying the effective interest rate to the carrying amount of exposure (when exposure is defined as the result of an impairment loss). In other words, income from interest is measured by applying the effective interest rate to net impairment. Income from interest is one of the basic determinants of banks' income. NBS defines income from interest as an interest margin in relation to gross income.

In this paper, annual values are expressed in % according to the original NBS data. According to the key macroprudential indicators of the RS (NBS, 2022c), data for 2021 are expressed in quarterly values, thus, the authors of this paper calculated the annual value of the indicator using the mean formula (arithmetic mean) for all variables (see section 3.3). The description and definition of used indicators are followed by the specification of the models used for analysing the relationship between them.

3.2. Model specification

A regression model was used for estimating the relationship between NPLs and ROA and the relationship between NPLs and ROE, according to the examples of Perić (2020) and Mirović et al. (2022). By including the selected modelling variables in the general regression specification

$$Y_t = \alpha + \beta^t X_t + \varepsilon_t \quad (3)$$

the following models are formulated:

$$ROA_t = \alpha + \beta_1 NPL_t + \beta_2 IFI_t + \varepsilon_t \quad (4)$$

$$ROE_t = \alpha + \beta_1 NPL_t + \beta_2 IFI_t + \varepsilon_t \quad (5)$$

where: ROA_t and ROE_t – dependent variables, α – constant, that is, the mean value of Y (cross-section), β – regression coefficients (estimation of explanatory variables), NPL_t and IFI_t – independent variables, and ε_t – random error of the model.

The role of the IFI indicator in modelling is deemed necessary as income from interest contributes to the overall banks' profitability.

The p-value is used for assessing statistical significance. The p-value represents the statistical significance of a model ($p < 0.05$). If p is > 0.05, the regression model or its coefficients are not statistically significant. The test for variable significance is also performed using the t-test. The level of significance of the t-test is set at 95% for testing

hypotheses. Before performing models 4 and 5, it is necessary to observe the statistical description of indicators.

3.3. Descriptive statistics

In statistical analysis, especially when it comes to the regression model, it is necessary to determine the appropriate size of a sample. The sample size is important as it represents the basis for model validity. If the sample size is below the minimum number of observations ($N_{min} = 10$), it is not expected that the regression model will produce valid results. The same principle applies to oversized samples. Although there is no precisely defined rule on the sample size, the research community believes that at least 10 observations per variable should be used for the application of the regression model, that is, at least 30 observations in case the model has three or more independent variables (e.g. Verbeek & Nijman, 1993; Timofeev, 2004). Considering that the sample in this paper is size 14 and the regression model has 2 independent variables, the sample requirements for the application of the regression model have been met. The description of variables is presented in Table 2.

Table 2: Descriptive statistics

Valid N = 14	Range	Min	Max	Mean		Std. Dev.	Variance	Skewness (std.err. =0.597)	Kurtosis (std.err. =1.154
	Stat.	Stat.	Stat.	Stat.	Std. Err.	Stat.	Stat.	Stat.	Stat.
Year	13	2008	2021	2014.5	1.118	4.183	17.500	0.000	-1.200
NPL	17.92	3.68	21.6	13.57	1.871	7.000	49.005	-0.382	-1.557
ROA	2.3	-0.1	2.2	1	0.216	0.810	0.655	0.214	-1.302
ROE	11.7	-0.4	11.3	5.13	1.084	4.057	16.458	0.135	-1.468
IFI	9.1	58.4	67.5	62.95	0.857	3.206	10.276	0.037	-1.553

Source: the author's calculation

Assuming a normal distribution of variables N(0.1), the symmetry of the data was verified. The Skewness and Kurtosis tests were used for this control. Considering that asymmetry values of both normality tests are acceptable (between -2 and 2 for Skewness and between -7 and 7 for Kurtosis), distribution is considered to be symmetric, and modelling can be continued (e.g. Blanca et al., 2013). In addition, multicollinearity has been tested and it is under the value of 10 (VIF = 5.478), meaning that there is no high multicollinearity between variables, and the regression model can be run (e.g. Salmeron Gomez et al., 2020).

Table 2 shows that the number of observations is identical for all variables (14), which indicates the completeness of data in the selected time series for the period of min = 2008 to max = 2021. The highest percentage of NPLs (max = 21.6) was recorded in 2015, while the lowest percentage of NPLs (min = 3.68) was recorded in 2021. The average ROA value (mean = 1, std. dev. = 0.81, var = 0.66) shows that the return on assets was 1% on average in the selected period. On the other hand, the average ROE value (mean = 5.13, std. dev. = 4.1,

var = 16.5) is higher than the average ROA value and shows that the return on equity was 5.13% in the same period. The profit resulting from interests was 62.95% on average (std. dev. = 3.2, var = 10.28) while the lowest value of this indicator was 58.4% in 2017, and the highest was 67.5% in 2013.

4. Results and discussion

Before the application of regression models and testing the hypotheses, a correlation analysis was conducted in order to determine the nature of the relationship between variables, that is, the positive or negative. The Pearson correlation coefficient (r) was used in this analysis, and the correlation matrix is presented in Table 3. It contains the statistical significance of the relationship (p-value, that is, Sig. at the level of 1% and 5%), as well.

Table 3: Correlation matrix

		Year	NPL	ROA	ROE	IFI
Year	Pearson Correlation	1	-.652*	0.252	0.399	-0.479
	Sig. (2-tailed)		0.012	0.385	0.158	0.083
NPL	Pearson Correlation	-.652*	1	-.776**	-.861**	.904**
	Sig. (2-tailed)	0.012		0.001	0	0
ROA	Pearson Correlation	0.252	-.776**	1	.984**	-.924**
	Sig. (2-tailed)	0.385	0.001		0	0
ROE	Pearson Correlation	0.399	-.861**	.984**	1	-.960**
	Sig. (2-tailed)	0.158	0	0		0
IFI	Pearson Correlation	-0.479	.904**	-.924**	-.960**	1
	Sig. (2-tailed)	0.083	0	0	0	
* Correlation is significant at the 0.05 level (2-tailed).						
** Correlation is significant at the 0.01 level (2-tailed).						

Source: the author's calculation

Correlation coefficient values represent the level of correlation between variables. The correlation level can range from 0 to 1, where 0 is the lowest (non-existent) and 1 is the highest (absolute) level of correlation. According to the statistical community (e.g. Cohen, 1988), the low level of correlation ranges from 0.10 to 0.29, the medium level of correlation ranges from 0.30 to 0.49, while the high correlation level ranges from 0.50 to 1. Grounded on the correlation analysis presented in Table 3, both positive and negative correlations between variables are observed. There is a positive relationship between NPLs and IFI ($r = 0.904$), which is statistically significant ($p < 0.05$), and indicates a quite high correlation between these two variables. High correlation represents a high degree of interdependence between variables, which confirms theoretical and empirical bases. In addition, a high degree of positive correlation exists between ROA and ROE ($r = 0.984$) which is statistically significant ($p < 0.05$). This last was expected because both indicators of banks' profitability are closely related. In terms of negative correlations, there is a significant relationship ($p < 0.05$) between NPLs and ROA ($r = -0.776$) and NPLs and ROE ($r = -0.861$), which indicates that an increase in one indicator causes a decrease in another. It is assumed that NPLs' growth causes a reduction in ROA and ROE, which will be analysed by applying the regression

model. In addition to these negative correlations, there is a high and statistically significant relationship between IFI and both profitability indicators. Namely, the correlation coefficient between IFI and ROA is r = -0.924 and between IFI and ROE is r = -0.960, pointing to a high degree of probability that the growth of income from interest causes a decrease in banks' profitability in terms of coefficient "r", and vice versa. In order to determine the impact of independent variables on banks' profitability, a regression analysis was conducted and presented in Tables 4 and 5 below.

Table 4: Impact of NPLs on ROA in the RS: 2008-2021, in %

ROA model (4)		Non-std. coeff.		Std. coeff.	t	Sig.	95% Confidence interval for B	
p-value = 0.000		B	Std. Err.	Beta			Lower Bound	Upper Bound
R Sq. = 0.935	Cons.	19.90	3.633		5.478	0.000	11.904	27.895
Adj R Sq. = 0.81	NPL	0.038	0.029	0.329	1.311	0.216	-0.026	0.102
Durbin-Watson = 2.139	IFI	-0.308	0.063	-1.221	-4.874	0.000	-0.448	-0.169

Source: the author's calculation

In the representative regression model, where ROA is a dependent variable, the empirical value of the model is p = 0.000, which indicates its high statistical significance. The credibility of the model is also high and amounts to 81%. The value of Durbin-Watson statistics is higher than 2, which explains the lack of positive serial correlation. When testing the first hypothesis, different causalities with ROA can be found. In this regard, regression model (4) shows that there is a positive causality with NPLs in the amount of 0.038%, which is not statistically significant (p = 0.216). Based on this result, it is concluded that non-profitable loans do not statistically affect the return on assets growth. In addition, there is a negative causality with IFI in the amount of -0.308%, which is statistically significant (p = 0.000). This last explains that the growth of income from interest affects the growth of the return on banks' assets. Based on the obtained results, the first hypothesis is rejected.

Table 5: Impact of NPLs on ROE in the RS: 2008-2021, in %

ROE model (5)		Non-std. coeff.		Std. coeff.	t	Sig.	95% Confidence interval for B	
p-value = 0.000		B	Std. Err.	Beta			Lower Bound	Upper Bound
R Sq. = 0.960	Cons.	83.983	14.32		5.865	0.000	52.464	115.50
Adj R Sq. = 0.922	NPL	0.021	0.114	0.037	0.187	0.855	-0.230	0.273
Durbin-Watson = 2.199	IFI	-1.257	0.249	-0.993	-5.040	0.000	-1.806	-0.708

Source: the author's calculation

The value of the ROE model is p = 0.000, and it is 92.2% credible, while the value of Durbin-Watson statistics is higher than 2. When testing the second hypothesis, similar structural results are found as in the previous model. Namely, the ROE regression model

displays a positive causality with NPLs in the extent of 0.021%, which is not statistically significant (p = 0.855), and a negative causality with IFI in the amount of -1.257%, which is statistically significant (p = 0.000). Founded on these results, it is concluded that non-profitable loans do not have a statistically significant impact on the return on banks' equity, which is why the second hypothesis is rejected. On the other hand, income from interest has a positive and significant impact on the return on banks' equity, that is, growth, which is in line with the previous empirical research and the logic that banks are guided by in terms of income.

Considering the results of the regression analysis there is no statistically significant relationship between NPLs and indicators of banks' profitability in the RS in the period 2008-2021. In other words, NPLs' growth does not statistically affect the reduction of ROA and ROE. The results of this research counter Ranjan & Dhal (2003), partially Adebisi & Matthew (2015), as well as Psaila, Spiteri & Grima (2019) and Irwan et al. (2022).

Considering the descriptive and deductive method, it may be concluded that the banking sector in the RS is not threatened by a banking crisis of such magnitude that would lead to the collapse of the banking sector and the financial crisis such as in 2008 (Ombaba, 2013; Biabani et al., 2012). Such a conclusion is given to a certain extent due to the measures that the RS government took preventively and reactively during the pandemic, and also due to efficient NPL management of large banks (Louzis et al., 2010). In addition, in accordance with the NPL trend, which was the highest in 2015 (several years after the global financial crisis), and the lowest in 2021 (during the pandemic) no sudden increase in NPLs is expected in the near future. However, it is necessary to monitor this trend with caution.

Based on the analysis of the current NPL trend, the claims of Serrano (2020) that banks in crisis periods tend to have higher rates of lending to the corporate sector and lower rates of lending to the retail sector are confirmed. In addition, after the global financial crisis (Thornton & Di Tommaso, 2020), slight NPLs growth in the RS, unlike in Europe, did not dramatically reduce the credit capacity of banks, which indicates the balanced liquidity of banks.

Conclusion and recommendations

The aim of this paper was to analyse the NPL trend in the RS with reference to banks' profitability during the health crisis caused by the new SARS-COV2 virus. This paper identified NPLs' impact on banks' profitability in this country for the period 2008-2021 and compared results with the previous global financial crisis. ROA and ROE were used as profitability indicators. In regression modelling, the IFI variable was used as one of the basic determinants of banks' income. In addition to regression models, a descriptive analysis of NPL trends in this country was conducted to gain insights into the current situation and a more credible interpretation of the results of this research. The results of this research showed that the growth of non-profitable loans does not statistically cause the reduction of banks' profitability.

Despite theoretical interests and empirical research, different studies link different variables with banks' profitability. Therefore, further research may expand the choice of independent variables depending on the choices and decisions of researchers. Limitations of this research may be seen in the following points, which also serve as recommendations for future research. First, econometric models could be taken into consideration in a larger number of observations to increase the probability of obtaining statistical significance of several independent variables. Second, GLS (generalized least squares) regression could be applied to make a comparison with the results of this study and to examine which regression model better describes the impact of independent variables on banks' profitability. Third, the sample would be larger if modelling was done with quarterly or monthly data, or if the time frame was considerably wider. In this case, even if there was a lack of data in time series, LMM (linear mixed model) could be applied, which takes into account not only fixed but also random effects. Fourth and last, models from this research could be reproduced with additional indicators of liquidity and banks' equity adequacy and/or standardized modelling data.

Lessons learned from the SARS-COV2 pandemic are based, inter alia, on the fact that banking crises are inevitable. In this regard, it may be concluded that the financial system and the banking sector should be prepared for the challenges caused by global financial shocks. Based on this, it is recommended that the banking sector perform lending activities selectively and to exercise continuous control over NPLs, even when this requires additional operating costs. This falls into the field of risk management, which is necessary for the improvement of banks' profitability, and which affects the level of trust of credit users and the general public. In addition to more efficient risk management conducted by banks' management, based on empirical studies it is recommended to banks' management to maintain low capitalization rates and take into account solvency, especially in the crisis period and particularly when NPLs rates are high. A high NPL level may be an indicator of the beginning of an economic crisis in the country. Therefore, it is quite important that institutions, supreme authorities, and fiscal and monetary decision-makers continuously analyse and envisage risks that may arise from the SARS-COV2 pandemic in order to prevent or mitigate negative consequences for the banking system, citizens, and the national economy. Finally, with regard to recommendations for decision-makers and institutional bodies that manage the country's macroeconomics and general economic growth, it is recommended to adopt and revise monetary, fiscal, and social measures which will, by mutual collaboration, keep under control public debt and unemployment, inflation and interest rates, especially in times of crisis, in order to contribute to the financial system and, consequently, to the banking sector.

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Analysis of development and effects of electronic trade in Serbia based on SF-TOPSIS and TOPSIS methods

Анализа развоја и ефекти електронске трговине у Србији на бази СФ-ТОПСИС и ТОПСИС метода

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Abstract: The issues of measuring and analysing the development dynamics and effects of electronic trade are currently topical, significant and complex in any country, including Serbia. In the observed period from 2017 to 2021, according to the obtained empirical results based on the SF TOPSIS method, the largest number of trading companies introducing e-business (IT technology) and e-trading appeared in Serbia in 2017. According to the obtained empirical results based on the classical TOPSIS method, the largest number of trading companies introducing e-business (IT technology) and e-trading was recorded in Serbia in 2019. The following is the ranking according to the SF-TOPSIS method: 2021, 2018, 2019 and 2020. The ranking according to the TOPSIS method is as follows: 2020, 2021, 2018 and 2017**.** The digitalisation factors of overall business operation of trade industry in Serbia are the global trend and requirements, degree of development of contemporary IT technology and the possibility of application in all the segments of trading operations, the economic climate, financial opportunities, entry of international retail chains, development of multichannel sale – classic and e-retail facilities, around-the clock business operations without time and geographical barriers etc. Considering the positive effects, significantly more should be invested in new information and communication technology in the future.

Keywords: development, effects, electronic trade, Serbia, SF-TOPSIS- TOPSIS method
JEL classification: D22, P25

Сажетак: Нема сумње да је данас врло актуелна, значајна и сложена проблематика мерења и анализе динамике развоја и ефекти електронске трговине у свакој земљи. У посматраном временском периоду 2017 – 2021, према добијеним емпиријским резултатима на бази СФ-ТОПСИС методе, највећи број трговинских предузећа у Србији са увођењем електронског пословања (информационе и комуникационе технологије) и електронским прометом је био у 2017. Следе по реду: 2021, 2018 , 2019. и 2020. Према добијеним емпиријским резултатима применом класичне ТОПСИС методе у периоду 2017 – 2021. највећи број трговинских предузећа у Србији са увођењем електронског пословања и електронским прометом забележен је у 2019. Следе по реду: 2020, 2021, 2018. и 2017. Фактори дигитализације целокупног пословања трговине у Србији су глобални тренд и потребе, развијеност савремене информационе и комуникационе технологије и могућности примене у свим сегментима трговачког пословања, економска клима, финансијске могућности, прилив страних малопродајних ланца, разавој мултиканалске продаје – класична и електронска продавница, пословање нон -стоп без временске и географске баријере, итд.
Кључне речи: развој, ефекти, електронска трговина, Србија, СФ-ТОПСИС метода, ТОПСИС метода
ЈЕЛ класификација: Д22, П25

Introduction

The application of modern information and communication technology in trade has a positive effect on sales revenues and costs, i.e. affects the achievement of the target profit (Berman et al., 2018; Levy et al., 2019; Lacey, 2021; Zu et al., 2022; Končar, 2003; Lukic & Vojteski Kljenak, 2017; Kazakov et al., 2021; Lovreta & Petković, 2021; Jorgensen et al., 2022; Miller & Miller, 2021; Miletic et al., 2021, Gluhović, 2020; Lukic, 2022, 2023; Antić et al., 2021). The effects of the improvement of electronic trade are the improvement of the overall performance (higher revenues from sales, lower costs and, finally, higher profits) of trade in Serbia (López González & Jouanjean, 2017; Argilés-Bosch et al., 2022; Gu et al., 2021; Liu et al., 2022; Lukić et al., 2016; Rehman et al., 2022; Tolstoy et al., 2022; Belouaar et al., 2022). This is completely and understandable when you take into account the fact that empirical analysis has established that information and communication technology significantly contributes to the improvement of financial performance and efficiency of all sectors, which means trade as well (Lukić, 2011; Berman et al., 2018; Levy et al. ., 2019; Lovreta & Petković, 2021; Gherghina et al., 2021; Alam et al., 2022).

1. Methodology

The procedure of the **SF-TOPSIS** method takes place through several stages shown below (Gündoğdu & Kahraman, 2019a,c; Gündoğdu & Kahraman, 2019a,b,c, 2020a,b; Sharaf, 2022).

Let us mark the alternative with $X = \{x_1, x_2, \dots, x_m\}\ (x \geq 2)$, the criteria with $C = \{C_1, C_2, \dots, C_n\}$, and the weight vector of criteria with $w = \{w_1, w_2, \dots, w_n\}$; $0 \leq w_j \leq 1$ and $\sum_{j=1}^{n} w_j = 1$.

Step 1: Using linguistic terms, spherical fuzzy numbers (Gündoğdu & Kahraman, 2019a)

Step 2: Evaluation of decision makers (DM),

that is

$$w = (w_1, w_2, \cdots\cdots, w_n);\ w_j \in [0,1];\ \sum_{i=1}^{n} w_i = 1$$

Spherical Weighted Arithmetic Mean (SWAM) is defined as

$$SWAM_w(\tilde{A}_{S1}, \ldots, \tilde{A}_{Sn}) = w_1\tilde{A}_{S1} + w_2\tilde{A}_{S2} \ldots\ldots w_n\tilde{A}_{Sn}$$
$$= \left\{ \left[1 - \prod_{i=1}^{n} \left(\mu_{\tilde{A}_{Si}}^2\right)^{w_i} \right]^{1/2}, \prod_{i=1}^{n} \upsilon_{\tilde{A}_{Si}}^{w_i}, \left[\prod_{i=1}^{n} \left(1 - \mu_{\tilde{A}_{Si}}^2\right)^{w_i} - \prod_{i=1}^{n} \left(1 - \mu_{\tilde{A}_{Si}}^2 - \pi_{\tilde{A}_{Si}}^2\right)^{w_i} \right]^{1/2} \right\} \quad (1)$$

that is

$$w = (w_1, w_2 \cdots\cdots, w_n);\ w_j \in [0,1];\ \sum_{i=1}^{n} w_i = 1$$

Spherical Weighted Geometric Mean (SWGM) is defined as

$$SWGM_w\left(\left(\tilde{A}_1, \cdots\cdots, \tilde{A}_n\right)\right) = \tilde{A}_{S1}^{w_1} + \tilde{A}_{S2}^{w_2} + \cdots\cdots + \tilde{A}_{Sn}^{w_n}$$
$$= \left\{ \prod_{i=1}^{n} \mu_{S_i}^{w_i}, \left[1 - \prod_{i=1}^{n} \left(1 - \upsilon_{\tilde{A}_{Si}}^2\right) \right]^{1/2}, \left[\prod_{i=1}^{n} \left(1 - \nu_{\tilde{A}_{Si}}^2\right)^{w_i} - \prod_{i=1}^{n} \left(1 - \upsilon_{\tilde{A}_{Si}}^2 - \pi_{\tilde{A}_{Si}}^2\right)^{w_i} \right]^{1/2} \right\} \quad (2)$$

2.1: Aggregation of criteria weights

2.2: Aggregated spherical fuzzy decision matrix

Denote the values of the evaluation of alternatives by $X_i(i = 1,2 \ldots\ldots m)$, respecting the criteria $C_j(j = 1,2 \ldots\ldots n)$, with $C_j(X_j) = (\mu_{ij}, \nu_{ij}, \pi_{ij})$and $D = \left(C_j(X_i)\right)_{mxn}$ for the purposes of determining the spherical fuzzy decision matrix. For the MCDM problem with SFS (Spherical Fuzzy Set), the decision matrix $D = \left(C_j(X_i)\right)_{mxn}$ is constructed as

$$D = \left(C_j(X_i)\right)_{mxn} = \begin{pmatrix} (\mu_{11}, \nu_{11}, \pi_{11}) & (\mu_{12}, \nu_{12}, \pi_{12}) & \cdots & (\mu_{1n}, \nu_{1n}, \pi_{1n}) \\ (\mu_{21}, \nu_{21}, \pi_{21}) & (\mu_{22}, \nu_{22}, \pi_{22}) & & (\mu_{2n}, \nu_{2n}, \pi_{2n}) \\ \vdots & & \ddots & \vdots \\ (\mu_{m1}, \nu_{m1}, \pi_{m1}) & (\mu_{m2}, \nu_{m2}, \pi_{m2}) & \cdots & (\mu_{mn}, \nu_{mn}, \pi_{mn}) \end{pmatrix} \quad (3)$$

Step 3: The aggregated weighted spherical fuzzy decision matrix

The aggregated weighted spherical decision matrix is constructed by applying the following equation:

$$\tilde{A}_s \otimes \tilde{B}_S = \left\{ \mu_{\tilde{A}_S} \mu_{\tilde{B}_S}, \left(\nu_{\tilde{A}_S}^2 + \nu_{\tilde{B}_S}^2 - \nu_{\tilde{A}_S}^2 \nu_{\tilde{B}_S}^2\right)^{1/2}, \left(\left(1 - \nu_{\tilde{B}_S}^2\right)\pi_{\tilde{A}_S}^2 + \left(1 - \nu_{\tilde{A}_S}^2\right)\pi_{\tilde{B}_S}^2 - \pi_{\tilde{A}_S}^2 \pi_{\tilde{B}_s}^2\right)^{1/2} \right\} \quad (4)$$

($\tilde{A}_S$and $\tilde{B}_S$are spherical fuzzy sets.)

The aggregated weighted spherical fuzzy decision matrix is defined as

$$D = \left(C_j(X_{iw})\right)_{mxn} = \begin{pmatrix} (\mu_{11w}, \nu_{11w}, \pi_{11w}) & (\mu_{12w}, \nu_{12w}, \pi_{12w}) & \cdots & (\mu_{1nw}, \nu_{1nw}, \pi_{1nw}) \\ (\mu_{21w}, \nu_{21w}, \pi_{21w}) & (\mu_{22w}, \nu_{22w}, \pi_{22w}) & & (\mu_{2nw}, \nu_{2nw}, \pi_{2nw}) \\ \vdots & & \ddots & \vdots \\ (\mu_{m1w}, \nu_{m1w}, \pi_{m1w}) & (\mu_{m2w}, \nu_{m2w}, \pi_{m2w}) & \cdots & (\mu_{mnw}, \nu_{mnw}, \pi_{mnw}) \end{pmatrix} \quad (5)$$

Step 4: Diffusing the aggregated decision weight matrix using the following equation

$$Score\left(C_j(X_{iw})\right) = \left(2\mu_{ijw - \pi_{ijw}/2}\right)^2 - \left(\nu_{ijw} - \pi_{ijw}/2\right)^2 \quad (6)$$

Step 5. Spherical fuzzy positive ideal solution (SF-PIS) and spherical fuzzy negative ideal solution (SF-NIS)

For SF-PIS

$$X^* = \left\{ \left\{ C_{j,} \max_i < Score\left(C_j(X_{iw})\right) > \middle| j = 1,2 \cdots n \right\} \right\} \quad (7)$$

$$X^* = \left\{ \langle C_j, (\mu_1^*, \nu_1^*, \pi_1^*) \rangle \langle C_2, (\mu_2^*, \nu_2^*, \pi_2^*) \rangle \cdots \cdots \langle C_n, (\mu_n^*, \nu_n^*, \pi_n^*) \rangle \right\}$$

For SF-NIS

$$X^- = \left\{\left\{C_j, \min_i < Score\left(C_j(X_{iw})\right) > \middle| j = 1,2 \cdots n\right\}\right\} \quad (8)$$

$$X^- = \left\{\langle C_j, (\mu_1^-, \nu_1^-, \pi_1^-)\rangle \langle C_2, (\mu_2^-, \nu_2^-, \pi_2^-)\rangle \cdots \cdots \langle C_n, (\mu_n^-, \nu_n^-, \pi_n^-)\rangle\right\}$$

Step 6: The distance between alternativesX_i, SF-PIS and SF-NIS

For SF-NIS

$$D(X_i, X^-) = \sqrt{\frac{1}{2n}\sum_{i=1}^{n}\left(\left(\mu_{X_i} - \mu_{X^-}\right)^2 + \left(\nu_{X_i} - \nu_{X^-}\right)^2 + \left(\pi_{X_i} - \pi_{X^-}\right)^2\right)} \quad (9)$$

For SF-PIS

$$D(X_i, X^*) = \sqrt{\frac{1}{2n}\sum_{i=1}^{n}\left(\left(\mu_{X_i} - \mu_{X^*}\right)^2 + \left(\nu_{X_i} - \nu_{X^*}\right)^2 + \left(\pi_{X_i} - \pi_{X^*}\right)^2\right)} \quad (10)$$

Step 7: The classical proximity ratio

$$\xi(X_i) = \frac{D(X_i, X^-)}{D(X_i, X^*) + D(X_i, X^-)} \quad (11)$$

Step 8: Optimal alternatives

Alternatives are ranked in order of decreasing proximity value.

The stages of the **TOPSIS** method are as follows (Hwang & Yoon, 1981, 1995; Young et al., 1994: Üçüncü *et al*., 2018):

Step 1: Creating the initial matrix

$$A_{ij} = \begin{vmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{vmatrix}$$

Step 2: The weighted normalized decision matrix

$$r_{ij} = \frac{a_{ij}}{\sqrt{\sum_{i=1}^{m} a_{ij}^2}} \quad (12)$$

$$t = 1,2,3,\dots,m\ j = 1,2,3,\dots,n$$

$$R_{ij} = \begin{vmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{vmatrix}$$

$$V_{ij} = W_{ij} * r_{ij}, i = 1,2,3,\dots,m\ j = 1,2,3,\dots,n \quad (13)$$

Step 3: (A^+) Positive ideal solution; (A^-) Negative ideal solution

$$A^+ = \{v_i^+, \dots, v_n^+\} = \left\{\left(\max_i v_{ij}, j \in j\right)\left(\min_i v_{ij}, j \in j'\right)\right\}\ i = 1,2,\dots,m \quad (14)$$

$$A^- = \{v_i^-, \dots, v_n^-\} = \left\{\left(\min_i v_{ij}, j \in j\right)\left(\max_i v_{ij}, j \in j'\right)\right\}\ i = 1,2,\dots,m \quad (15)$$

(j benefit criterion, j' cost criterion.)

Step 4: Special measures

(S_i^+) Positive ideal solution; (S_i^-) Negative ideal solution:

$$S_i^+ = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^+)^2} \quad (16)$$

$$S_i^- = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^-)^2} \quad (17)$$

$$i = 1,2,3,\dots,m\ j = 1,2,3,\dots,n$$

Step 5: The relative closeness to the ideal solution (C_i^+)

It is determined as follows:

(C_i^+; i=1,..., m; j=*1,..., n*):

$$C_i^+ = \frac{S_i^-}{S_i^- + S_i^+}, i = 1,2,3,\dots,m \quad (18)$$

Step 6: Optimal alternatives

High scores correspond to better performance (Üçüncü *et al*., 2018).

2. Results

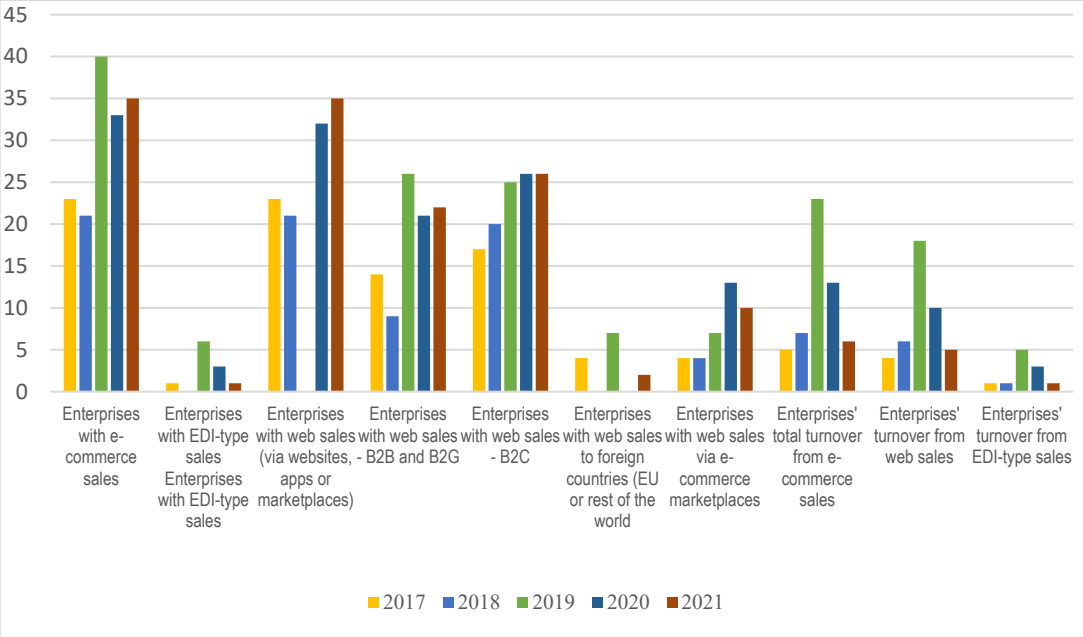
The initial statistical data of EUROSTAT indicators for the period 2017 - 2021 are presented in Table 1 and Figure 1. (All calculations and results are the author's.)

Table 1: Indicators

	Enterprises with e-commerce sales (% enterprises) C1	Enterprises with EDI-type sales Enterprises with EDI-type sales (% enterprises) C2	Enterprises with web sales (via websites, apps or marketplaces) (% enterprises) C3	Enterprises with web sales - B2B and B2G (% enterprises) C4	Enterprises with web sales - B2C (% enterprises) C5	Enterprises with web sales to foreign countries (EU or rest of the world (% enterprises) C6	Enterprises with web sales via e-commerce marketplaces (% enterprises) C7	Enterprises' total turnover from e-commerce sales (% total turnover) C8	Enterprises' turnover from web sales (% total turnover) C9	Enterprises' turnover from EDI-type sales (% total turnover) C10
A1 2017	23	1	23	14	17	4	4	5	4	1
A2 2018	21	0	21	9	20	0	4	7	6	1
A3 2019	40	6	0	26	25	7	7	23	18	5
A4 2020	33	3	32	21	26	0	13	13	10	3
A5 2021	35	1	35	22	26	2	10	6	5	1

Source: Eurostat

Figure 1: Indicators of electronic commerce in Serbia



Source: the author's picture

Table 2 shows descriptive statistics of indicators of electronic commerce in Serbia.

Table 2: Descriptive statistics

Statistics										
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
Mean	30.4000	2.2000	22.2000	18.4000	22.8000	2.6000	7.6000	10.8000	8.6000	2.2000
Median	33.0000	1.0000	23.0000	21.0000	25.0000	2.0000	7.0000	7.0000	6.0000	1.0000
Std. Deviation	8.11172	2.38747	13.73681	6.80441	4.08656	2.96648	3.91152	7.49667	5.72713	1.78885
Minimum	21.00	.00	.00	9.00	17.00	.00	4.00	5.00	4.00	1.00
Maximum	40.00	6.00	35.00	26.00	26.00	7.00	13.00	23.00	18.00	5.00

Source: the author's calculation

Descriptive statistics show that the criteria range from C1 21.00 (2018) to 40.00 (2019), from C2 .00 (2018) to 6.00 (2019), from C3 .00 (2019) to 35.00 (2021), from C4 9.00 (2018) to 26.00 (2019), from C5 17.00 (2017) to 26.00 (2020, 2021), from C6 .00

(2018,2020) to 7.00 (2019), from C7 4.00 (2017,2018) to 13.00 (2020), from C8 5.00 (2017) to 23.00 (2019), from C9 4.00 (2017) to 18.00 (2019) and from C10 1.00 (2017,2018,2021) to 5.00 (2019). The averages are C1 30.4000, C2 2.2000, C3 22.200, C4 18.4000, C5 22.8000, C6 1.6000, C7 7.600, C8 10.800, C9 8.600 and C10 2.200. Therefore, the importance of e-commerce in Serbia has increased recently.

The correlation between criteria C1 and C4 is strong, and at the level of statistical significance (Table3).

Table 3: Correlations

Correlations											
		1	2	3	4	5	6	7	8	9	10
1 C1	Pearson Correlation	1	.808	-.277	.984**	.855	.486	.629	.738	.731	.751
	Sig. (2-tailed)		.098	.652	.002	.065	.406	.256	.155	.161	.143
2 C2	Pearson Correlation	.808	1	-.688	.809	.518	.685	.305	.967**	.958*	.983**
	Sig. (2-tailed)	.098		.200	.097	.372	.202	.618	.007	.010	.003
3 C3	Pearson Correlation	-.277	-.688	1	-.239	.099	-.777	.458	-.755	-.768	-.704
	Sig. (2-tailed)	.652	.200		.698	.874	.122	.438	.141	.130	.184
4 C4	Pearson Correlation	.984**	.809	-.239	1	.795	.530	.637	.698	.685	.731
	Sig. (2-tailed)	.002	.097	.698		.108	.358	.248	.190	.202	.160
5 C5	Pearson Correlation	.855	.518	.099	.795	1	-.029	.854	.512	.508	.520
	Sig. (2-tailed)	.065	.372	.874	.108		.963	.066	.377	.382	.369
6 C6	Pearson Correlation	.486	.685	-.777	.530	-.029	1	-.297	.591	.592	.584
	Sig. (2-tailed)	.406	.202	.122	.358	.963		.627	.294	.293	.301
7 C7	Pearson Correlation	.629	.305	.458	.637	.854	-.297	1	.235	.214	.300
	Sig. (2-tailed)	.256	.618	.438	.248	.066	.627		.703	.729	.624
8 C8	Pearson Correlation	.738	.967**	-.755	.698	.512	.591	.235	1	.999**	.992**
	Sig. (2-tailed)	.155	.007	.141	.190	.377	.294	.703		.000	.001

9 C9	Pearson Correlation	.731	.958*	-.768	.685	.508	.592	.214	.999**	1	.986**
	Sig. (2-tailed)	.161	.010	.130	.202	.382	.293	.729	.000		.002
	N	5	5	5	5	5	5	5	5	5	5
10 C10	Pearson Correlation	.751	.983**	-.704	.731	.520	.584	.300	.992**	.986**	1
	Sig. (2-tailed)	.143	.003	.184	.160	.369	.301	.624	.001	.002	

Source: the author's calculation

Non-parametric tests are presented in Table 4.

Table 4: Npar Tests – Friedman Test

Ranks	
	Mean Rank
C1	9.70
C2	2.00
C3	7.70
C4	7.40
C5	8.00
C6	2.80
C7	4.80
C8	5.90
C9	4.60
C10	2.10

Test Statistics[a]	
N	5
Chi-Square	35.967
df	9
Asymp. Sig.	.000
a. Friedman Test	

Source: the author's statistics

There is a significant statistical difference between the given variables (Asymp. Sig. .000 < .05).

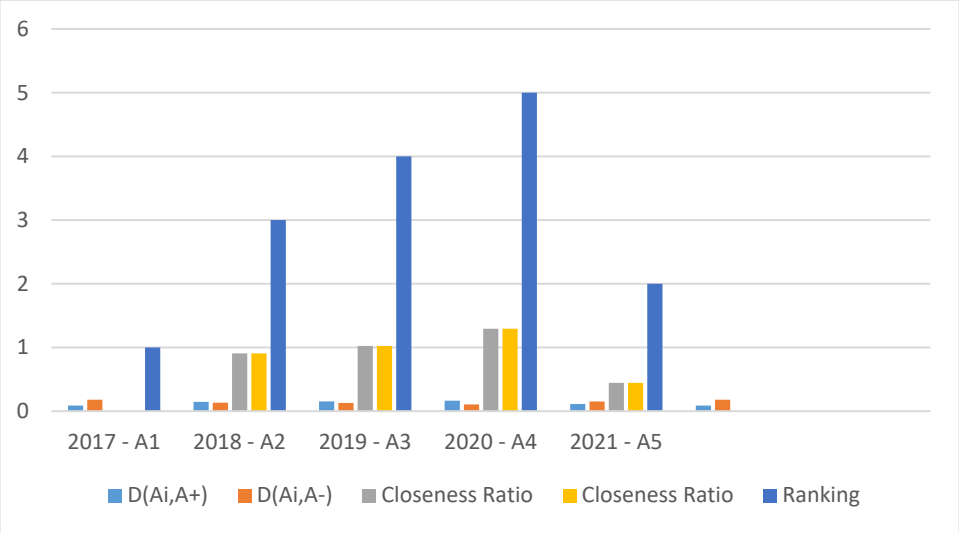
The Relative Closeness Ratio is shown in Table 5 and Figure 2.

Table 5: Relative Closeness Ratio

	D(Ai,A+)	D(Ai,A-)	Closeness Ratio	Closeness Ratio	Ranking
2017 - A1	0.088	0.179	0.000	**0.000**	**1**
2018 - A2	0.145	0.133	0.907	**0.907**	**3**
2019 - A3	0.153	0.129	1.024	**1.024**	**4**
2020 - A4	0.165	0.105	1.294	**1.294**	**5**
2021 - A5	0.113	0.152	0.444	**0.444**	**2**
	0.088	**0.179**			
	MIN	**MAX**			

Source: the author's calculation

Figure 2: Relative Closeness Ratio



Source: the author's picture

The dynamic selection and ranking of electronic trade in Serbia according to the SF-TOPSIS method is as follows: 2017, 2021, 2018, 2019 and 2020. Recently, therefore, the

results have been positive. In the future, considering the positive effects, significantly more should be invested in new information and communication technology.

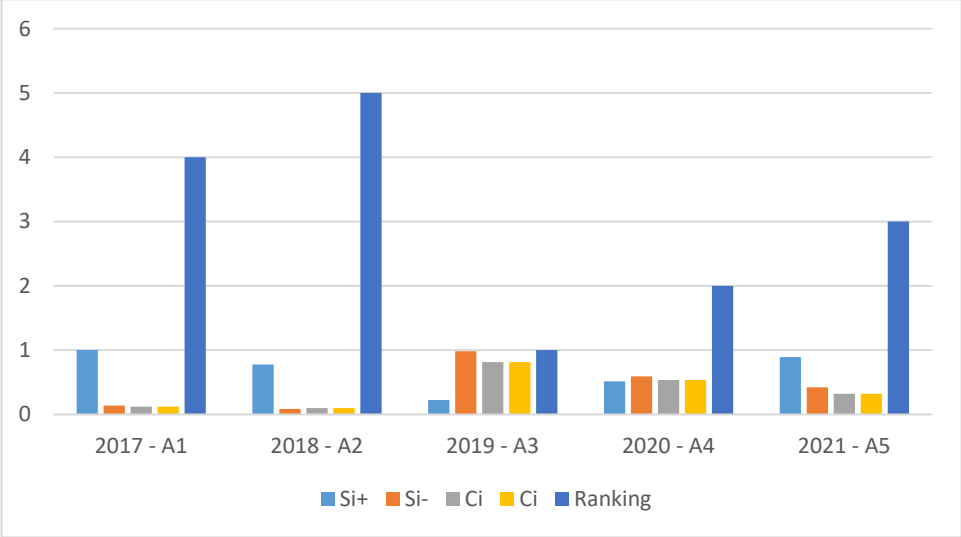
Table 6 and Figure 3 show the results.

Table 6: Ranking

	Si+	Si-	Ci	Ci	Ranking
2017 - A1	1.0023	0.1381	0.1211	0.121	**4**
2018 - A2	0.7780	0.0851	0.0986	0.099	**5**
2019 - A3	0.2249	0.9822	0.8137	0.814	**1**
2020 - A4	0.5146	0.5914	0.5347	0.535	**2**
2021 - A5	0.8914	0.4216	0.3211	0.321	**3**

Source: the author's calculation

Figure 3: Ranking



Source: the author's picture

The ranking results are as follows: (1) SF-TOPSIS method: 2017, 2021, 2018, 2019 and 2020; (2) TOPSIS: 2019, 2020, 2021, 2017 and 2018. The conclusion is that e-commerce in Serbia has improved recently. The conclusion is that e-commerce in Serbia has improved recently. This had a positive impact on the overall performance of trade in Serbia.

Discussion

In order to obtain as complete a picture as possible of the dynamics of the development and effects of electronic trade in Serbia, it is recommended that the analysis be carried out continuously using not only the analysed (SF-TOPSIS, TOPSIS) but also other multi-criteria decision-making methods (MABAC, MARCOS, LMAW-DNMA, etc.).

The SF-TOPSIS method is based on linguistic terms and their assignment to certain criteria by decision makers. To a large extent, it depends on the expertise of the decision-makers, which linguistic term will be assigned to certain criteria, and thus the accuracy of the results obtained. It has elements of "subjectivity". However, regardless of certain elements of "subjectivity" in both methods, those in relation compared to classical methods, for example, ratio analysis, they give more precise results because they simultaneously take into account several criteria – integrated which is not the case with ratio analysis, where each indicator – criterion is considered in isolation.

In any case, it can be freely said that compared to traditional methods, multi-criteria decision-making methods give more precise results in terms of understanding the dynamics of the development of electronic commerce, because they simultaneously include several criteria viewed as factors. For these reasons, their application in the analysis of electronic commerce is recommended.

Conclusion

The ranking results are as follows: (1) SF-TOPSIS method: 2017, 2021, 2018, 2019 and 2020; (2) TOPSIS: 2019, 2020, 2021, 2017 and 2018. By themselves, they point to the general conclusion that electronic trade in Serbia has improved recently. Considering the positive effects in the future, as much as possible should be invested in improving the information and communication technology of trade in Serbia.

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The determinants of government expenditures in Serbia: the application of ARDL model

Детерминанте државних расхода у Србији: Примена АРДЛ модела

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Abstract: Government expenditures represent one of the most important issues for policymakers both in ordinary and extraordinary conditions. The aim of this paper is to estimate and identify the effects of selected macroeconomic determinants on government expenditures in Serbia from 2002 to 2020. Using the ARDL technique, the empirical findings confirmed that there is a long-run relationship between gross domestic product, government revenues, inflation, and population size and government expenditures for the observed period. The significant and positive effects of explanatory variables are confirmed in the long run, except for inflation, whose impact is not significant in the short run. Specifically, GDP growth, higher inflation rate, greater government revenues and population contribute to the higher government expenditures level. The obtained findings give certain directions to fiscal authorities in creating and defining optimal government expenditures level in the context of influences of chosen macroeconomic variables.

Keywords: government expenditures, economic growth, determinants, ARDL model, Serbia
JEL classification: C51, H10, H50, P24

Сажетак: Државни расходи представљају једно од најважнијих питања за креаторе политика како у редовним, тако и у ванредним условима. Циљ овог рада је да процени и идентификује ефекте одбраних макроекономских детерминанти на државне расходе у Србији од 2002 до 2020. године. Користећи АРДЛ технику, емпиријски налази су потврдили да постоји дугорочна веза између бруто домаћег производа, државних прихода, инфлације и величине популације и државних расхода за посматрани период. Значајни и позитивни ефекти експланаторних варијабли су потврђени на дуг рок, осим инфлације чије утицај није значајан у кратком року. Наиме, раст БДП-а, виша стопа инфлације, већи државни приходи и величина популације доприносе вишем нивоу државних расхода. Добијени налази дају одређене смернице фискалним властима у креирању и дефинисању оптималног нивоа државних расхода у контексту утицаја одабраних макроекономских варијабли.

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Кључне речи: државни расходи, економски раст, детерминанте, АРДЛ модел, Србија.
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Introduction

The comprehensive stability in consumption templates is very important in the economy (Mahmood & Zamil, 2019). The factors of public expenditures stimulate not only economic stability, but also manage fiscal imbalances (Aladejare, 2019; Jibir and Aluthe, 2019). To boost social welfare through economic, political, legal and social programmes is the main goal of the government, but these programmes contribute to government expenditure growth (Faheem et al. 2021). The design of government expenditures differs substantially across economies and has historically modified over time at a global level (Chen et al., 2019). Government expenditures represent a saviour in critical situation (Algaeed, 2020) and a decisive factor of fiscal policy are crucial to economic growth, sustainability and stability (Gbaka et al. 2021). It is essential to point out that modern macroeconomic theory identified government expenditure as the key element of aggregate demand and the main control variable of budget policy (Nouira and Kouni, 2021). Thus, growth-stimulating public spending and sound public finance should improve potential output in the long-run (Schuknecht and Zemanek, 2021). Previous empirical studies have investigated the relationship between government expenditure and economic growth have measured different forms of gross domestic product such as growth rate or GDP per capita (Selvanathan et al., 2021). In the literature, there are various theoretical approaches to the relationship between these macroeconomic variables (Olaoye and Afolabi, 2021). Specifically, when estimating the role of the public sector in the economy, Wagner's law and Keynesian hypothesis are two often used theories (Wagner, 1883; Keynes, 1936). These theoretical approaches imply that increased national income provides greater state activity, and also that government expenditures affect the national income size (Nusair and Olson, 2020). It means that the first approach highlights that economic growth is the main driver of government spending, while the second view indicates that government expenditure is the key driver of an economy (Zungu and Greyling, 2022). The richer economies have better public sector efficiency, where government responsibility and demographic factors play a relevant role (Hauner and Kyobe, 2010). High government expenditures can lead to smaller economic growth (Hajamini and Falahi, 2018; Kim et al., 2018). Therefore, it is necessary to achieve efficiency in government spending to avoid potential their negative effects as a result of the inefficiency of bureaucracy (Rahman et al. 2020).

The research is comprised of five parts. First and second part include introduction and literature review where similar research have estimated the determinants of government expenditures. The third part is a methodological framework that defines variables and all econometric procedures, as well as, preconditions for an adequate estimation model. The fourth segment is an empirical analysis of government expenditure determinants in Serbia for the period 2002-2021. This segment implies descriptive and empirical analysis to provide which macroeconomic determinants are vital for government expenditure in Serbia.

The last segment compiles the obtained results, and the conclusion summarizes the findings and conclusions with propositions for forthcoming research.

Literature review

When it comes to analysis of government expenditures, there are two theoretical approaches, namely, Wagner' law and the Keynesian hypothesis. To begin with, the analysis of Wagner's law is divided into three aspects. The first aspect is based on unidirectional causality from economic growth to spending (Wagner's hypothesis). The second aspect includes unidirectional causality from spending to economic growth (Keynesian hypothesis). The third aspect implies both Wagner's and Keynesian hypothesis (Jalles, 2019). Wagner's law implies that expenditure grows more than proportionally with income due to economic development (Prado et al., 2020) and provides theoretical principles and enables specific policy suggestions to achieve optimality in expanding public spending and its financing (Forte and Magazzino, 2018). The validity of Wagner's law has been identified by many studies (Tobin, 2005; Tasseven, 2011; Silva and Siqueira, 2014; Akitoby et al., 2006; Karagianni and Pempetzoglou, 2011; Barra et al., 2015; Magazzino et al., 2015; Bayrakdar et al., 2011; Barra et al., 2015; Funashima and Hiraga, 2017). Kumar and Cao (2020) supported Wagner's law in East Asian countries such as China, Hong Kong, Japan and South Korea. Also, Tesařová (2022) determined the validity of Wagner's law in the long run in the Czech Republic for the analysed period 1999-2019.

Many empirical papers have investigated the relationship between government expenditure and economic growth (Adelman, 2000; Wu et al., 2010; Dudzevičiūtė et al., 2018; Paparas et al., 2018; Irandoust, 2019; Sedrakyan and Varela-Candamio, 2019; Arestis et al., 2021, Kirikkaleli and Ozbeser, 2022). For example, Dudzevičiūtė et al. (2018) analyzed the relationship between government expenditure and economic growth in the European Union countries for the period 1995-2015. The empirical analysis confirmed a significant relationship between these variables in eight EU countries (Belgium, Cyprus, Germany, Poland, Portugal, Slovakia and Sweden). Paparas et al. (2018) tested the relationship between government spending and national income in the United Kingdom for the period 1850-2010. Their findings confirmed the long-run relationship among these variables and supported Wagner's and Keynesian hypotheses. Sedrakyan and Varela-Candamio (2019) investigated relation between government expenditures and economic growth in Armenia and Spain from 1996 to 2014. Using VAR method, this study concluded positive implications of expenditures to the economic growth in these countries. Inchauspe et al. (2020) confirmed unidirectional causality from gross domestic product and prices to government expenditure in Indonesia for the period 1980-2014. Ghazy et al. (2021) revealed bidirectional causality between gross domestic product and government expenditure in Egypt for the period 1960-2018. Kirikkaleli and Ozbeser (2022) analyzed the correlation between government expenditure and economic growth in the United States for the period 1960-2019. Using the wavelet coherence approach, these authors confirmed that economic growth enhances government expenditures in the long term, while government expenditures improve economic growth in the short term.

Methodology and data

Following the aim of this study to estimate the government expenditure determinants, we used annual data obtained from the International Monetary Fund for the period 2002-2020. The variable selection is presented in Table 1.

Table 1: Variable description

Variable	Symbol	Calculation	Expected impact
Government expenditure	GE	% of GDP	/
Gross domestic product	GDP	annual rate	+
Government revenue	GR	% of GDP	+
Inflation	INF	annual rate	+
Unemployment	UNM	annual rate	+
Population	POP	absolute number	+

Source: the authors' illustration

We specify the model of this research in a functional form using the logarithmic values of observed variables:

$$GE = f(GDP, GR, INF, POP) \quad (1)$$

The use of autoregressive distributed lag model has been manifested by Pesaran et al (1996) and improved by Shin et al. (2001). This model is lucrative to identify the relationship between observed variables in the short term and long-term.

Having in mind a defined objective of the research, the following hypotheses are developed:

H_0: There is a long-run relationship between government expenditures and selected macroeconomic determinants.

H_1: GDP growth rate significantly affects government expenditures in the long run.

H_2: Government revenues significantly affect government expenditures in the long-run.

H_3: Inflation significantly affects government expenditures in the long-run.

H_4: Population size significantly affects government expenditures in the long-run.

Empirical analysis and results

Before applying the empirical model to provide which determinants are essential for government expenditure level, there is a descriptive analysis of chosen variables. The obtained findings of the descriptive statistics are reflected in Table 2.

Table 2: Descriptive statistics

Variable	GE	GDP	GR	INF	POP
Mean	42.52	3.35	40.13	6.38	7232947
Std. dev.	1.92	3.52	1.35	4.48	189546.7
Min.	39.82	-2.73	37.32	1.12	6927000
Max.	48.23	10.15	42.03	16.25	7500000

Source: the authors' calculation

Analysing selected variables from 2002 to 2020, the average value of government expenditure was 42.52% of the gross domestic product. This is more than the average share of government revenue, which was 40.13% of GDP. Likewise, comparing the share of GE and GR in 2020, it can notice that GE' share was 48.23% of GDP, which is far more than GR' share in the same period (40.98% of GDP). The mean economic growth measured by GDP was 3.35%, whereas the maximum growth rate was 10.15% in 2005. In contrast, the smallest growth rate was recorded in 2007, when Serbian economy declined by 2.73%. Furthermore, the average inflation rate was 6.38% for the analyzed period, which is greater than the mean growth rate for the same period. It implies that the economy registered real fall of 3.03% for the observed period. However, in the last five years (2016-2020), mean GDP growth rate was 2.67%, while the average inflation rate was 1.93%.

Table 3: ADF and PP tests

Variable	GE	GDP	GR	INF	POP
Level					
ADF	-2.228	-2.420	-1.622	-2.056	1-824
	(0.196)	(0.036)	(0.472)	(0.063)	(0.998)
PP	-15.073	-8.652	-6.380	-7.090	0.360
	(0.168)	(0.070)	(0.389)	(0.010)	(0.998)
First difference					
ADF	-4.045	-5.671	-5.288	-5.471	-3.052
	(0.001)	(0.000)	(0.000)	(0.000)	(0.030)
PP	-23.468	-21.609	-27.120	-19.944	-10.238
	(0.001)	(0.000)	(0.000)	(0.000)	(0.036)
Integration	I(1)	I(0)	I(1)	I(0)	I(1)

Source: the authors' calculation

We employed the traditional tests such as ADF and PP test to estimate potential unit roots. The results showed that all variables are integrated at 1, except GDP and INF that are I(0). However, after the first difference, variables become stationary at the significance level of 1% and 5%. Thus, ARDL model is applicable for measuring the long-run relationship between series with different orders of integration (Pesaran et al., 2001).

Table 4: VIF test

Variable	VIF	1/VIF
POP	2.35	0.426
GDP	2.33	0.428
INF	2.18	0.459
GR	1.64	0.608
Mean VIF	2.13	

Source: the authors' calculation

When two or more independent variables have a strong correlation with each other, there may be the potential risk of multicollinearity (Eftimovska and Laurent, 2022). Results from Table 4 confirmed that there is no problem of collinearity between observed explanatory variables (mean value of VIF is 2.13 which is less than 4). Therefore, the selected explanatory variables can be concluded in the estimated model.

Table 5: Model selection

AIC	BIC	HQIC	ADj. R-squared	Specification
4.2094	4.5062	4.2503	0.2225	ARDL (1,0,0,0,0)
4.2465	4.5928	4.2943	0.2123	ARDL (1,0,0,0,1)
4.2803	4.6266	4.3281	0.1853	ARDL (1,1,0,0,0)
4.2976	4.6438	4.3453	0.1711	ARDL (1,0,1,0,0)
4.3107	4.6569	5.3584	0.1602	ARDL (1,0,0,1,0)

Source: the authors' calculation

After estimating multicollinearity, there is model selection using defined criteria such as AIC, BIC and HQIC. The given findings represented that ARDL (1,0,0,0) is appropriate for evaluating the determinants of government expenditures.

Table 6: ARDL Bound test

Test stat	Value	K
F-stat	4.7363	2
Critical value	I(0) Bounds	I(1) Bounds
10%	2.2	3.09
5%	2.56	3.49
2.5%	2.88	3.87
1%	3.29	4.37

Source: the authors' calculation

The results from Table 5 showed that there is a long-run relationship between government expenditures, gross domestic product, government revenues, inflation and population. Hereby, we can reject the null hypothesis at the significance level of 10%, 5%, 2.5% and 1% and conclude there is a long-run convergence among analyzed variables.

Table 7: ARDL estimation

Variables	Coefficient	P-value
Short run		
GDP	0.494	0.003
GR	0.439	0.021
INF	0.037	0.776
POP	1.068	0.028
ECT	-0.920	0.000
Long run		
GDP	0.446	0.036
GR	0.297	0.057
INF	0.029	0.081
POP	1.283	0.064
Diagnostic tests	**F-stat**	**P-value**
LM test	0.570	0.583
ARCH test	0.246	0.627
BPG test	2.435	0.096
Ramsey	0.313	0.760

Source: the authors' calculation

Based on Table 6, the negative value of ECT coefficient (-0.920) implies that there is a long-run convergence between considered variables. Looking at the estimated coefficients, we can conclude that GDP significantly affects GE in the short run and the long run at significance level of 1%. An increase in GDP by 1% enables greater GE by

0.49% in the short run and 0.45% in the long run. Further, GR has a significant effect on GDP in the short run at significance level of 5% and at significance level of 10% in the long run. The growth of GR by 1% raises GE's share by 0.44% in the short-run and 0.30% in the long-run. The positive effects of INF on GDP are only confirmed in the long-run, where 1% INF growth increases GE by 0.03% at significance level of 10%. Finally, POP significantly and positively affects the GE in the short run and at the significance level of 1% and 10% in the long run. Also, the obtained findings of diagnostic tests confirmed that there is no problem of serial correlation (LM test) and heteroscedasticity (ARCH test and BPG test), or the stability of the model (Ramsey test).

Conclusion

The research estimated the long-term relationship between selected macroeconomic determinants and government expenditures in Serbia from 2002 to 2020. The variable selection included the influence of gross domestic product, government revenues, inflation and population size on government expenditures level. The empirical research implied ARDL model to measure and identify the potential long-run relationship between observed macroeconomic determinants and government expenditures for the analyzed period. Specifically, the empirical analysis confirmed that there is a cointegration between selected macroeconomic determinants and government expenditures in Serbia for the observed period. It implies that hypothesis H_0 can be accepted. In order to provide positive implication of economic growth, which can be measured in relative or absolute values (Jovanović et al., 2022), the results of ARDL model manifested that GDP significantly and positively affects the GE in the short run and long run, which means that hypothesis H_1 can be confirmed. Also, variable GR has significant effect on GE in the short run and long run, which denotes that H_2 can be accepted. Variable INF significantly affect the GE in the long-run, which indicates that H_3 can be accepted. Likewise, it is necessary to highlight that effect of INF is not significant for GE in the short run. Finally, POP significantly and positively affects the GE in the long-run, which means that hypothesis H_4 can be confirmed. The obtained estimated coefficients of selected explanatory variables are in line with the defined expected impacts presented in Table 1. The paper expands current theoretical opus related to government expenditures' management and enables IT support for policymakers in the Serbia. This support is manifested in estimated and obtained coefficients of selected macroeconomic determinants such as gross domestic product, government revenues, inflation and population on government expenditure level. The fiscal authority should be aware of optimal nexus between government expenditures and government revenues to provide positive implications for economic prosperity. Accordingly, policymakers in Serbia should focus on productive government expenditures to enable favourable effects on public finance state and macroeconomic framework. It means that fiscal authorities must detect and reduce unproductive or less productive government expenditures ensuring more funds to allocate to capital expenditures. These expenditure types can be supported by bank financing as one of the most developed financial institutions in Serbia which is in line with Rakočević et al. (2021). The novelty of the paper represents including inflation rate and population size in measuring government

expenditures in the Republic of Serbia. According to authors' investigation, this is the first research that has analyzed these two variables in the context of their influence on government expenditures in Serbia.

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Списак рецензената часописа „Анали Економског факултета у Суботици“ у 2023. години (број 50) / Reviewers of the journal “Anali Ekonomskog fakulteta u Subotici” in 2023 (No 50)

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Annamária Dézsi-Benyovszki, Faculty of Economics and Business Administration, University Babes-Bolyai, Cluj-Napoca, Romania

Darko Marjanović, Institute of Economic Sciences, Beograd, Republic of Serbia

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Техничко упутство за форматирање радова / Technical instructions for paper formatting

The paper should consist of:

Title of the paper (no more than 10 words) in English.

Subtitle (optional) in English.

Personal data of authors/coauthors: name, surname, title and Institution in English.

Abstract of 200 words or less, giving the factual essence of the article, should be written in English.

Key words (no more than 10) in English.

Text of the paper, in English, cannot exceed 12 pages.

Bibliography.

Guidelines for the paper format

Type your work in a common Word Processor (e.g. MS Word).

Page format: B5.

Margin: 2 cm every

Font: Times New Roman, size 11 (use it for title, subtitle, figures, tables, abstract, key words, and so on).

Titles, subtitles, names of the tables, illustrations, figures, etc should be written in Arabic numerals.

Figures, illustrations and schemes should be enclosed in the .jpg format (resolution 300*300 dpi) or in the vector form (.wmf or cdr) with enclosed fonts or fonts transformed in curves. Figures, illustrations and schemes should be black-and-white (gray-scale). For the texts included in figures, illustrations and schemes font Arial, size 9 pt is preferred.

1. Referencing Guide

The references should specify the source (such as book, journal article or a web page) in sufficient detail to enable the readers to identify and consult it. The references are placed at the end of the work, with sources listed alphabetically (a) by authors' surnames or (b) by the titles of the sources (if the author is unknown). Multiple entries by the same author(s) must be sequenced chronologically, starting from the earliest, e.g.:

Ljubojević, T.K. (1998).
Ljubojević, T.K. (2000a).
Ljubojević, T.K. (2000b).
Ljubojević, T.K., & Dimitrijević, N.N. (1994).

Here is a list of the most common reference types:

A. Periodicals

Authors must be listed by their last names, followed by initials. Publication year must be written in parentheses, followed by a full stop. Title of the article must be in sentences case: only the first word and proper nouns in the title are capitalized. The periodical title must be in title case, followed by the volume number, which is also italicized:

Author, A. A., Author, B. B., & Author, C. C. (Year). Title of article. *Title of Periodical, volume number*(issue number), pages.

➲ Journal article, one author, paginated by issue

Journals paginated by issue begin with page 1 in every issue, so that the issue number is indicated in parentheses after the volume. The parentheses and issue numbers are not italicized, e.g.

Tanasijević, V. (2007). A PHP project test-driven end to end. *Management Information Systems, 5*(1), 26-35.

➲ Journal article, one author, paginated by volume

Journals paginated by volume begin with page 1 in issue 1, and continue page numbering in issue 2 where issue 1 ended, e.g.

Perić, O. (2006). Bridging the gap: Complex adaptive knowledge management. *Strategic Management, 14*, 654-668.

➲ Journal article, two authors, paginated by issue

Strakić, F., & Mirković, D. (2006). The role of the user in the software development life cycle. *Management Information Systems, 4*(2), 60-72.

➲ Journal article, two authors, paginated by volume

Ljubojević, K., & Dimitrijević, M. (2007). Choosing your CRM strategy. *Strategic Management, 15*, 333-349.

➲ **Journal article, three to six authors, paginated by issue**

Jovanov, N., Boškov, T., & Strakić, F. (2007). Data warehouse architecture. *Management Information Systems, 5*(2), 41-49.

➲ **Journal article, three to six authors, paginated by volume**

Boškov, T., Ljubojević, K., & Tanasijević, V. (2005). A new approach to CRM. *Strategic Management, 13*, 300-310.

➲ **Journal article, more than six authors, paginated by issue**

Ljubojević, K., Dimitrijević, M., Mirković, D., Tanasijević, V., Perić, O., Jovanov, N., et al. (2005). Putting the user at the center of software testing activity. *Management Information Systems, 3*(1), 99-106.

➲ **Journal article, more than six authors, paginated by volume**

Strakić, F., Mirković, D., Boškov, T., Ljubojević, K., Tanasijević, V., Dimitrijević, M., et al. (2003). Metadata in data warehouse. *Strategic Management, 11*, 122-132.

➲ **Magazine article**

Strakić, F. (2005, October 15). Remembering users with cookies. *IT Review*, *130*, 20-21.

➲ **Newsletter article with author**

Dimitrijević, M. (2009, September). MySql server, writing library files. *Computing News, 57,* 10-12.

➲ **Newsletter article without author**

VBScript with active server pages. (2009, September). *Computing News, 57,* 21-22.

B. Books, Brochures, Book Chapters, Encyclopedia Entries, And Book Reviews

Basic format for books

Author, A. A. (Year of publication). *Title of work: Capital letter also for subtitle*. Location: Publisher.

Note: "Location" always refers to the town/city, but you should also include the state/country if the town/city could be mistaken for one in another country.

➲ **Book, one author**

Ljubojević, K. (2005). *Prototyping the interface design*. Subotica: Faculty of Economics.

➲ **Book, one author, new edition**

Dimitrijević, M. (2007). *Customer relationship management* (6th ed.). Subotica: Faculty of Economics.

➲ **Book, two authors**

Ljubojević, K., Dimitrijević, M. (2007). *The enterprise knowledge portal and its architecture*. Subotica: Faculty of Economics.

➲ **Book, three to six authors**

Ljubojević, K., Dimitrijević, M., Mirković, D., Tanasijević, V., & Perić, O. (2006). *Importance of software testing*. Subotica: Faculty of Economics.

➲ **Book, more than six authors**

Mirković, D., Tanasijević, V., Perić, O., Jovanov, N., Boškov, T., Strakić, F., et al. (2007). *Supply chain management*. Subotica: Faculty of Economics.

➲ **Book, no author or editor**

Web user interface (10th ed.). (2003). Subotica: Faculty of Economics.

➲ **Group, corporate, or government author**

Statistical office of the Republic of Serbia. (1978). *Statistical abstract of the Republic of Serbia.* Belgrade: Ministry of community and social services.

➲ **Edited book**

Dimitrijević, M., & Tanasijević, V. (Eds.). (2004). *Data warehouse architecture*. Subotica: Faculty of Economics.

➲ **Chapter in an edited book**

Boškov, T., & Strakić. F. (2008). Bridging the gap: Complex adaptive knowledge management. In T. Boškov & V. Tanasijević (Eds.), *The enterprise knowledge portal and its architecture* (pp. 55-89). Subotica: Faculty of Economics.

➲ **Encyclopedia entry**

Mirković, D. (2006). History and the world of mathematicians. In *The new mathematics encyclopedia* (Vol. 56, pp. 23-45). Subotica: Faculty of Economics.

C. Unpublished Works

➲ **Paper presented at a meeting or a conference**

Ljubojević, K., Tanasijević, V., Dimitrijević, M. (2003). *Designing a web form without tables*. Paper presented at the annual meeting of the Serbian computer alliance, Beograd.

➲ **Paper or manuscript**

Boškov, T., Strakić, F., Ljubojević, K., Dimitrijević, M., & Perić, O. (2007. May). *First steps in visual basic for applications*. Unpublished paper, Faculty of Economics Subotica, Subotica.

➲ **Doctoral dissertation**

Strakić, F. (2000). *Managing network services: Managing DNS servers*. Unpublished doctoral dissertation, Faculty of Economics Subotica, Subotica.

➲ **Master's thesis**

Dimitrijević, M. (2003). *Structural modeling: Class and object diagrams.* Unpublished master's thesis, Faculty of Economics Subotica, Subotica.

D. Electronic Media

The same guidelines apply for online articles as for printed articles. All the information that the online host makes available must be listed, including an issue number in parentheses:

Author, A. A., & Author, B. B. (Publication date). Title of article. *Title of Online Periodical, volume number*(issue number if available). Retrieved from http://www.anyaddress.com/full/url/

➲ **Article in an internet-only journal**

Tanasijević, V. (2003, March). Putting the user at the center of software testing activity. *Strategic Management*, *8*(4). Retrieved October 7, 2004, from www.ef.uns.ac.rs/sm2003

➲ **Document from an organization**

Faculty of Economics. (2008, March 5). *A new approach to CRM*. Retrieved July 25, 2008, from http://www.ef.uns.ac.rs/papers/acrm.html

➲ **Article from an online periodical with DOI assigned**

Jovanov, N., & Boškov, T. A PHP project test-driven end to end. *Management Information Systems*, *2*(2), 45-54. doi: 10.1108/06070565717821898.

➲ **Article from an online periodical without DOI assigned**

Online journal articles without a DOI require a URL.

Author, A. A., & Author, B. B. (Publication date). Title of article. *Title of Journal, volume number*. Retrieved from http://www.anyaddress.com/full/url/

Jovanov, N., & Boškov, T. A PHP project test-driven end to end. *Management Information Systems*, *2*(2), 45-54. Retrieved from http://www.ef.uns.ac.rs/mis/TestDriven.html.

2. Reference Quotations in the Text

➲ **Quotations**

If a work is directly quoted from, then the author, year of publication and the page reference (preceded by "p.") must be included. The quotation is introduced with an introductory phrase including the author's last name followed by publication date in parentheses.

> According to Mirković (2001), "The use of data warehouses may be limited, especially if they contain confidential data" (p. 201).
>
> Mirković (2001), found that "the use of data warehouses may be limited" (p. 201). What unexpected impact does this have on the range of availability?

If the author is not named in the introductory phrase, the author's last name, publication year, and the page number in parentheses must be placed at the end of the quotation, e.g.

> He stated, "The use of data warehouses may be limited," but he did not fully explain the possible impact (Mirković, 2001, p. 201).

➲ **Summary or paraphrase**

> According to Mirković (1991), limitations on the use of databases can be external and software-based, or temporary and even discretion-based (p.201).
>
> Limitations on the use of databases can be external and software-based, or temporary and even discretion-based (Mirković, 1991, p. 201).

➲ **One author**

> Boškov (2005) compared the access range…
>
> In an early study of access range (Boškov, 2005), it was found...

➲ When there are **two authors**, both names are always cited:

> Another study (Mirković & Boškov, 2006) concluded that…

➲ If there are **three to five authors**, all authors must be cited the first time. For subsequent references, the first author's name will cited, followed by "et al.".

> (Jovanov, Boškov, Perić, Boškov, & Strakić, 2004).

In subsequent citations, only the first author's name is used, followed by "et al." in the introductory phrase or in parentheses:

> According to Jovanov et al. (2004), further occurences of the phenomenon tend to receive a much wider media coverage.
>
> Further occurences of the phenomenon tend to receive a much wider media coverage (Jovanov et al., 2004).

In "et al.", "et" is not followed by a full stop.

➲ Six or more authors

The first author's last name followed by "et al." is used in the introductory phrase or in parentheses:

> Yossarian et al. (2004) argued that…
>
> … not relevant (Yossarian et al., 2001).

➲ Unknown author

If the work does not have an author, the source is cited by its title in the introductory phrase, or the first 1-2 words are placed in the parentheses. Book and report titles must be italicized or underlined, while titles of articles and chapters are placed in quotation marks:

> A similar survey was conducted on a number of organizations employing database managers ("Limiting database access", 2005).

If work (such as a newspaper editorial) has no author, the first few words of the title are cited, followed by the year:

> ("The Objectives of Access Delegation," 2007)

Note: In the rare cases when the word "Anonymous" is used for the author, it is treated as the author's name (Anonymous, 2008). The name Anonymous must then be used as the author in the reference list.

➲ Organization as an Author

If the author is an organization or a government agency, the organization must be mentioned in the introductory phrase or in the parenthetical citation the first time the source is cited:

> According to the Statistical Office of the Republic of Serbia (1978), …

Also, the full name of corporate authors must be listed in the first reference, with an abbreviation in brackets. The abbreviated name will then be used for subsequent references:

> The overview is limited to towns with 10,000 inhabitants and up (Statistical Office of the Republic of Serbia [SORS], 1978).
>
> The list does not include schools that were listed as closed down in the previous statistical overview (SORS, 1978).

➲ When citing **more than one reference from the same author**:

> (Bezjak, 1999, 2002)

➲ When several **used works by the same author were published in the same year**, they must be cited adding a, b, c, and so on, to the publication date:

> (Griffith, 2002a, 2002b, 2004)

➲ **Two or more works in the same parentheses**

When two or more works are cited parenthetically, they must be cited in the same order as they appear in the reference list, separated by a semicolon.

> (Bezjak, 1999; Griffith, 2004)

➲ **Two or more works by the same author in the same year**

If two or more sources used in the submission were published by the same author in the same year, the entries in the reference list must be ordered using lower-case letters (a, b, c…) with the year. Lower-case letters will also be used with the year in the in-text citation as well:

> Survey results published in Theissen (2004a) show that…

➲ To **credit an author for discovering a work**, when you have not read the original:

> Bergson's research (as cited in Mirković & Boškov, 2006)…

Here, Mirković & Boškov (2006) will appear in the reference list, while Bergson will not.

➲ When **citing more than one author**, the authors must be listed alphabetically:

> (Britten, 2001; Sturlasson, 2002; Wasserwandt, 1997)

➲ When there is **no publication date**:

> (Hessenberg, n.d.)

➲ **Page numbers must always be given for quotations**:

> (Mirković & Boškov, 2006, p.12)
>
> Mirković & Boškov (2006, p. 12) propose the approach by which "the initial viewpoint…

➲ **Referring to a specific part of a work**:

> (Theissen, 2004a, chap. 3)
>
> (Keaton, 1997, pp. 85-94)

➲ **Personal communications, including interviews, letters, memos, e-mails, and telephone conversations**, are cited as below. (These are *not* included in the reference list.)

> (K. Ljubojević, personal communication, May 5, 2008).

3. Footnotes and Endnotes

A few footnotes may be necessary when elaborating on an issue raised in the text, adding something that is in indirect connection, or providing supplementary technical information. Footnotes and endnotes are numbered with superscript Arabic numerals at the end of the sentence, like this.[1] Endnotes begin on a separate page, after the end of the text. However, journal **does not recommend the use of footnotes or endnotes.**

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