ЕКОНОМИКА

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1. Часопис "Економика" покренут је јула 1954. године и под називом " Нишки привредни гласник" излазио је до јуна 1957. године, а као "Привредни гласник" до краја 1969. године. Назив "Наука и пракса" носио је закључно са бројем 1/1973. год. када добија назив "Економика" који и данас има.

2. Часопис су покренули Друштво економиста Ниша и Друштво инжињера и техничара Ниша (остало као издавач до краја 1964. године). Удружење књиговођа постаје издавач почев од броја 6-7/1958. године. Економски факултет у Нишу на основу своје одлуке броја 04-2021 од 26.12.1991. године постао је суиздавач "Економике". Такође и Економски факултет у ПриШтини постао је суиздавач од 1992. године. Почев од 1992. године суиздавач "Економике" је и Друштво за маркетинг региона Ниш. Као суиздавач "Економике" фигурирали су у току 1990-1996. године и Фонд за научни рад општине Ниш, Завод за просторно и урбанистичко планирање Ниш и Корпорација Винер Брокер Ниш.

3. Републички секретаријат за информације СР Србије својим Решењем бр. 651-126/73-02 од 27. новембра 1974. године усвојио је захтев "Економике" за упис у Регистар новина. Скупштина Друштва економиста Ниша на седници од 24. априла 1990. године статутарном одлуком потврдила је да "Економика" има статус правног лица. На седници Скупштине Друштва економиста Ниш од 11. новембра 1999. године донета је одлука да "Економика" отвори посебан жиро-рачун.

4. Према Мишљењу Републичког секретаријата за културу СР Србије бр. 413-516/73-02 од 10. јула 1973. године и Министарства за науку и технологију Републике Србије бр. 541-03-363/94-02 од 30. јуна 1994. године "Економика" има статус научног и ранг националног часописа "Економика" је почев од 1995. добила статус међународног економског часописа.

5. УРЕДНИЦИ: др Јован Петровић (1954-1958), Миодраг Филиповић (1958-1962), Благоје Матић (1962-1964), др Драгољуб Стојиљковић (1964-1967), др Миодраг Николић (1967-1973), др Драгољуб Симоновић (1973-1984), др Миодраг Јовановић (1984-3-4/1988), др Драгољуб Симоновић (1990-2019), др Зоран Симоновић (2019-до данас).

САДРЖАЈ / CONTENT

ОРИГИНАЛНИ НАУЧНИ РАДОВИ / ORIGINAL SCIENTIFIC ARTICLE

ПРЕГЛЕДНИ НАУЧНИ РАДОВИ /
SCIENTIFIC REVIEW ARTICLE

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INTERDEPENDENCE OF TOURISM COMPETITIVENESS AND DEVELOPMENT OF SOUTHERN EUROPEAN COUNTRIES

Abstract

The importance of tourism sector in modern conditions and its significant participation in the macroeconomic indicators of countries, determine it as one of the key factors of competitiveness and development of national economies. Tourism contribution of tourism to competitiveness and economic development, as well as the economic effects of tourism, may vary from country to country. The purpose of the paper is to examine the interdependence between tourism competitiveness and the economic effects of tourism, as well as between tourism competitiveness and development of the Southern European countries. The methods applied in the paper are comparative analysis, descriptive statistics and correlation analysis. The results of the research indicate that there is no significant positive relationship between the tourism competitiveness and economic effects of tourism in the analysed group of countries, while the relationship between tourism competitiveness and development of these countries is characterized by a high level of positive correlation. This conclusion can be useful for economic and tourism development policy makers and the creator of the policy of improving the competitiveness of tourism.

Key words: *tourism, competitiveness, development, economic effects*

JEL classification: *L83, Z32*

МЕЂУЗАВИСНОСТ КОНКУРЕНТНОСТИ ТУРИЗМА И РАЗВОЈА ЈУЖНОЕВРОПСКИХ ЗЕМАЉА

Апстракт

Важност сектора туризма у савременим условима и његово значајно учешће у макроекономским показатељима земаља чине га једним од кључних фактора

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конкурентности и развоја националних економија. При томе се допринос туризма конкурентности и економском развоју, као и економски ефекти туризма могу разликовати од земље до земље. Сврха рада је истраживање међузависноти између конкурентности туризма и економских ефеката туризма, као и између конкурентности туризма и развоја Јужноевропских земаља. У раду су примењене следеће методе: компаративна анализа, дескриптивна статистика и корелациона анализа. Резултати истраживања указују да између конкурентности и економских ефеката туризма није потврђена значајна позитивна веза у анализираној групацији земаља, док однос између конкурентнсоти туризма и развоја наведених земаља карактерише висок ниво позитивне корелације. Ови закључци могу бити корисни за краторе политике економског и туристичког развоја, као и политике унапређења конкурентности туризма.

Кључне речи: туризам, конкурентност, развој, економски ефекти

Introduction

Conscious of the growing roles and the importance of tourism, countries are paying more attention to the competitiveness of tourism, which depends on the success of the interaction of all comparative and competitive advantages of the destination and tourism products. As tourism in many countries is recognized as one of the strategic sectors, the improvement of tourism competitiveness consequently leads to the improvement of the competitiveness of national economies. On the other hand, the significant share of the tourism sector in key macroeconomic indicators, such as gross domestic product (GDP), employment, exports, globally and within a large number of individual countries, imposes as a logical assumption its great importance for economic development. As this importance varies from country to country, it is useful to consider the contribution of tourism to the competitiveness and development of the national economy of individual countries or groups of countries. Tourism is a dynamic activity and it is useful to consider each of its changes in the context of the impact on the economy that such changes can cause (Dwyer et al., 2004).

In the global context, the importance of tourism for the economy is evident and can be supported by empirical data. According to the data of the World Travel & Tourism Council (WTTC) for 2019 (the year before the exceptional conditions caused by the COVID-19 pandemic), the participation of tourism in key macroeconomic indicators is very significant. The total contribution of travel & tourism to GDP was 9,170.0 billion US$ (10.4% of total GDP) in 2019. Travel & tourism supported 334 million jobs or 1 for every ten jobs belonged to travel & tourism in 2019 (10.6% of all jobs). Also, it "was responsible for creating 1 in 4 of all net new jobs across the world between 2014 - 2019" (WTTC, 2021). These and other relevant data confirm the importance of the economic effects of the tourism sector.

Many studies deal with the analysis of the contribution of tourism to the economic development of countries and the economic effects of tourism. Also, tourism competitiveness is the subject of numerous research and scientific papers. However, there is a lack of studies dealing with the interdependence between tourism competitiveness and the economic effects of tourism, as well as between tourism competitiveness and economic development of countries. This is a gap in the literature that this paper is trying to fill. The results of

the research and discussion are grouped into two parts. First, a cross-country comparison of tourism competitiveness, economic effects and economic development of the analysed countries is made. After that, the interdependence of tourism competitiveness, on the one hand, and the economic effects of tourism and economic development, on the other hand, on the analysed sample of countries is examined.

Theoretical backgrounds

Considering the contribution of tourism to the key macroeconomic indicators of countries in modern conditions, tourism is of great importance in terms of the development. One of the specifics of tourism is reflected in the multi sectoral influence and the fact that tourism links and that its effects extend through a large number of other sectors. Tourism development contributes to direct inflows into the local economy, the diversification of the economy, the sustainability of the environment and the local community. In this context, it can be said that tourism contributes not only to development, but also to the overall competitiveness of national economies. Over the last few decades, tourism has played an increasingly important role in the economic growth of many countries. Every consumption that generates economic activity is worthy of macroeconomic attention. While earlier economic research was focused mainly on the income that certain activities that are part of tourism generate, today tourism studies consider its broader impacts on overall economic development. (Stanić & Vujić, 2017).

The important role that tourism has for the economic and social progress of countries is recognized by the governments of modern countries (Dritsakis, 2004), but also by the scientific community and many authors studying the link between tourism and economic growth measured by gross domestic product (GDP) (Ivanov & Webster, 2007; Gökovali & Bahar, 2006; Sequeira & Maçãs Nunes, 2008; Richardson, 2010; Samimi et al., 2011). De Vita & Kyaw (2016) confirmed that in certain groups of countries the growth of tourism arrivals is associated with an increase in the per capital real GDP growth rate. Lee and Chang (2008) confirm that tourism development has a positive impact on GDP, while also emphasizing that the strength of the impact depends on the group of countries observed and the greater impact is recorded in less developed countries. Oh (2005), using the Granger causality model, investigates the causal relationship between tourism growth and economic expansion. It is interesting that this author concludes that tourism is not a driver of economic growth in the short term. Ekanayake & Long (2012) come to the similar conclusion using the same model, noting that tourism revenues make a positive contribution to economic growth in developing countries. Dritsakis (2012) tests the impact of tourism development on economic growth on a sample of selected Mediterranean countries and concludes that tourist receipts have a high impact on the GDP of the analyzed countries. Eyuboglu & Eyuboglu (2020) have found a hidden causality between tourism development and economic growth in certain emerging countries.

Tourism generates multiple economic benefits for receptive countries. This is especially important from the aspect of developing countries, where the expected positive economic effects of tourism are a motive to promote tourism (Surugiu, 2009). The economic effects of tourism, mostly measured by its contribution to income and employment, are also the subject of numerous studies. The reason for choosing these economic aggregates and through them expressing the economic effects of tourism is, among other things, their visibility and relatively easy measurability

(Vladušić et al., 2020; Zdravković & Peković). For the same reason, studies of the economic impact of tourism focus primarily on economic benefits, while costs are often neglected (Comerio & Strozzi, 2019). However, the economic impact should be understood to include both direct costs and benefits, directly related to the travel activity and expenditures, and secondary costs and benefits, which are induced. Tourism impact analysis, in order to gain more comprehensive insight into the economic effects of tourism, must take into account both of these types of benefits and costs (Ennew, 2003). There are two main reasons why the scientific and professional public is extremely interested in understanding the economic effects of tourism. First, the economic effects in tourism are not as easily visible as in some other sectors, so tourism stakeholders emphasize them in this way. Second, the complex structure of the tourism sector requires greater effort in measuring and expressing economic effects (Mayer & Vogt, 2016).

Tourism competitiveness is also a concept that is gaining in importance in literature and practice. Research is primarily focused on reviewing the level achieved (Enright & Newton, 2004; Michael et al., 2019; Cronjé & du Plessis, 2020; Roman et al., 2020; Khalifa, 2020) and key determinants (Fernández et al., 2020; Corne & Peypoch, 2020; Krstić et al., 2017) of competitiveness of the country, region or tourist destination. However, there are sporadic studies that link the competitiveness of tourism and economic growth of countries (Pablo-Romero et al., 2016; Crouch and Ritchie, 2005; Botti et al., 2009). Wang and Liu (2020), dealing with the relationship between tourism competitiveness and economic growth of 56 developing countries, conclude that this relationship is not balanced and this is a result by the lag of economic growth of the analysed group of countries. However, there is still a lack of studies that examine the link between the competitiveness of tourism and the economic effects of tourism and economic development of the country.

Research Methodology and Hypothesis

The aim of the paper is to examine the interdependence between competitiveness of tourism, on the one hand, and the economic effects of tourism and development of Southern European countries, on the other hand. In accordance with the defined aim of the research, the paper starts from the two hypotheses:

1) There is a high positive correlation between tourism competitiveness and economic effects of tourism in Southern European countries;
2) There is a high positive correlation between tourism competitiveness and development of Southern European countries.

The information base of the research are data of the World Travel & Tourism Council, World Economic Forum (WEF) and World Bank. The competitiveness of tourism in selected countries was measured by the Travel & Tourism Competitiveness Index (TTCI). The economic effects of tourism are measured by the following indicators: Total contribution of tourism to GDP (%) and Total contribution of tourism to employment (%).The development of countries is measured by the GDP per capita and Global Competitiveness Index (GCI).

The methods applied in processing analysed data and finding results are the method of comparative analysis, descriptive statistics and correlation analysis. The research is conducted on a sample of a total of 14 Southern European countries (according to the classification of the World Tourism Organization).

Research Results and Discussion

Research results are grouped into three sections:
a) Cross-country comparison of tourism competitiveness, economic effects of tourism and development, and
b) Examination of correlation between tourism competitiveness and economic effects of tourism and development of the countries.
a) Cross-country comparison of tourism competitiveness, economic effects of tourism and development

The values of the analysed indicators for measuring the economic effects of tourism (Total contribution to GDP (%), Total contribution to Employment (%)), tourism competitiveness (TTCI) and development of the Southern European countries (GDP per capita and GCI) are given in Table 1.

Table 1: Competitiveness and economic effects of tourism, GDP and GCI in Southern Europe countries (2019)

Country	TTCI (Value)	Total contribution of tourism to GDP (%)	Total contribution of tourism to employment (%)	GDP per capita (US$)	GCI (Value)
Albania	3.6	20.5	21.3	5,207.3	57.6
Bosnia and Herzegovina	3.3	9.8	10.5	6,313.1	54.7
Croatia	4.5	24.3	22.2	16,519.0	61.9
Cyprus	4.2	13.4	13.4	32,517.2	66.4
North Macedonia	3.4	6.6	6.8	5,625.7	57.3
Greece	4.5	20.3	21.1	23,503.6	62.6
Italy	5.1	13.1	15.0	35,999.0	71.5
Malta	4.4	15.9	21.3	29,149.6	68.5
Montenegro	3.9	30.9	31.9	8,591.4	60.8
Portugal	4.9	17.1	20.7	24,679.0	70.4
Serbia	3.6	5.9	6.3	7,229.9	60.9
Slovenia	4.3	10.6	11.0	27,421.0	70.2
Spain	5.4	14.1	14.4	33,352.3	75.3
Turkey	4.2	11.0	9.3	15,125.9	62.1

Source: WTTC, 2021; WEF, 2019; WEF, (2019a); World Bank,2021

If tourism competitiveness is analysed, the leaders of the Southern European countries is traditional Mediterranean tourist destinations, Spain, with a score of the TTCI of 5.4. The worst results was recorded in Bosnia and Hercegovina (index score of 3.3). When it comes to the total contribution of tourism to GDP, Montenegro (with a share of 30.09%) recorded the best results among the analysed countries. The lowest total contribution of tourism to GDP was recorded in Serbia (5.9 %). Regarding the total contribution of tourism to employment u Southern European countries, the situation

is similar to the previously analysed indicator. Countries with the largest percentage share of the total contribution of tourism to employment is Montenegro (31.9%). The smallest total contribution of tourism to employment among the Southern European countries was recorded in Serbia (6.3%). According to development indicators, leader by GDP per capita (33,352.3 US$), as well as by GCI (value of 75.3) is Spain. The worst result according to GDP per capita was recorded in Albania (5,207.3 US$). Bosnia and Hercegovina recorded the lowest value of GCI (54.7). The descriptive statistics of the analysed indicators are shown in Table 2.

Table 2: Descriptive Statistics

	Minimum	Maximum	Mean	Std. Deviation	Variation Coefficient
TTCI (value)	3.3	5.4	4.2	0.6331	14.9
Total contribution of tourism to GDP (%)	5.9	30.9	15.2	6.9323	45.5
Total contribution of tourism to employment (%)	6.3	31.9	16.1	7.2569	45.1
GDP per capita (US$)	5,207.3	35,999.0	19,373.8	11436.4	59.0
GCI (value)	54.7	75.3	64.3	6.1	9.5

Source: Authors' calculation (SPSS Statistics 23)

Based on the data in Table 2, it can be concluded that the analysed countries record the greatest variability of analyzed indicators (measured by the coefficient of variation) when it comes to GDP per capita. Southern European countries represent a very heterogeneous group of countries, both when it comes to the economic development level and when it comes to the level of tourism development achieved.

b) Examination of correlation between tourism competitiveness and economic effects of tourism and development of the countries

In order to examine the interdependence between the tourism competitiveness and economic effects of tourism and development of countries, Table 3 shows the values of the Pearson's correlation coefficient between the relevant indicators. Correlation analysis is done on a sample of all 14 analysed countries.

Table 3: Correlation Matrix

	TTCI	Total_ GDP	Total_ employment	GDP_pc	GCI
TTCI	1	0.201 (0.491)	0.244 (0.401)	0.854 (0.000)	0.900 (0.000)
Total_ GDP		1	0.966 (0.000)	-0.023 (0.938)	-0.021 0.943

				0.060 (0.838)	0.071 (0.808)
Total_employment			1		
GDP_pc				1	0.905 (0.000)
GCI					1

Source: Authors' calculation (SPSS Statistics 23)

Based on the values of the coefficients shown in Table 3, it can be concluded that, tested on a sample of analysed Southern European countries, there is high positive statistically significant correlation between TTCI and GDP per capita ($r=0.854$, $p=0.000$) , as well as between TTCI and GCI ($r=0.900$, $p=0.000$). Weak positive non-statistically significant correlation is observed between TTCI and Total contribution of tourism to GDP ($r=0.201$, $p=0.491$), as well as between TTCI and Total contribution of tourism to employment ($r=0.244$, $p=0.401$). This can be seen by reviewing the linear regression curves between the mentioned variables shown in Figure 1.

Figure 1: Linear regression models

Source: Authors (SPSS Statistics 23)

Based on the presented results, it can be concluded that the first initial hypothesis of the research is rejected. Namely, there is no high positive correlation between tourism competitiveness and economic effects of tourism in Southern European countries. The obtained values of the correlation coefficients indicate a weak positive correlation that is not statistically significant. On the other hand, the second initial hypothesis of the research is confirmed, i.e. there is a high positive correlation between tourism competitiveness and development of Southern European countries.

Conclusion

Given the many benefits that tourism brings to receptive countries, considering and studying its contribution to key macroeconomic aggregates of countries, as well as to overall development is imperative for both scientific and professional public. Countries in the world increasingly understand the role and importance of tourism and are trying to valorise own tourism potential. In modern conditions, the economic effects of tourism are not the only goal that is set when it comes to tourism development. The need to develop tourism in a sustainable and competitive way is increasingly emphasized (Veličković &Jovanović, 2021). Considering that, competitiveness in tourism is a phenomenon that is gaining in importance. All the countries of the world are trying to improve the tourism competitiveness to the greatest possible extent. Improving the tourism competitiveness means recognizing tourism potentials and comparative advantages and turning them into competitive advantages. The paper attempts to understand the relationship between the tourism competitiveness and its economic effects, as well as the relationship between the tourism competitiveness and development on the example of Southern European countries.

The results of the research indicate, the significant heterogeneity of the Southern European countries, having in mind the analysed indicators. Spain is the country that is the leader among the observed countries when it comes to the competitiveness of tourism, measured by the TTCI, and when it comes to development, i.e. indicators of GDP per capita and GCI. When it comes to the economic effects of tourism, expressed through the total contribution of tourism to employment and the total contribution of tourism to GDP, the largest share of tourism in the analysed macroeconomic indicators is recorded by Montenegro. The interdependence between tourism competitiveness and the economic effects, as well as between tourism competitiveness and development of the analysed countries is tested by correlation analysis. The results of the correlation analysis confirm the fact that there is no high positive correlation between the indicators of measuring economic effects and the TTCI value on the sample of the analysed group of countries. This is in line with the modern concept of understanding the competitiveness of tourism, in which the economic dimension is only one of many equally important dimensions of competitiveness. In other words, the fact that tourism is very important from the economic point of view for a particular country does not necessarily mean that the tourism competitiveness in that country is at a high level. On the other hand, the results of the research confirmed the existence of a high positive correlation between the tourism competitiveness and economic development, as in the overall national competitiveness of the analysed group of countries.

The key limitation of the research is the heterogeneity of the selected group of countries, since the group of Southern European countries includes countries that differ from each other

both in terms of the achieved level of tourism development and the achieved level of overall economic development. Regarding this , future research can be focused on further dividing the analysed group of countries into developing and developed countries, concluding on the relationship between tourism competitiveness and analysed indicators separately for these subgroups and comparative analysis of results and conclusions

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THE PRACTICE OF FINANCIAL PARTICIPATION IN CORPORATIONS IN THE CEE COUNTRIES

Abstract

The application of financial participation, as a way of rewarding employees, is one of the most important topics in the modern practice of rewarding employees because it directly affects employees' attitudes and behaviour. The subject of the paper is the analysis of the application of the employee share scheme, profit sharing, and stock options in rewarding managers, professionals, and clericals in the corporations of nine Central and Eastern European (CEE) countries, members of the Cranet academic network, related to the policy and practice of human resource management in their country. The data, which were analyzed through the SPSS statistical program, were taken from the official Cranet database from 2016. This paper aims to determine the level of application of the three most important types of financial participation in rewarding employees. Various studies have pointed out the importance of applying financial participation to the satisfaction, motivation, and productivity of employees. Based on the theoretical development and empirical data, it has been found that companies in the CEE use a wide range of financial participation schemes and that financial participation is used mostly for managers and professionals.

Keywords: *financial participation, stock, options, rewarding employees, CEE*

JEL classification: *M52, M54*

ПРИМЕНА ФИНАНСИЈСКЕ ПАРТИЦИПАЦИЈЕ У КОРПОРАЦИЈАМА ЗЕМЉАМА ЦИЕ

Апстракт

Примена финансијске партиципације, као начин награђивања запослених, , представља један од најзначајих тема у савременом награђивању запослених, јер управо њихова примена директно утиче на ставове и понашае запослених.. Предмет рада представља анализу примене шема зе поделу акција, подела профита и опције/право на куповину акција у награђивању менаџера, стручних радника као и административних и/или физичких запослених у корпорацијама девет земаља Централно-источне Европе (ЦИЕ), које су чланице Кранет академске мреже које се односе на политику и праксу

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управљања људских ресурсима своје земље. Подаци који су анализирани путем СПСС статистичког програма, преузети су из званичне Кранет базе из 2016. године. Циљ рада је утврдити ниво примене три најзначајније врсте финансијске партиципације у награђивању запослених. Разне студије су указале на значајност примене финансијске партиципације на задовољство, мотивисаност ипрокутивност запослених. На основу теоријског развоја и емпиријских података, утврђено је да компаније у ЦИЕ користе широк спектар шема финансијског учешћа, те да се финансијска партиципација користи углавном за менаџере и стручне раднике.

Кључне речи: *финансијска партиципација, акције, опције, награђивање запослених, ЦИЕ*

Introduction

Due to the escalating globalization that has a strong impact on business worldwide, companies have faced new challenges that leave great impacts on business (Lowe et al., 2002; Harvey & Moeller, 2009; Vasic, 2020; Gašić, 2021). Companies need to find adequate human resource management (HRM) practices to keep their best employees and motivate them to use their knowledge and efforts to influence the company's even greater business success so that it not only survives in a fiercely competitive market but also becomes a leader in its business (Lai, 2011; Darma & Supriyanto, 2017). Business cannot be imagined without the key resources, the employees. To remain the loyalty and satisfaction of employees, it is necessary to define an adequate compensation system consisting of basic salary, incentives, and benefits. HRM primarily involves the care of people, so the authors DeCenzo and Robbins (2002) point out that human resource management is responsible for the human dimension of the organization. The author Dessler (2002) emphasizes that human resource management refers to policies and practices that are necessary to perform managerial tasks, and these tasks relate to recruitment, selection, development, evaluation, and rewarding of employees. Authors von Bonsdorff and Moilanen (2005) point out that most scientists who study human resource management accept rewarding as one of the basic functions in the management of organizations. They also point out that the rewards don't apply only to the managers in the company, but to all employees, regardless of their gender, work experience, or age, and that reward has an indisputable influence on the motivation and productivity of employees, as well as that rewarding is a required managerial job.

The subject of the paper is the analysis of the application of the employee share scheme, profit sharing, and stock options in rewarding managers, professionals, and clericals in the corporations of nine Central and Eastern European countries, members of the Cranet academic network, of economic faculties related to the policy and practice of human resource management in their country. The data, which were analyzed through the SPSS statistical program, were taken from the official Cranet database from 2016.

The structure of the scientific article consists of four parts. The first part relates to the background of the research, where the employees' compensation system would be described, with the emphasis on financial participation, as a form of rewarding

employees in corporations. Three types of financial participation, employee share schemes, profit sharing, and stock options would be analyzed. This is followed by an analysis of HRM compensation practice, population, and GDP per capita practices for all nine CEE countries. The second part will explain the methodology used. The third part refers to the presentation of research results and discussions on the results of the financial participation in rewarding employees for all nine countries of Central and Eastern Europe, where a graphical presentation of all three types of financial participation will be performed, especially for managers, professionals, and clericals. The final part refers to the author's observations on the application of this type of rewarding employees in corporations of CEE countries, shows the advantages and disadvantages of application in selected countries, and provides directions for future research on this topic.

Theoretical background

Rewarding employees is one of the most important practices in each HRM process. The authors Fay & Thompson (2001) define compensation as a systematic approach to providing a monetary amount as well as other forms of benefits to employees for their work, all to retain existing and attract new employees. Many studies have found that compensations have a great impact on the motivation of all employees, all to achieve the highest possible level of business performance of employees (Harris & McMahan, 2015; Bangun et al., 2019; Ghazanfar et al., 2011; Berber et al., 2017).

The following table shows the elements of the compensation system: basic pay, incentive pay (*individual*, *group*, *or organization level*), and benefits.

Table 1: Compensation system elements

Basic pay	The minimum level of pay that employees receive for their work. In some situations, it is a standard salary, while in others it is supplemented with other elements of salary.
Incentive pay	There are three types of incentive pay: individual, group, and organizational. An incentive of individuals refers to the success of the individual and his contribution to the business of the organization. Group incentives take into account the success of the whole group, while incentives at the organizational level represent the rewarding of all employees for the achieved performance of the organization.
Benefits	Benefits are an indirect part of the compensation system. They represent benefits above basic and incentive earnings. Examples of benefits could be health and pension insurance, unemployment insurance, a company car, a children's kindergarten, consulting services, etc.

Source: Author based on Štangl Šušnjar et al., (2017, p. 457).

Financial participation of employee is a form of employee participation and refers to cases where employees are shareholders of the company in which they are employed, which allows them to have private ownership, which includes participation in the distribution of company profits (Remus, 1983; Pendleton et al., 2003). The most important forms of financial participation that will be analyzed are employee share schemes, profit sharing, and stock options (Kalmi et al., 2006), which will be described below. Financial participation of employees exists as a part of the employment of an

increasing number of employees, especially in the industrialized world (Poutsma et al., 2012).

Table 2: Theoretical overview of three types of financial participation in rewarding employees

Employee share schemes	Representing the right to own shares in the company, the company's management often decides to direct this type of participation towards managerial positions because the employees who are responsible for the business results of the organization are employed in these positions. There are mutual benefits for the company and managers such as dividend income or gains from the growth of the value of shares, provides the right to vote, etc. By the fact that managers own the company's shares, they will try to increase the value of the company, which automatically affects the increase in the value of the shares they own (Leković & Šušnjar Štangl, 2009). Also, it can decrease the agency problem in corporations.
Profit-sharing	It is one of the most important components of financial participation in most countries (Welz & Fernández-Macías, 2008). With this type of financial participation, companies have the opportunity to strengthen their image to increase the success and stability of their business. The advantages of using profit sharing as a type of incentive at the organizational level are increased identification of employees with the company, employees are motivated to increase productivity, creativity, and innovation, and cooperation between management and employees is strengthened. The disadvantages can be the following: the effort and the reward aren't always correlated, while the payment is often far from the effect (Yan et al., 2019). There are several types of profit-sharing in business practice: cash is the most popular type of profit-sharing in the form of cash among employees. An example is where the amount of 10-20% of the realized profit can be distributed to the employees in the company. Deferred profit sharing: in which companies remit the amount of the reward to the account of their employees, who can use it only when they retire. The company decides when and how much money it will pay to the employee's account (Štangl Šušnjar et al., 2017, p. 497).
Stock options	Author Bird (2018) defines this type of financial participation as the ability of employees to buy shares in the company in which they are employed at a defined price until a certain date (expiration date). The disadvantage of this type of rewarding of employees is that it is not guaranteed and if the company goes bankrupt, the shares will lose their value. Berber (2015, p. 207) points to changes in Serbia when the privatization process was in full swing in 2000, when large companies were transformed into private property, and when a significant share of foreign companies came into the domestic market. This was one of the possible reasons for the increased use of options. In that period, foreign companies opted more for this type of financial participation than for other forms.

Source: Authors

Although financial participation has several advantages, shown in table 2, the authors Poór et al. (2012) found that variable earnings are used to a much greater extent in all categories of employees than financial participation. In situations where financial participation is applied, the authors Karoliny et al. (2009) point out that the most common form of application in rewarding was profit sharing. In the work of the author Berber & Štangl-Šušnjar (2013), a study of the practice of compensation for professionals was conducted and it was found that performance pay is more useful than the application of financial participation in companies from the CEE region. According to Svetlik et al.

(2010), financial participation techniques used in developed market economies such as employee share schemes, profit sharing, and stock options rights, are relatively low in terms of takeovers, while only 5-15% of companies use this type of rewarding employees. The reasons why financial participation is used less than other variable pay methods (i.e. performance-related pay), can be explained in terms of property rights sharing. According to Bryson et al. (2012) in the case of incentive pay for performance, "the schemes do not constitute an entitlement for the workers but are paid on a discretionary basis (tied to individual or group performance), while in the case of financial participation employees have a residual right to the firm's surplus (income or wealth)" (p. 8).

The following table will present HRM practices as well as basic indicators such as population and GDP per capita (US $).

Table 3: Theoretical overview of three types of financial participation in rewarding employees

Country	Population	GDP per capita (US $)	HRM compensation practice
Croatia	4.047.200	14.134	The minimum wage is legally determined, and all aspects of variable remuneration are quite present in use. The most common group incentives are profit-sharing, and stock options (which are mainly used in rewarding CEOs) (Vokić et al., 2016).
Estonia	1.331.057	23.027	The minimum wage is defined and private pension funds, as well as schemes to reward employees with profits or shares, are used to a very small extent. There is a decentralized approach when defining the basic salary, for managers, salary is defined on an individual level and there is an increase in the use of incentives (Alas & Kaarelson, 2009).
Hungary	9.749.763	15.980	The Government of Hungary determines the minimum level of salary every year, while the payment is made based on hours or employees' performances. For managers, the compensation system is defined at the individual level, while for other employees, negotiation at the company level is more often applied. Variable earnings in terms of performance-based earnings are used more than financial participation (Karoliny et al., 2009).
Latvia	1.901.548	17.726	The minimum wage is defined by the Government. Civinskas & Dvorak (2017) notice that shares obtained on a privileged basis represent income from the work of the employee and that for this reason they are taxed in the same way as earnings. Since 2013, according to the new law on labour taxation (as well as the rules on tax exemption), employees have been able to acquire shares in their company for free or with a certain discount.

Lithuania	2.794.700	20.233	The minimum wage is set and there is an obligation that each employee must be aware of the total salary he receives. Compensation is influenced by factors such as inflation, unions, the labour market, etc. The payment of bonuses is mostly once a year, most often for the category of managers. Benefits are mainly related to health as well as travel insurance, while family benefits are used to a lesser extent (Pundziene & Bučiuniene, 2009, p. 75-76).
Romania	19.286.123	12.896	The minimum wage is defined by the law. Albu & Bormann (2006) point out that there is no special regulation regarding the distribution of profits other than the share in profits in state or municipal enterprises that are either constituted in the prescribed proper forms. Mass privatization has indirectly affected the growth of employee ownership. The MEBO method had a direct impact on the growth of ownership of shares and the growth of profit sharing.
Serbia	6.908.224	7.720	Earnings are mainly based on hours and seniority, there is a noticeable increase in the use of bonuses, collective bargaining on issues related to earnings, and decentralization in defining salaries. The Labor Law guarantees a minimum wage, and a low level of use of modern forms of variable wages as well as non-financial benefits was noticeable (Štangl Šušnjar & Leković, 2009).
Slovakia	5.458.827	19.266	The minimum wage has been set, but it is noticeable that private pension funds are used to a lesser extent. The highest level of earnings is recorded in the capital of Slovakia, variable earnings are directed more towards earnings for performance, incentives for managers and sales staff are noticeable (Kachanakova et al., 2009, p. 176-177).
Slovenia	2.100.126	25.517	Wages were bureaucratized in the pre-transition period while today they are more decentralized, mostly focused on rewarding employees according to performance as well as the application of financial participation such as share and profit-sharing. The minimum wage is defined by law (Svetlik, 2009, p. 23).

Source: Authors based on https://data.worldbank.org/indicator; https://www.sorainen.
com/UserFiles/File/Publications/briefing.Employment-benefits-in-the-European-
Union.2007-05-01.Clifford-Chanse-LLP.eng.andisb-agrisr-pdf

This part of the paper presented the main ideas on financial participation and some empirical results from previous research in the field. The following sections present the methodology used and the results of the research in countries in the CEE.

Methodology

Data used in the analysis were obtained from the Cranet Network survey. This research is conducted approximately every 4 years in over 40 countries (Brewster et al., 2011; Parry et al., 2011; Berber et al., 2014). The part in which the respondents had the opportunity to answer the questions about whether they offer some of the following

elements of earnings such as *employee share schemes*, *profit sharing*, and *stock options* is in the fourth part of the questionnaire. In addition to these types of salary elements offered to *managers*, *professionals*, and *clericals*, there are also incentives based on individual performance, bonuses based on individual goals/performance, bonuses based on team goals/performance, and bonuses based on organizational goals/performance and non-monetary incentives.

Cranet is an academic network of economics faculties that includes a wide range of countries that regularly collect unique and mutually comparable data related to their country's human resource management policies and practices. It was founded in 1989 based on cooperation between members from Great Britain, France, Germany, and Sweden. The Cranet survey uses a standardized questionnaire that has been translated into all the languages of the members of this academic network. This questionnaire is filled out by human resource management experts in companies with more than 50 employees. The survey can be conducted online, by mail, or through a personal interview with the respondent. The questionnaire contains questions related to the basic activities of HRM and consists of six parts: the first part refers to the activities of HRM in the organization, the practice of recruiting and selecting candidates in the organization, employee development, compensation, and benefits of organization, employee-employer relations and communication in the organization and the last part deal with information about the organization (Parry et al., 2013, p. 1). In the analysis of the application of financial participation in the remuneration of employees in CEE corporations, the database from 2016 was used, where an analysis of a total of 468 corporations was performed. During the analysis of the application of financial participation, a selection was made of companies belonging to the private sector and which are open joint-stock companies (listed on the stock exchange).

Table 4: Overview of the CEE countries sample

Country	Frequency	Percent	Valid Percent
Croatia	51	10,9	10.9
Estonia	15	3.2	3.2
Hungary	45	9.6	9.6
Latvia	16	3.4	3.4
Lithuania	26	5.6	5.6
Romania	44	9.4	9.4
Serbia	37	7.9	7.9
Slovakia	208	44.4	44.4
Slovenia	26	5.6	5.6
Total	468	100	100

Source: Authors based on data taken from the 2016 Cranet database

The following table shows the size of the company according to the number of employees in the organization. Companies with 1-249 employees are described as small and medium, while companies with more than 250 employees are as large (Jovic et al., 2009).

Table 5: Overview of the size of the company according to the number of employees

Size of the company by number of employees	Frequency	Percent (%)	Valid Percent
SME	*227*	*48.5*	49.1
Large	*235*	*50.2*	50.9
Total	462	98.7	100
Missing	*6*	*1.3*	
Total	468	100	

Source: Authors based on data taken from the 2016 Cranet database

The following table will show the number of organizations based on their affiliation with the private or public sector. The private sector implies a part of the economy run by private individuals or groups of people to make a profit that is not under state control (Hancock et al., 2011) on the other hand there is a public sector that is part of the state (Serrat, 2017).

Table 6: Review of affiliation to the public or private sector

Sector		Frequency	Percent (%)	Valid Percent
	Private sector	*460*	*98.3*	98.3
Valid	Public sector	*8*	*1.7*	1.7
	Total	468	100	100

Source: Author based on data taken from the 2016 Cranet database

Based on the data shown in table 6, we conclude that out of a total of 468 samples, the largest part belongs to the private sector as many as 460.

Also, the largest number of organizations serve the national market (181), followed by the world (124), regional (76), continental (73), and local market (12). According to the analysis of the sample according to the main sector of operations to which they belong, out of a total number of companies 43% belong to manufacturing and 57% to the service sector.

Research results and discussion

In this part, a graphical presentation of the results will be performed based on the analysis of data from the 2016 Cranet questionnaire. The analysis was performed for three groups of employees, managers, professionals, and clerical/manual workers, for all three forms of financial participation, employee share schemes, profit sharing, and stock options for all nine CEE countries.

The following chart shows the percentage of the implementation of *employee share schemes*, *profit sharing*, and *stock options* for managers for nine CEE countries.

Figure 1: Percentage application of financial participation for CEE member

Source: Authors based on data taken from the 2016 Cranet database

Based on figure 1, we conclude that out of a total of nine countries, seven use *employee share schemes* as a form of financial participation for managers. Hungary mostly uses this type of financial participation in rewarding managers with as much as 53.3%, which is a significant application compared to other countries, followed by Slovakia, Croatia, Slovenia, Serbia, and Estonia, which have a percentage between 20 and 29, while Lithuania has a slightly lower percentage of only 11.5. The countries that don't use this type of rewarding employees at all are Latvia and Romania. Comparing the use of *profit-sharing*, we conclude that Romania has the largest percentage with 43.2%, followed by Serbia with 40.5%, while other countries record percentages below 40 such as Slovenia, Croatia, Estonia, and Lithuania. Hungary and Slovakia, while the lowest percentage of implementation of this type of financial participation is used by Latvia with only 12.5%. Comparing stock options, we conclude that Latvia is the only country that doesn't use, while the largest percentage is recorded by Romania with 56.8%, followed by Hungary with 42.2%, Croatia with 38.3% while other countries record slightly lower values. Based on the conducted analysis, we come to the conclusion that the highest priority in rewarding managers in nine CEE countries is recorded by *profit sharing* (26.3%), followed by *employee share schemes* (25.4%) while the lowest level of application in rewarding is *stock options* (20.5%).

The second chart shows the percentage of the implementation of *employee share schemes*, *profit sharing*, and *stock options* for professional workers for nine CEE countries.

Figure 2: Percentage of application of financial participation for professionals of CEE members

Source: Authors based on data taken from the 2016 Cranet database

Based on figure 2, we conclude that out of a total of nine countries, Latvia and Romania don't use employee share schemes to reward professionals. The largest percentage is recorded by Hungary at 28.9%, followed by Slovakia, Croatia, and Slovenia, while Serbia, Estonia, and Lithuania have a slightly lower percentage of implementation. Comparing profit sharing, we conclude that out of nine countries, Latvia doesn't use this type of financial participation in rewarding professionals, while Slovenia has the largest percentage of 38.5%, followed by Estonia and other countries, with slightly lower application rates. Romania has the lowest value of eight countries using this type of reward with only 2.3%. Comparing stock options as a form of rewarding professionals showed that out of a total of nine countries, as many as three: Estonia, Latvia and Lithuania don't use this type of financial participation in rewarding professionals. Romania has by far the largest percentage of implementation at 43.2%, followed by Croatia with 28.2%, and other countries: Serbia, Hungary, Slovenia, and Slovakia have a slightly lower percentage of implementation. Based on the conducted analysis, we conclude that the highest priority in rewarding managers in nine CEE countries is recorded by *employee share schemes* (17.8%), followed by *profit sharing* (14.1%) while the lowest level of application in rewarding is *stock options* (12.7%).

Figure 3: Percentage of application of financial participation for clericals/ manual workers of CEE members

Source: Authors based on data taken from the 2016 Cranet database

Based on figure 3, we conclude that out of a total of nine countries, Latvia and Romania, don't use employee share schemes to reward clericals. The largest percentage of implementation is recorded in Slovakia with 27.4%, followed by Croatia at 22.7%, Hungary at 20%, and Slovenia at 19.2%, while Serbia, Estonia, and Lithuania have lower percentages. Comparing profit sharing in the remuneration of clericals, we conclude that only Latvia doesn't use this type of financial participation in remuneration while other countries use it to some extent, so Slovenia has the largest percentage of 38.5 %, then Serbia with 24.3%, Croatia 18.4% while other countries record slightly lower values. Comparing stock options of rewarding clericals showed that out of nine countries, as many as three: Estonia, Latvia and Lithuania don't use this type of financial participation. Compared to other countries, the largest percentage of implementation is recorded by Romania with 27.3%, followed by Croatia with 25.6%, and then other countries with a slightly lower percentage of implementation. Based on the conducted analysis, we conclude that the highest priority in rewarding managers in nine CEE countries is recorded by *employee share schemes* (18.7%), followed by *profit sharing* (13.7%) while the lowest level of application in rewarding is *stock options* (8.4%).

Conclusion

Based on the analysis of the application of financial participation (employee share schemes, profit sharing, and stock options) in rewarding employees (managers, professionals, clerical and manual workers) in corporations from the CEE, we conclude that the highest application is the rewarding of managers in all three types of remuneration, so in the case of employee share schemes, (24.4%) concerning clericals

(18.7) and professionals (17.8%). In the case of profit-sharing, managers (26.3%), professionals (14.1%), and clerical (13.7%). When comparing the application of stock options in rewarding employees managers (20.5%), professionals (12.7), and clericals (8.4%). The analysis of the application of financial participation for managers shows that some countries don't apply all types of participation for managers, so Latvia doesn't apply employee share schemes and stock options, and Romania doesn't apply employee share schemes. If we look at the highest level of financial participation as a form of rewarding managers, we conclude that Hungary has the highest level of implementation of the employee share scheme. Analyzing the application of financial participation in the remuneration of professionals from CEE member states, we conclude that Latvia doesn't use this type of financial participation in remuneration at all, while Hungary has the largest application of the employee share scheme, followed by Serbia and Croatia. Slovenia records the largest use of profit sharing and Romania stock options. By analyzing the application of financial participation in the remuneration of professionals, we conclude that Latvia doesn't apply any of the analyzed types of remuneration. Slovakia has the largest application of the employee share scheme, Slovenia uses profit-sharing, and Romania the stock options in rewarding professionals. In summary, Latvia records the lowest level of application of these types of rewards for its employees, while other countries record significantly higher levels of application.

Financial participation, as a form of rewarding employees in the business of every company around the, could have a significant impact on increasing employee satisfaction, and motivation and thus affects the growth of productivity and efficiency. On the other hand, there could be found a reduction in operating costs which could be used to reward employees and invest in business development. Also, the contemporary pandemic crisis raised several issues in business. For example, flexible work arrangements have changed the business of corporations around the world and have a significant impact on employee attitudes and behaviour (Gašić & Berber, 2021), as well as on corporate efficiency (Gašić, 2021). Employees around the world suffered social distance and lack of face-to-face cooperation for almost two years, so the problem of the lack of motivation, team cohesion, and potential turnover intentions are becoming more threatening factors for HRM professionals in companies. The potential that lies in financial participation, as employees' reward techniques, relates to ownership. If employees own a certain amount of ownership in the company in which they work, such as shares (equity securities according to Rydqvist et al., 2014), they will be focused on securing their share of ownership, increasing value because they know that if there is a loss in the company, there would be a decline in the value of their share owned by the company. Also, financial participation could reduce the agent-principal problem, since managers, that would have shares in companies where they are employed, would be more oriented to business goals and organizational performance, to increase the value of the companies, and by that, their value. According to Denis et al. (1997), "as managers' ownership stakes increase, they bear a greater fraction of the costs associated with value-reducing actions and are therefore less likely to adopt policies that reduce shareholder wealth" (p. 140). McConville et al. (2020) found that employees' share ownership schemes led to a greater sense of inclusion of employees, which is important for enhancing their loyalty and satisfaction.

Although there are many observed benefits of financial participation, companies from the sample in the CEE countries still use them on a lower level. McConville et

al. (2020), based on semi-structured interviews with 37 participants in nine companies in the United Kingdom, found that employees felt that share ownership schemes had "not increased their motivation, commitment or performance because they were already exhibiting these at a high level, as any good employee should" (p. 2340). Also, employees stated that the payoff of that kind of incentive is too in the future so they can't feel the real effect in present.

Future directions of research development are reflected in getting a larger sample, as well as in a deeper analysis of the financial participation in corporations in the CEE countries and organizational and workers performances.

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ЕКОНОМИКА

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GREEN SUPPLY CHAINS AND GLOBAL
COMPETITIVENESS OF COMPANIES

Abstract

Companies are increasingly incorporating both social and environmental sustainability into their business activities. Ethical issues along with environmental and labor protection issues are integral components of the supply chain strategy. By implementing the concept of green supply chain, the level of sustainability, supply continuity and long-term business efficiency are improved. Positioning modern supply chains in the context of a green economy and a dynamic business environment is a matter of work. The key goal of this paper is to identify the business implications of the relationship between green supply chains, the environment and economic, social and environmental performance, based on the analysis for the field of research of relevant scientific sources, and to propose a model of "greening" of classic supply chains. of benefit to researchers and company managers. The research contribution of this paper is reflected in the achieved level of development and degree of implementation of sustainability practices in global supply chain management practices, overview of concepts, paradigms and research in the field of green supply chains over a period of twenty years, as well as in examining the impact of leading global supply chains on three main aspects of the environment - climate, water resources and forests. The paper is structured according to the IMRAD principle. The first part points out the different theoretical coverage of the concept of green supply chain. Then a green supply chain model is proposed. Analysis of the development perspective and discussion on the impacts of green chains on the environment is a key topic of the next part of the paper.

Keywords: *sustainable development, green economy, environmental performance*

JEL classification: *M11, M14*

ЗЕЛЕНИ ЛАНЦИ СНАБДЕВАЊА И ГЛОБАЛНА
КОНКУРЕНТНОСТ КОМПАНИЈА

Апстракт

Компаније све више инкорпорирају социјалну и еколошку одрживост у своје по-словне активности. Етичка питања и питања заштите животне и радне среди-

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*не представљају интегралне компоненте стратегије ланца снабдевања. Импле-
ментацијом концепта зеленог ланца снабдевања, унапређује се ниво одрживости,
континуитет снабдевања и дугорочна пословна ефикасност. Позиционирање са-
времених ланаца снабдевања у контексту зелене економије и динамичног пословног
окружења, представља предметно одређење рада. Кључни циљ рада је да се, на
бази анализе за подручје истраживања релевантних научних извора идентификују
пословне импликације односа између зелених ланаца снабдевања, животне средине и
економских, социјалних и еколошких перформанси, као и да се предложи модел "озе-
лењавања" класичних ланаца снабдевања који ће бити од користи истраживачима
и менаџерима компанија. Истраживачки допринос овог рада огледа се у приказу
достигнутог нивоа развијености и степена имплементације пракси одрживости
у управљачке праксе глобалних ланаца снабдевања, прегледа концепата, парадигми
и истраживања из области зелених ланаца снабдевања у периоду од двадесетак
година, као и у испитивању утицаја водећих глобално присутних ланаца снабде-
вања на три главна аспекта животне средине – климу, водне ресурсе и шуме. Рад је
структуиран по ИМРАД принципу. У првом делу се указује на различита теоријска
обухватања концепта зеленог ланца снабдевања. Затим се предлаже модел зеленог
ланца снабдевања. Анализа развојне перспективе и дискусија о утицајима зелених
ланаца на околину кључна је тема наредног дела рада.*

Кључне речи: *одрживи развој, зелена економија, еколошке перформансе*

Introduction

The irresponsible behavior of people towards nature reaches destructive proportions. Therefore, it is necessary to focus people and companies on the issues of sustainability of the planet and determine the rules that should regulate human behavior. Accelerating global warming and reducing biodiversity are just some of the phenomena that have called into question the survival of the planet as we know it today, while unplanned and irresponsible actions by industry are a potential threat to sustainability (Stoian, 2021). The effects of these changes are visible on several levels. On the economic aspect, they are manifested by the emergence of a "green" economy, which is based on "sustainable society" and "sustainable use of resources."

Sustainable development and environmental protection at the global level are recognized as imperative. As the public becomes more aware of environmental issues, consumers will ask more questions about the products they buy, about how green companies 'production processes are, what level of their carbon footprint is, and how much attention is paid to recycling. In today's business world, where competition is no longer at the level of individual firms, but at the level of supply chains, and the requirements for achieving environmental efficiency are high on the list of business priorities, integrating environmental management practices along the entire supply chain is essential. Implementing the green supply chain management concept is an important innovation that provides organizations with a win-win strategy in terms of reducing risk and environmental impact, maintaining a competitive advantage, achieving business profit and market share goals. The supply chain should be managed in such a way that, in parallel with the reduction of costs, the minimum

negative impact on the environment and the maximum increase of social utility are enabled (Sahaidak, et al., 2022). In this way, the concept of a green supply chain, which, without neglecting the economic dimension, focuses on the social, regulatory and environmental aspects of business, has become more important.

Theoretical backgrounds and literature review

Green economy implies an economy that leads to improved human well-being and social equality, while significantly reducing environmental risks and environmental scarcity (UNEP Green Economy Initiative, 2008). At the core of the green economy is the commitment to emit low-carbon processes, use natural resources efficiently and achieve social inclusion (European Commission, 2015). Sustainable Development (SD) means development that meets the needs of the present without compromising the ability of future generations to meet their needs (WECD, 1987).

In a green economy environment, respecting social and environmental issues at the supply chain level in the direction of achieving a symbiosis between industrial development and environmental protection is crucial (Wang & Dai, 2018). Key companies in the chain need to take social and environmental responsibility and help other companies incorporate environmental standards into their business practices (Neumuller et al., 2016). Any failure in such efforts can lead to the erosion of the reputational capital of the entire chain (Burritt et al., 2011). By the late 1980s, researchers encouraged more responsible and comprehensive implementations of environmental care practices in supply chain management (Shi et al., 2013). The paradigm shift, ie the transition from traditional to green supply chain, respecting environmental repressions, and the affirmation of the concept of the green supply chain as an effective tool for managing proactive manufacturing firms comes somewhat later (Zhu et al., 2008). While the traditional supply chain focuses on issues such as: 1) determining the most efficient production/distribution schedule and optimal locations of distribution centers; 2) optimizing raw material stocks and the number of participants in the chain; 3) determining the most appropriate tasks for production facilities; 4) customer/supplier relationship management (Fiksel, 1996, p. 54), until greening of phases and activities of entities within the supply chain implies rational use of limited natural resources, energy efficiency, reduction of risk of water contamination, reduction of greenhouse gas emissions, management waste, recycling, reduction of packaging materials (Geyer & Jackson, 2004), and due to improved return on investment, adoption of regulations, risk minimization, product differentiation, cost reduction, increased efficiency, ethical reasons (Dubber-Smith, 2005). The implementation of environmental requirements and green practices adapted to them creates significant differences in the relationship between traditional and green supply chains (Table 1).

Table 1: Comparative overview of traditional and green supply chain

Variables	Traditional supply chain	Green supply chain
The goal	Maximizing economic benefits	Balance between economic, social and environmental benefits
Management structure	Operational, financial and strategic performance are measured	Environmental performance is also measured
Relations with the suppliers	Short-term relationships	Long-term relationships based on respect for environmental criteria in the selection of suppliers
Business model and business process	The concept of "from the cradle to the grave" - from input suppliers to end users	The concept of "cradle to reincarnation" - from input suppliers to waste management
Return flows	Only for municipal waste	For all types of waste, recycling

Source: Kumar & Kumar, 2013; Hosseini, 2016, p. 161.

The importance of respecting the principles of sustainability and redesigning traditional supply chains in the direction of their "greening", in recent years has been recognized by business entities globally. The concept of green supply chain is becoming increasingly relevant, both in developing economies (Malaysia, Thailand, Egypt, Iran) (Eltayeb et al., 2011; Zailani et al., 2012; Hamdy et al., 2018), and in developed countries (USA, Germany, Japan) (Laosirihongthong et al., 2013). The green supply chain is a holistic concept and as such implies that the integration of environmental criteria into the business philosophy of the production organization is accompanied by cooperation with suppliers towards their further integration into the supply chain and engagement of other actors such as shareholders, authorities and NGOs (Wong et al., 2015). This concept is gaining popularity as eco-efficiency and reproduction processes become important means of achieving best practices (Fortes, 2009), and minimizing waste generated in production is a priority (Hosseini, 2016, p. 161). There are different definitions of the green supply chain in the literature. Some authors define it as a set of activities ranging from green shopping to fully integrated environmental practices at the level of suppliers, producers, customers and river logistics, thus "closing the loop" of sustainability throughout construction (Zhu & Sarkis, 2004). Others (Large & Thomsen, 2011) state that this is a concept popularized by the expansion of learning about corporate environmental management and environmentally sound production strategy, at the core of which are four key factors - (1) the possibility of "greening" supply, (2) strategic procurement management, (3) achieved level of environmental commitment, (4) cooperation with suppliers in terms of operationalization of green practices. There are also those who equate the green supply chain with a set of practices aimed at influencing, controlling and supporting the environment by allocating possible material resources and redefining organizational responsibilities and procedures (Kim et al., 2011), or consider it a combination of production and supply chain and reverse logistics chain used products (Sheu et al., 2005), and a fundamental philosophy of sustainability management, included in all processes and decisions in the entire supply chain (Klumpp, 2018). However, the theoretical definition according to which the green supply chain implies the incorporation of environmental thinking into management practices, product design, procurement and selection of materials, the process of production and delivery to final consumers, as well as product management after its end of life (Srivastava, 2007).

When it comes to research achievements in the field of green supply chains, relatively few papers focus on the methodology of green supply chain management (Govindan et al., 2015; Soda et al., 2016), more of them deal with specific aspects and practices of green chains (Islam et al., 2018). Moreover, some authors emphasize the distinction between "green" supply chain and "sustainable" supply chain (Fahimnia et al., 2015), or talk about "environmental supply chain management" (Sharfman et al., 2009), management. sustainable supply network "(Tseng et al., 2018). An overview of significant research in the field of green supply chains is given in Table 2.

Table 2: Summary of previous green supply chain studies

Source	Research goals	Findings
Holt R. (2005)	Identify potential links between GCSM and environmental performance, economic performance, and competitiveness	Greening the different phases of SC leads to integrated supply, which ultimately leads to greater competitiveness
Vachon S. (2007)	Examining the link between green supply chain practices and the choice of environmental technologies	The results show that environmental cooperation with suppliers is associated with greater investment in pollution prevention, while such cooperation with customers does not lead to the adoption of preventive technologies.
Walker et al. (2008)	Exploring the factors that drive or hinder private and public sector organizations in implementing GSCM initiatives	Internal factors of the organization, legislative and regulatory framework, customer expectation, market forces, social factors, suppliers
Zhu Q. et al. (2008)	Investigate whether the size of organizations plays a role in the adoption of the GSCM	The success of GSCM implementation does not depend on the size of the organization
Holt & Ghobadian (2009)	Environmental sustainability testing through SC management on a sample of producers in the UK	Regulations, social factors, customer pressures, internal factors are determinants of the introduction of green SC management
Soler et al. (2010)	Describe the use of environmental information in different phases of food SC management in Sweden	The consumer should be regarded as an important actor of SC, the correct transaction of information on consumer preferences in the relevant green SC allows to avoid distortion of information
Duarte et al. (2011)	Develop a conceptual model that integrates lean and green supply with the BSC approach on performance measurement of SC	Linking performance measurement systems to lean and green practices leads to better positioning of all entities in the chain
Luthra et.al (2011)	Develop a structural model of barriers to GSCM implementation in the automotive industry	Eleven variables have been identified, the most important of which are market competition and uncertainty, lack of green practices, costs, environmental ignorance of customers, lack of government support

Pandya et al. (2012)	Investigation of the external factors affecting green SC and understand the link between green practices and environmental, operational and financial performance in the context of the Indian pharmaceutical industry	Environmental regulations and environmentally conscious suppliers, consumers and the local community can improve a firm's performance
Laosirihongthong et al. (2013)	Examining the application of proactive and reactive practices in GSCM and their impact on the environment, economic and intangible impact	Proactive practice - green procurement, ecodesign, river logistics; Reactive practice - legislation and regulations
Tachizawa et al. (2015)	Analysis of the interrelationships between environmental drivers, GSCM practice, and performance	A multiple positive correlations was observed to exist between the given variables
Kuei et al. (2015)	Identification of critical factors influencing GSCM adoption and associated performance	Technological, internal (organizational), external (from the environment)
Lee S.Y. (2015)	The impact of green supply chain management on supplier performance through the accumulation of social capital	Greening the supply chain can increase its social capital, through a focus on frequent communication and common goals between partners, deepening mutual understanding and motivating customers to be directly involved in product decision-making.
Shen et al. (2017)	The issue of SC sustainability in the textile industry	Some consumers are willing to pay more for sustainable products, especially when it comes to clothing
Correia et al. (2017)	Factors and actors of greening SC	Pressures to implement the concept of sustainability through the supply chain come from internal and external actors, such as customers, government, NGOs

Source: Authors

Research Design and Hypothesis

Over time, there have been numerous efforts to propose a comprehensive, practical, multidimensional conceptual green supply chain conceptual framework that would incorporate the relevant dimensions of green practices, and their implications for the performance set. Thus, some authors emphasize greening of procurement (Hajikhani et al., 2012), and environmental aspects of internal environmental management through green shopping, cooperation with clients, eco-design, sustainable investments (Hamdi et al., 2018). Green supply chain, green construction, green operations and maintenance, reverse logistics (Wibowo et al., 2018), or green transport, green construction and waste management are identified as elements of the green supply chain (Balasubramanian, 2017). Similarly, "green" components are added at all stages of the product life cycle and all activities, with the aim of ensuring long-term benefits and minimizing negative impacts on the environment and society (Dadhich et al., 2015). More about research on

activities and processes within the supply chain that need to be made sustainable can be seen in Table 3.

Table 3: Different conceptual frameworks of green supply chain dimensions

Dimension of SC	Description	Source
Green procurement	Purchase of eco-friendly products that have a green label, cooperation with suppliers in terms of achieving environmental goals, adoption of environmental management systems	Vachon & Klassen (2008), Zhu et al. (2008), Perotti et al. (2012), De Giovanni & Vinzi (2012), Esfahbodi et al. (2016), Laari (2016), Hamdy et al. (2018)
Green design	Products and production processes designed to reduce material/energy consumption, products intended for reuse, recycling, products designed to avoid or reduce the use of hazardous products, cooperation with customers to develop eco-design	Zhu et al. (2008), Esfahbodi et al. (2016), Hamdy et al. (2018)
Green production	Optimization of production processes to reduce emissions of harmful gases into the air, depletion of water resources, reduction of waste and noise, use of cleaner production technologies and best practices, establish a system of recycling waste products	De Giovanni & Vinzi (2012), Zailani et al. (2012), Wang & Dai (2017)
Green distribution	Coordination with customers on the development of green transport packaging, reform of logistics and transport systems, monitoring and monitoring of emissions from product distribution	Zhu et al. (2008), Green et al. (2012), Perotti et al. (2012), Yang et al. (2013), Esfahbodi et al. (2016), Laari (2016), Hamdy et al. (2018)

Sources: Authors

By adopting GSCM (Green supply chain management) practices, supply chain participants are affected in different ways depending on the type of industry and the context in which it is examined (Chiou et al., 2011), the performance of individual phases in the supply chain determines the performance of other members (Wang & Dai, 2017). In this regard, the impact of green procurement and innovation on the environment was analyzed (Khaksar et al., 2016), it was examined how green supply chain practices can contribute to improving the company's performance in terms of environment, economic and operational outcome (Hamdy et al. , 2018), a model was developed to investigate the existence of a positive correlation between green packaging and sustainable economic, environmental and social impact (Zailani et al., 2012). Some authors also mention an additional dimension of performance in green supply chains - brand image (Testa & Iraldo, 2010), often characterized as an intangible outcome (Eltayeb et al., 2011). An overview of the multilayer performance of the green supply chain is given in Table 4.

Table 4: Conceptual framework of green supply chain performance

Dimension SC	Description	Source
Economic performance	Economic performance means savings in material procurement costs, energy consumption, waste treatment and waste disposal fees, reduction of fines in case of liability for causing an environmental accident.	Zhu et al. (2008), Zailani et al. (2012), Green et al. (2012), Das (2018), Laari (2016), Pereira-Moliner et al. (2012)
Social performance	The social impact is reflected in the improvement of employment opportunities, training and development of employees, donations, work on eradicating all forms of inequality, participation in the fight against poverty.	Zhu et al. (2016), Das (2018)
Ecological performance	They include the benefits of reducing waste and waste costs, reducing the consumption of toxic materials and energy, reorienting to alternative energy sources, renewable resources and clean technologies, reducing the frequency of environmental accidents, increasing revenue by converting waste into new products, reusing valuable and recycled materials, returned product components by implementing efficient product return programs.	De Giovanni & Vinzi (2012), Yang et al. (2013), Laari (2016), Zhu et al. (2008), Das (2018)**,** Muma et al. (2014)**,** Cosimato & Trosi (2015)

Sources: Authors

Based on the analysis of conceptual frameworks developed so far, it has been shown that strong interaction of sustainability practices in all dimensions of the supply chain, proactive monitoring of effects on triple performance indicators and a high degree of environmental collaboration throughout the chain, results in significant benefits for both chain companies and Society (Paulraj, 2011). Conversely, respect for environmental regulations, adoption of eco standards and cooperation in the implementation of green postulates, is a key relational capability that facilitates the strategic formulation and execution of the green supply chain management concept (Eriksson & Svensson, 2015). In line with all the above, the green supply chain management model could be designed as shown in Figure 1. The proposed design is also based on the idea that through long-term cooperation and strong interaction of all elements and dimensions of sustainability between all participants in the chain supplies, can achieve above-average financial results and social well-being.

Figure 1: Conceptual model of the green supply chain

Sources:Authors based on Chandra & Kumar, 2000.

In accordance with all the above, the following hypothesis will be tested in the continuation of the paper:

H: *In an era of intensifying environmental problems and accelerating the expansion of the green economy, it is essential to preserve and improve company performance by redesigning traditional supply chains in terms of implementing green business practices.*

In order to confirm the truth of the hypothesis, and guided by the proposed conceptual model, the impact of leading globally present supply chains on three main aspects of the environment - climate, water resources and forests - will be examined.

Research results and Discussion

The achieved level of development and perspectives of green supply chains in the international framework will be reviewed on the basis of data from the CDP (Carbon Disclosure Project Supply Chain Report 2018/19), which includes 115 leading organizations worldwide and 5,545 suppliers based in 90 countries, through three aspects: *1) impact on climate, 2) impact on forests and 3) impact on water resources.*

When it comes to the aspect characterized as the impact on the climate, the emission of greenhouse gases caused by the activities of suppliers, in 2018, reached 7.268 million tons of CO2. During the same period, the upstream supply chain recorded a reduction in emissions of 633 million tons of CO2, which is more than 1% of all current global emissions and represents a significant improvement compared to the level of emissions in 2017 when it was 551 Mt CO2. The savings were accompanied by financial benefits of $ 19.3 billion, up from $ 14 billion reported in the previous year, and were made possible by improved energy efficiency and reduced process emissions. The achieved reduction per company averages 6%, while 27% of energy comes from renewable sources (Table 5).

Table 5: Impact of SC on climate change, by sectors

	Total	North America	Latin America	China	Japan	Rest of Asia	Europe	Africa
No. of SC (suppliers)	5.545	1.721	869	519	538	448	1.312	5
% reporting scope 1	75%	72%	65%	74%	92%	74%	80%	58%
Total scope 1 emissions(tCO₂e)	5.556.239.578	1.390.625.075	1.496.649.887	104.661.632	432.388.304	332.040.273	1.390.625.075	71.872.839
% reporting scope 2	58%	54%	37%	56%	80%	63%	67%	36%
Total scope 2 (market-based; tCO2 e)	1.712.243.246	323.291.134	506.899.688	264.665.760	117.400.979	137.491.568	328.062.578	13.869.036
% reporting upstream scope 3	33%	28%	34%	33%	42%	32%	37%	36%
Total upstream scope 3 (tCO2 e)	3.210.954.073	995.205.162	506.381.090	12.767.263	286.110.710	307.341.925	1.048.043.642	2.404.101
% with emission targets	47%	36%	19%	61%	84%	57%	56%	24%
No. with reduced emissions	1.582	495	134	160	165	131	456	6
No. with science-based targets	94	28	1	0	21	3	39	0
% engaging upstream suppliers	35%	31%	25%	25%	38%	30%	50%	24%

Source: CDP Supply Chain Report, 2018/19, p. 38.

Based on data collected from 33% of suppliers, on average emissions at the level of the entire supply chain 5.5 is higher than the direct impact of the company, although there are differences between sectors, which is just another finding that supports the view that greening overall processes and chain activities crucial for minimizing adverse effects on climate and ecosystems in general (Figure 2).

Figure 2: Relationship of supply chain and direct greenhouse gas emissions

Source: CDP Supply Chain Report, 2018/19, p. 18.

When it comes to the aspect of impact on forests, it turned out that 305 suppliers from the sample responded to requests for conservation of forest resources, which is an increase of 247% compared to the level of 2017. Only 17% of suppliers could identify forest, plantation or farm from came the raw material that entered his goods. Wood products, palm oil, soybeans and rubber are considered key goods to which the risk of deforestation is linked. Similarly, 17% of suppliers reported setting any deforestation targets, and 17% said they were working outside the first level to mitigate forest-related risks. The total financial impacts related to risks related to the production, consumption and trade of forest goods in 2018 amounted to USD 23 billion (Table 6).

Table 6: Impact of SC on forest resources

	Total	North America	Latin America	China	Japan	Rest of Asia	Europe	Africa
No. of SC (suppliers)	305	80	129	5	24	19	41	1
No. with forests risk assessment	142	45	34	0	15	10	33	1
No. with targets	62	19	8	0	11	1	20	1
No. with deforestation policy	69	24	9	0	14	2	17	1

Izvor: CDP Supply Chain Report, 2018/19, str. 38.

When it comes to the aspect of impact on water resources, during 2018, 1,709 suppliers took measures in terms of more rational use of water resources. There has been an improvement in the approach to measuring and managing water resources, as indicated by the increase in reported water-related targets, from 51% in 2017 to 69% in 2018, while

17% of suppliers indicated an interest in further engagement with their partners on the topic of water supply. Overall, the data shows significant progress compared to 2015 - 50% more companies integrate water quality into their risk assessments, 65% more companies set water pollution reduction targets, 104% more report withdrawals, discharges and water consumption. In 2018, the results showed that 329 companies consider water efficiency to be a strategic, operational or market opportunity. $62 billion of revenue generated from the management of identified water safety risks was also reported (Table 7).

Table 7: Impact of SC on water resources

	Total	North America	Latin America	China	Japan	Rest of Asia	Europe	Africa
No. of SC (suppliers)	1.709	408	364	121	287	130	368	18
Reported water withdrawal volume	1.116	269	234	66	189	82	256	12
No. with water risk assessment	962	212	175	85	158	77	237	12
No. with water targets	1.182	262	241	99	188	100	274	9
No. with public policy on water	545	118	59	55	124	58	128	2
% engaging upstream suppliers	17%	23%	8%	7%	19%	16%	21%	6%

Source: CDP Supply Chain Report, 2018/19, page 38.

According to data for 2018, 43% of supply chains, members of the CDP Supply Chain program declared that they use environmental performance as a criterion when choosing suppliers to work with, while 30% of them emphasize their intention to introduce such a process in the future, in compared to only 4% in 2008. All of the above speaks in favor of the fact that green supply chains are recognized as important on a global level, that they have largely come to life and that they will experience expansion in the period that follows.

Conclusion

In the last decade, there has been an increase in interest, both in scientific and business circles, in the functioning of green supply chains. It has been found that in order for a particular chain to be considered green, all of its activities must fully implement green initiatives in their operations. In this regard, the existence of specialized strategies and numerous examples of implementation of green practices in procurement, production, distribution and marketing has been identified. It is also pointed out that the connection between the implementation of green initiatives within the supply chain and the competitiveness of such a chain is the subject of numerous studies, the analysis of which concluded that theoretical arguments unequivocally indicate that environmentally conscious business leads to competitive advantage, while there is no absolute consensus related to empirical research testing this claim.

The contribution of this paper is reflected in the analysis of the achieved level of development and the degree of implementation of sustainability practices in the

management practices of global supply chains, as well as reviews of concepts, paradigms and research in the field of green supply chains over twenty years. The paper emphasizes that the incorporation of care for sustainable development, assessment of the impact of business activities on the environment and society, as well as risk management of environmental degradation, at the level of supply chains, and through greening activities and processes that take place in it, as an inevitability, and on the path of expansion and development of corporate entities in an environment of green economy and turbulent business life. In this way, the initial hypothesis was proven that the intensification of the risk of environmental disasters leads to the emergence of new, green business patterns and practices, that green supply chains are gaining momentum and slowly suppressing traditional supply chains, since only they are sufficiently flexible, resilient and monitored. , measuring and maintaining a balance between ephonomic, social and environmental performance.

The limitation of this research is that it did not examine the extent to which the business performance of companies that constitute green supply chains is superior to those that continue to operate under the auspices of traditional chains, and that no analysis of the representation, transparency and frequency of environmental performance reporting was performed. , both at the level of multinational supply chains and those in the Republic of Serbia. This can serve as a starting point for future research.

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SELECTION OF VARIABLES IN THE FUNCTION OF IMPROVING THE BANKRUPTCY PREDICTION MODEL

Abstract

The significance of early disclosure of the probability of launching a bankruptcy proceeding leads the authors to develop a model of high prediction power. In this way, the authors use different variables and statistical tools, and techniques. The impact of the economic environment and data availability limits the introduction of certain variables in bankruptcy prediction models. The paper aims to explore attitudes in existing literature regarding the selection of variables used to develop models for predicting bankruptcy, their characteristics, limitations, and impact on the power of predictions. The labor findings show that the historical character of the data and the conservative approach to financial reporting have turned authors to the use of non-financial and market variables. For the most part, efficient markets absorb all external and internal information and future predictions, which are read through market prices. However, this assumption does not apply to less developed markets, and the use of market variables is questionable. In conditions of increased systemic risk, macroeconomic variables can be good indicators for predicting the likelihood of bankruptcy. Developing a model for predicting bankruptcy requires looking at the economic environment and choosing variables that correspond to existing business conditions. With the changing economic environment, adjustment of the model needs to be made so that the accuracy of the forecast does not decrease.

Key words: *financial variables, non-financial variables, market variables, statistical variables, bankruptcy forecasting model.*

JEL classification: *G33*

ИЗБОР ВАРИЈАБЛИ У ФУНКЦИЈИ УНАПРЕЂЕЊА МОДЕЛА ЗА ПРЕДВИЂАЊЕ СТЕЧАЈА

Апстракт

Значај раног откривања вероватноће покретања стечајног поступка предузећа наводи ауторе на развијање модела високе моћи предвиђања. При томе, аутори користе различите варијабле и статистичке алате и технике.

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Утицај привредног амбијента и доступност података ограничава увођење одређених варијабли у моделе за предвиђање стечаја. Рад има за циљ да истражи ставове у постојећој литератури у вези селекције варијабли које се користе за развијање модела за предвиђање стечаја, њихових карактеристика, ограничења и утицаја на моћ предвиђања. Налази рада показују да су историјски карактер података и конзервативни приступ у финансијском извештавању окренули ауторе на употребу нефинансијских и тржишних варијабли. Највећим делом, ефикасна тржишта апсорбују све екстерне и интерне информације и будућа предвиђања, што се очитава кроз тржишне цене. Међутим, за мање развијена тржишта, ова претпоставка не важи, те је и употреба тржишних варијабли упитна. У условима повећаног системског ризика макроекономске варијабле могу бити добри индикатори за предвиђање вероватноће покретања стечаја. Развијање модела за предвиђање стечаја захтева сагледавање привредног амбијента и бирање варијабли које одговарају постојећим условима пословања. Са променом привредног амбијента потребно је извршити и кориговање модела како се прецизност предвиђања не би смањила.

Кључне речи: *финансијске варијабле, нефинансијске варијабле, тржишне варијабле, статистичке варијабле, модел за предвиђање стечаја*

Introduction

When developing a bankruptcy prediction model, the most crucial issue is choosing variables that will predict the likelihood of bankruptcy proceedings with the utmost accuracy. A large number of authors use variables that have been used in previous studies. According to the du Jardin survey (2009), 40% of the studies analyzed use variables used in earlier research.

How certain variables can be important for predicting bankruptcy in a country, with a change in the business environment and the impact of the same variable can vary. Therefore, some authors choose to explain more variables and use specific statistical techniques to obtain the optimal number of variables that define the likelihood of going bankrupt.

Most studies use account schedule indicators that describe a company's operations using data from financial statements. Nevertheless, to increase the model's predictive power, authors also introduce statistical, non-financial or market variables in addition to financial coefficients. Given the economic environment and availability of data, the use of certain variables can be limiting.

The paper aims to explore existing attitudes in the literature regarding the selection and application of different types of variables, their characteristics, usage limitations, and their impact on the accuracy of bankruptcy predictions in different economic environments.

The paper uses an analysis method, a descriptive analysis that describes the characteristics of individual types of variables and how they are collected, concerning the most commonly used variables in bankruptcy prediction models. On the other hand, the detailed analysis seeks to explain the use-value and limitations of individual variables through the views of authors derived from empirical research conducted in markets of varying degrees of development and different time frames. The paper covers studies from 1973 to 2010. The comparative analysis

highlights the authors' similar and other views and conclusions regarding the pros and constraints and the recommendation of using certain variables to predict bankruptcy.

The paper is structured as follows: In the first part of the paper (now these numbers depend on whether you number the introduction, so correct it if necessary) are presented with financial analysis indicators, and data read from financial statements used to develop a model for predicting bankruptcy. The second part of the paper highlights the karate of non-financial variables. Then, the third part of the paper describes market variables with comparative power to predict models that use accounting and market data. The fourth part of the paper explains the use of statistical variables, with a view to the most commonly used. The conclusion summed up the survey results with main contributions and limitations of paper and the direction of future research.

Use of financial analysis indicators and financial statements to develop models for forecasting company bankruptcy

Financial indicators based on data from financial statements are the basis of models that analyze the business creditworthiness of the company, predict future business and the risk of bankruptcy. In addition to financial ratios, financial variables can be used to develop a model for predicting bankruptcy, including data from financial statements that can be used independently, such as the number of cash flows, sales revenues, the value of business assets, etc. However, the use of financial ratios in bankruptcy prediction models is much more common.

Financial ratios can analyze a company's business and track its movements over time as an efficient tool for summarizing large amounts of data. With the help of financial ratios, it is possible to compare the strengths and weaknesses of companies within the same business activity by quantifying specific aspects of the business. On the other hand, financial ratios are not comparable between companies of different industries, as they face other risks, capital requirements, and competition (Gill, 1994).

There are many financial ratios that can be calculated using data from financial statements, but only a specific, smaller set of ratios affects the prediction of company bankruptcy. Based on the characteristics that describe companies, financial ratios can be classified into several commonly used groups (Brealey, Myers & Marcus, 2001, p. 134-144):

- Debt ratio. Companies can be financed by borrowing from creditors. On that occasion, they undertake to pay part of the principal and the corresponding interest within the agreed terms. Debt is used for investment and, together with its own sources of financing, increases returns to shareholders in good business conditions. Also, in poor business conditions, the debt reduces the return to shareholders, bearing in mind that even then the company's obligation to repay the debt does not end. Debt ratios show how much debt an enterprise can take by comparing long-term debt with equity or long-term tied sources of financing, total liabilities with operating assets, or the ratio of profit before interest and taxes to interest expense.
- Liquidity ratio. An important segment of the analysis is the assessment of the company's solvency and fulfillment of due obligations. For that purpose,

the liquid assets that the company has at its disposal are considered, which can be easily transformed into cash. Compared to fixed assets, whose book value often does not correspond to the market value, with the most liquid form of working capital, it is easy to establish cash value on current accounts. However, the problem in liquidity analysis may arise due to the nature of working capital. Namely, working capital changes its shape quickly and easily, and liquidity ratios calculated based on financial statements are often outdated. In addition, companies can settle stocks before the end of the year, which will increase the company's liquidity and point out wrong conclusions. On the other hand, an increase in trade receivables or inventories without an increase in sales revenue may indicate inefficient management of these accounts, leading to future write-offs and losses rather than improved liquidity. It is therefore suggested that the liquidity ratio should be analyzed together with the efficiency ratios. The most commonly used liquidity analysis is the current, rigorous and cash liquidity ratio and the ratio of net current assets and operating assets. However, Mills and Yamamura (1998) argue that cash flow information may be more reliable for determining liquidity due to the historical nature of balance sheet positions.

- Efficiency ratio. Efficiency analysis is conducted in order to obtain information on how efficiently the company uses its resources. The following ratios are most often analyzed depending on the form of assets: asset turnover ratio (sales revenue / average operating assets) and inventory turnover ratio (costs of sold products / average value of inventories).

- Profitability ratio. The focus of observing profitability is the profit that the company makes. The analysis of the profit margin examines the share of sales revenue in net profit. If the company is financed partly from debt, then the profit is distributed to the company owners and creditors. In this case, the profit margin is calculated by comparing the sum of net profit and interest expenses with sales revenue. A significant indicator of profitability is the rate of return on operating assets, which is calculated by comparing net profit (or net profit increased with interest expenses) and average operating assets. Suppose the ratio of net profit and average value of capital is taken into account. In that case, the rate of return on capital is obtained, which shows how much profit the company generates on the engaged equity (Tomašević, Jović, & Vlaović Begović, 2019, p. 296).

Financial ratios are easy to apply, they do not require special skills for their calculation. However, the quality of the financial results obtained depends on the quality of the financial statements. Internal and external users should receive high-quality information on the company's operations based on financial reports, through financial ratios. Although there are different definitions of quality, international bodies and standard-setting committees consider that the quality of accounting information implies the reliability and transparency of data in financial statements (Camacho-Minano, & Campa, 2014, p. 77). Even assuming that the financial statements reflect an accurate and fair presentation of the company's operations, these are data relating to past events, "without appropriate guidance for future action, which may represent an improvement or deterioration in performance" (Prošić, 2014, p. 177).

These shortcomings of financial statements warn that business decisions should not be made solely based on analysis using financial statements, without the use of additional information. Decision-makers need information that they do not find in the financial statements concerning its performance and forecasting future business. For this reason, a new, integrated approach is emerging that combines financial and non-financial data for the purpose of evaluating the company's operations (Krstić, & Bonić, 2013).

Non-financial variables for developing a bankruptcy prediction model

There are a large number of non-financial variables that can be monitored and observed. The correct choice of non-financial variables is crucial for making business decisions, namely the variables that accompany the implementation and success of the strategy. Managers often rely on their perception when using non-financial variables without applying statistical and mathematical methods to confirm their assumptions (Krstić, & Sekulić, 2007, p. 78), which may indicate erroneous conclusions of the analysis.

One of the ways to collect non-financial information is the collection through integrated reporting, which includes financial and non-financial information about the company's operations, which raises the quality of corporate reporting. By flexibly adapting to the needs and requirements of stakeholders, the traditional financial and economic approach is expanded and improved (Bogićević, Domanović & Krstić, 2016, p. 6). It is applied to a greater or lesser extent by the Republic of South Africa, France, Sweden, Denmark and the United Kingdom.

The issue of the content of integrated reporting is the subject of the Framework of the International Integrated Reporting Committee - IIRC (Dumay et al., 2016, p. 167), and it should provide an accurate picture of the value and performance of companies through the publication of financial and non-financial information at different times intervals relevant to all stakeholders concerned. This type of reporting has yet to be regulated and harmonized, supported by the fact that many companies, despite the lack of obligation, still disclose on a voluntary basis reports on social and environmental performance and corporate social responsibility (Knežević, & Pavlović, 2019, p.128). The popularization of integrated reporting and the linking of diverse information in reports raises the question of revision of this information in order to assure its validity and credibility for all interested users.

Integrated reporting includes information relevant to current and future business related to strategy, management, financial operations, environmental impacts, human resources, investment development, local communities and threats and opportunities (Prošić, 2015, p. 68). Comprehensive information creates a good basis for making business decisions related to strategy improvement, risk management, increasing business efficiency and the like.

In addition to the numerous advantages of integrated reporting, certain problems have been identified in practice. Namely, it is very difficult to assess and connect qualitative information related to the environment and socially responsible business with the company's financial business. In addition, the problem of presenting intangible assets in the report remains (Prošić, 2015, p. 74).

One of the most popular ways to collect non-financial information is through the Balanced Scorecard (BSC). In response to contemporary management challenges, Kaplan Norton (Kaplan, & Norton, 1992, pp. 71-79) have developed a performance measurement model that includes non-financial variables in addition to financial ones. The model was developed through the following four dimensions (Krstić, & Sekulić, 2007, p. 181):

- the financial dimension evaluating the increase in value for business owners,
- consumer dimension that measures consumer satisfaction,
- dimension of internal processes that measure the efficiency of purchase, production, distribution and other functions in the company,
- dimension of learning and growth that measures the quality of human resources and their innovation.

In the company's bankruptcy prediction models, the authors used different non-financial variables. Some of them are presented in Table 1.

Table 1: Non-financial variables

Non-financial variables	Research study
Audit opinion indicator (1 if clean, 0 otherwise) Audit qualification indicator (1 if qualified, 0 otherwise) Number of years of financial statements in the database Number of consecutive years negative net income The number of consecutive years sales decline	Marais, Patell, & Wolfson (1984)
% Δ Industry output * Cash flow/Sales % Δ Industry Output * Total debt/Total assets % Δ Company sales / % Δ Industry output	Platt, & Platt (1991)
Auditor Auditor opinion Number of years of income drop Number of years of negative profit Number of employees	Leshno, & Spector (1996)
Complexity of capital structure defined by number of major classes of debtholders Degree of competitiveness as measured by the Herfindahl–Hirschman Index 1 if the fraudulent activity was observed, 0 otherwise 1 if resignation by top management took place around the filing date, 0 otherwise Ownership concentration: the total number of common shares outstanding divided by number of shareholders at the filing date Firm age: measured by months from incorporation date to the bankruptcy filing date	Barniv, Agarwal, & Leach (1997)
Gross domestic product growth	Bryant (1997) Li, & Faff (2019)
Manager Work Experience Company position on the market The technical structure of the building Organizational staff The competitive advantage of a company Market flexibility	Greco, Matarazzo, & Slowinski (1998)

Industry position Personnel and staff hiring policy Technology development and quality innovation Market niche/trend Pricing competitive advantage International competitive advantage Profit perspective Quality of management Relationship between labor and capital Working conditions and welfare facilities Industry reputation Growth potential	Park, & Han (2002)
Federal Budget/Gross Domestic Product Government Spending/Gross Domestic Product Money Supply 1 Money Supply 2 Short-Term Interest Rate Spread between Short-Term and Long-Term Interest Rate Consumer Price Index Trade Balance/Gross Domestic Product Current Account Balance/Gross Domestic Product Effective Exchange Rate Purchase Price of Crude Oil	Lam, (2004)
Retail Price Index (RPI) United Kingdom Short Term (3-month) Treasury Bill Rate Deflated	Tinoco, & Wilson (2013)
Number of employees	Stanišić, Mizdraković, & Knežević (2013)
Number of years since first registered as a corporate firm ΔGDP REPO-RATE (short-term interest rate set by the Swedish central bank)	Giordani, Jacobson, Von Schedvin, & Villani (2014)
Registered unemployment rate (urban areas) Total executive compensation (top 3 executives) Total director compensation (top 3 directors) GDP growth per capita	Jiang & Jones (2018)
Audit opinion Sum of accounting disclosures in the audit report Sum of general disclosures in the audit report	Muñoz-Izquierdo, Laitinen, Camacho-Miñano, & Pascual-Ezama (2020)

Source: Overview of authors

Macroeconomic variables can be found within the non-financial variables in the bankruptcy forecasting models. Jacobson, Linde and Roszbach (2013) examined the role of macroeconomic factors in bankruptcy prediction and found they were a significant determinant. Fejer-Kiraly (2015) believes that if there are economic changes in the time horizon in which the research is conducted and financial variables, it is necessary to include important macroeconomic variables in the bankruptcy forecasting model. In addition to accounting, market and statistical variables, Li and Faff (2019) introduced the most commonly used macroeconomic variable in the form of gross domestic product growth rates. In addition to also using the Gross Domestic Product Index as one of

the variables, Giordani and others (2014) improved their model by introducing spline function (eng. spline functions) to increase the model's predictive power.

To build a model with high predictability and practical use, Tinoco and Wilson (2013) combined accounting variables with the market and macroeconomic variables. Nam and others (2008) have shown that the introduction of macroeconomic variables in an unstable environment is important for predicting the company's bankruptcy. However, they did not extensively analyze the impact of different macroeconomic variables on the company's bankruptcy forecasting.

In certain studies, the authors suggest that specific characteristics of the company be introduced as variables for bankruptcy prediction models. Rose (1992), for example, proposed raising a human resource variable (capital), under which high-efficiency and trained human resources reduce the risk of bankruptcy. Dennis and others (1997) believe the number of business segments needs to be taken into account. If businesses differ only in size, Beaver and others (2005) believe large enterprises are less likely to file for bankruptcy. In addition to looking at the height of Wu and others (2010), they add diversification as a characteristic important for predicting bankruptcy. Stanišić and others (2013) introduced an absolute variable measuring the number of employees in their bankruptcy prediction model in Serbia, concluding that increasing the number of employees jeopardizes the company's successful operation. Bankruptcy prediction models can also include variables that describe competitive advantage, management quality, number of years of functions and other non-financial variables.

The importance of non-financial variables in predicting bankruptcy of small and medium-sized enterprises was examined by both Altman and others (2010) and concluded that the introduction of non-financial variables increases the accuracy of model predictions by 13%.

Market variables for developing a bankruptcy prediction model

Although accounting data analyzes the company's operations, the reason for the dominance of financial coefficients based on accounting data in bankruptcy prediction models is not in absolute advantage in predictive power, but in the availability of data (du Jardin, 2009, p. 5.). On the other hand, market data cannot be provided for each analyzed company. Companies that are not public and whose shares are not traded on the stock exchange do not have market data. In underdeveloped and developing countries, fewer businesses opt to go public, making the availability of market information limited.

On the other hand, in developed economies, businesses collect missing capital by going to the stock exchange, and market data is usually easy to manage. Therefore, it is no surprise that models with market variables for predicting the company's bankruptcy were developed in the 1970s. Black and Scholes (1973) and Merton (1974) felt that market value influenced future expected cash flows, thus increasing the model's predictive power. However, rigorous assumptions such as normality of yield on shares and the existence of a coupon-free loan have been made to implement these models without distinguishing between different forms of loan (Saunders &Allen 2002; Agarwal &Taffler, 2008). By comparing models based on accounting variables and market models, the researchers came to different conclusions. While Agarwal and Taffler (2008) believe that accounting-

based models are not inferior to market-based models, Hillegeist and others (2004) recommend using market-based models as providing significantly more information about bankruptcy prediction. Balcaen and Ooghe (2004) believe that if researchers use only accounting data, they imply the assumption that financial statements contain all the factors that influence the launch of the company's bankruptcy. However, because financial reports do not reflect both internal and external bankruptcy factors, Tinoco and Wilson (2013) believe it is necessary to include market data in the company's bankruptcy filing forecast. Bearing in mind that accounting variable-based models and market-based models have their advantages and limitations in the application, many researchers combined these two data sets with building a model with the highest predictive power (Shumway, 2001; Kealhofer, 2003; Oderda, Dacorogna, & Jung, 2003; Reisz, & Perlich, 2007; Campbell, Hilscher, & Szilagyi, 2008; Mai, Tian, Lee, & Ma, 2019).

Tian, Yu and Guo (2015) explored the relative importance of the different variables commonly used in studies. The authors concluded that variables based on accounting data are an effective supplement to bankruptcy prediction information based on market data on property values. Interestingly, the importance of accounting-based variables increases with an increase in the observation time horizon relative to market-based variables. Typically, the following market variables occur in bankruptcy forecasting models: market value versus book value of capital, yield per share over time, standard deviations of yield per share, etc. On the other hand, more variables based on financial statements should be included in the model in companies with excellent information asymmetry.

Statistical variables for developing a bankruptcy prediction model

In bankruptcy prediction models, authors apply statistical variables such as average, maximum, minimum, standard deviation, or variance of a particular financial account value or economic variable. Often, it is easier to handle high-value data and natural logarithm, which is an inverse function of the exponential function. The logarithmic transformation of financial indicators achieves greater accuracy of predictive models (Bradbury, 1988). Although the application of logarithmic function may increase the power of a given variable that is important for the process of regression (Altman, & Sabato, 2007, p. 343), there is a risk of losing the interpretive power of the variable reflected in the complex explanation of the variable trend, as well as the "business and economic logic of the variable itself" (Nikolić, 2014, p. 45). The table shows some of the studies that use the logarithmic transformation of the financial indicator to predict bankruptcy.

Table 2: Variables with logarithmic transformation of financial indicators

Variables	Research study
log(Total Assets/GNP price-level index)	Ohlson (1980)
log (Interest Coverage+ 15) log (Total Assets)	Frydman, Altman, & Kao (1985)
log (Tangible Asset turnover)	Karels, & Prakash (1987)
log (Total Assets) log (Interest Coverage) StDv (EBIT/Total Assets) StDv (Log(EBIT/Total Assets)	Leshno, & Spector (1996)
Natural Log of Total Assets deflated the GDP	Barniv, Agarwal, & Leach (1997)
log (Total Assets)	Korol (2013)
log (Sales) log (Total Assets)	Tian, & Yu (2017)
ln (Current assets/Current liabilities)	Gupta, Barzotto & Khorasgani (2018)
log (Total Assets) log (Sale) log (Price) log (Market Capitalization)	Mai, Tian, Lee & Ma (2019)
log (Price) log (Market Capitalization)	Cao, Liu, Zhai & Hua (2020)

Source: Overview of authors.

Standard deviation is a measure of the deviation of value from the arithmetic environment of the observed sample that can also be found as variables in the company's bankruptcy prediction models. Marais, Patell and Wolfson (1984) used as one of the variables the standard deviation of the company's common stock yield rate, while Leshno and Spector (1996) calculated the standard deviation of the business property yield rate measured through the ratio of profit before taxes and interest and business assets, and the standard deviation of the logic of the relationship between taxes and interest and business assets.

Conclusion

Most authors use financial accounts and financial statements as variables to develop bankruptcy prediction models. No analysis of a company's operations can be imagined without interpreting the value of financial accounts and financial statements. Nevertheless, the conclusions' quality is directly related to the credibility and quality of information presented in the financial reports. Adding to this, the timing and time period of financial reporting, numerous authors believe that this information alone is insufficient to decide on the company's operations and forecast future operations. For this purpose, non-financial variables related to innovation, quality of processes, products or investment

in employee training are used more and more. Some authors believe that variables should be introduced in bankruptcy prediction models that will represent specific characteristics of the company, such as human resource variables, number of business segments, etc. Based on non-financial variables, relevant areas of action should be disclosed whose improvements directly positively affect financial indicators.

The most commonly used non-financial variable is the macroeconomic variable in a gross domestic product index. An unstable environment requires the introduction of other macroeconomic variables, such as inflation or unemployment indicators.

The loss of the power of predicting financial variables, according to many authors, is compensated by the use of market data that reflects both internal and external impacts that contribute to the initiation of bankruptcy proceedings. Combining variables based on accounting and market data contributes to the development of high-power prediction models. However, in countries with underdeveloped capital markets, it is not possible to collect adequate market data that could be used to develop and implement models.

For easier handling of high-value data in bankruptcy forecasting models, logarithmic transformation of financial indicators and balance sheet positions is used. This achieves greater accuracy of predictive models.

The paper provides a comprehensive overview of empirical research related to developing bankruptcy prediction models using different variables. By drawing attention to the pros and cons of individual variables and their impact on the power of prediction in certain economic circumstances, the paper can be helpful to researchers developing new models. Although many studies are used in the paper, insufficient attention is paid to predicting bankruptcy for companies operating in emerging markets, such as Serbian.

In addition to choosing variables, developing a high prediction accuracy model also depends on choosing a classic algorithm (e.g., Discriminatory analysis, logistical regression, neural networks, etc.). Although variables are most often represented by financial coefficients that describe the company's business, the choice of variables also depends on the economic environment in which the company operates, the development of capital markets, etc. By choosing different variables and different classification algorithms, different prediction accuracy results are usually obtained. Therefore, the subject of future research will be an analysis of the impact of different classification algorithms for developing high-power models of bankruptcy start-ups, as well as limits on their use.

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AHP MULTICRITERIA DECISION-MAKING METHODIN GREEN PROCUREMENT

Abstract

The aim of this article is to research and demonstrates effectiveness of the proposed a multicriteria decision-making methodology, applied for a case of themeat processing industry for cans as a packaging material supplier selection supported by an environmental approach. There are 7 criteria of supplier selection with green dimensions identified, examined and ranked by evaluation factors, the financial, qualitative and environmental management system criteria. The results of this study will support the introduction of the environmental management system and a quality of the suppliers. Sustainable packaging in a food industry is a relatively new addition to the environmental considerations for packaging and could have a pivotal role in a green supply chain of food production, in sustainable partnerships development and a buyer's corporate green image and competencies.

Keywords:*a green supply chain image, green performance, green procurement, a multicriteria decision-making, AHP.*

JEL classification*: Q01, Q11, Q56, Q57, C44*

МУЛТИКРИТЕРИУМСКИ МЕТОД ОДЛУЧИВАЊА-АХП У ЗЕЛЕНИМ НАБАВКАМА

Abstrakt

Циљ овог чланка је да се истражи и покаже ефикасност предложене АХП, више критеријумске методе доношења одлука, примењене у избору добављача амбалажног материјала, конзерви у индустрије прераде меса подржаног еколошким приступом у избору. За потребе избора добављача дефинисано је 7 критеријума избора са еколошким/зеленим димензијама

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у: идентификацији, испитивању и рангирају по факторима евалуације, финансијским, квалитативним и критеријумима система управљања животном средином. Резултати ове студије доприносе увођењу зелених набавки у систему управљања животном средином и квалитету добављача. Одрживо паковање у прехрамбеној индустрији је релативно нов приступ еколошким аспектима за паковање и могло би да има кључну улогу у зеленом ланцу снабдевања производње хране, у партнерству за одрживи развој и корпоративном зеленом и мицу добаљача и компетенцијама купаца.

Кључне речи: зелени и мицу ланца снабдевања, зелене перформансе, више критеријумско одлучивање, АХП.

Introduction

Supplier selection is the process in which companies identify, evaluate and contract with suppliers and is growing to be an important but complex issue, as it involves many factors and decisions (Mitic et al, 2021; 2021a). Some researchers agreed that a combination of factors should fit not only the technical requirements, but also the company's strategy (Miškić et al, 2017; Kvrgic et al, 2020), and even more, demand that suppliers would have to ---reduce environmental impacts (Jevtic et al, 2020).

A food manufacturer must evaluate potential packaging suppliers according to some of the following delicate characteristics when selecting a PMS (Popovic et al, 2020): availability of the technological base necessary to produce the packaging material; skilled labor force availability for the packaging material production; a requisite standard of quality program; technical support for maintaining the components; volume flexibility to manufacture different lot sizes; product flexibility to efficiently manufacture many products; effectiveness in protecting the manufacturer's proprietary information. In this regard, they are usually asked to pass an independent audit to check good manufacturing, hygiene and environmental practice (Srebro et al, 2020; Jevtic et al, 2020a; 2018; 2014; Radovic et al, 2013; 2013a; Turanjanin et al, 2020).

All these developments motivated the authors to propose a supplier selection model for a meat processing company from Serbia using analytic hierarchy process (AHP) approach respecting the green environmental standards and criteria in the selection process.

The article is structured so, that after the abstract, introduction and literature review are presented key findings and discussion in the process of decision-making integrating it in multicriteria approach helped by AHP method. At the end are given conclusions and references.

Methodology

The objective of the research is the selection of suppliers introducing the criteria of green economy, image and performance as required environmental standards in the supplier evaluation system and encouraging the very competitiveness of the meat industry

and suppliers in the supply chain. The company selected for the case study considers the analytic hierarchy process (AHP) and techniques suitable decision framework for evaluating and prioritization of green suppliers, Figure 1.

In the research the analytic hierarchy process (AHP) is used for the elaboration of the results as the multi criteria decision-making (MCDM) modeling and methodological tool for dealing with the suppliers' selection problem.

The method has been developed by Thomas Saaty (2001; 2002; 2004). It includes a weighted method (Muralidharan et al, 2002; Cupic & Sukonovic, 1995; Thanaraksakul & Phruksaphanrat, 2009). The method supportsthe potential suppliers rating with respect to weighted factors determined by the procurement department. Weber & Current (1993), Partovi et al. (1990), Degraeve et al. (2000), and De Boer et al. (2001). The application of this method is further based on the theoretical works (Humpreys et al, 2003) on the: Evaluation of the environmental performance of a company's existing operating system, Environmental efficiency, Green image, and Environmental flexibility In the model application the decision-maker (DM) performs pair-wise comparisons, and, the pair-wise comparison matrix and the eigenvector are derived to specify the weights of each parameter in the problem.

Figure 1. Proposed research model

Source: Authors

The whole process is according to the figure 1 consists of further steps:

1. Constructing AHP decision model. AHP decision model was constructed and based on opinions of directors of the relative departments working in the company. Food Company's team defined 7 criteria for the evaluation of three suppliers, mostly based on a green approach. According to company's preferences there are: factors concerning the quality of cans as a product, including an eco-design, easily understanding and an easy measurement. The production technology, EMS and organization, green image, and cost, delivery, and financial conditions (Table 1).

Table 1. Evaluation criteria.

C No.	Criteria	Definition
C_1	Quality	Quality Includes the material terms of use suitability of a green product, use time and the duration, a suitability innovation, an eco-design, easily understand, measured
C_2	Production technology	Clean, green origin, DE
C_3	EMS & organization	Environmental management system and organization, ISO 14001 certification inclusion
C_4	Green image & competencies	Includes a supplier's: green image, environmental performance environmental efficiency, green competencies
C_5	Delivery	Important especially for time based companies. Defined a of time required for the necessary materials and how many days or hours it takes to supply these materials
C_6	Cost	Defined as the summation of a net price after discount (if any) for purchased materials by the manager of department
C_7	Payment flexibility	The company attaches the importance to the payment in terms of delay or an installment. Possible trade credit inclusion. These are preferred more if available

Source: Saaty (1980)

A hierarchy problem decomposition in the suppliers' selection is presented in Figure 2.

Figure 2.A hierarchy by AHP method problem decomposition

Source: Authors' calculations

1. ***Determining weights of criteria***. The decision-makers (DM) perform pair-wise comparisons, and, the pair-wise comparison matrix and the eigenvector are derived to specify the weights of each parameter in the problem in the process of choosing the superior alternative. Seven factors are taken into

the consideration simultaneously, allowing for dependence, a feedback and numerical trade-offs to arrive at a synthesis or the conclusion. The scale of the measurement for AHP is proposed in a table 2.

Table 2. The 1-9 scale for AHP

Definition	Explanation	Importance intensity
Equal importance	Two activities contribute equally to the objective	1
Moderate importance of one over another	Experience and a judgment strongly favor one over another	3
Very strong importance of one over another	Experience and a judgment slightly favors one over another	5
Very strong importance of one over another	Activity is strongly favored, and its dominance is demonstrated in a practice	7
Extreme importance of one over another Importance of one over another	Used to represent a compromise between the priorities listed above	9
Intermediate values	Used to represent a compromise between the priorities listed above	2,4,6,8

Source: Authors according to Saaty (1980).

2. ***Evaluating alternatives*** (suppliers) based on each criterion. It will assess each of the 3 alternatives based on 7 considered a decision-making criterion.
3. ***Evaluate alternatives*** based on all criteria. During this step, each alternative gains its value. The aim is to evaluate all performances, especially environmental performance and a green image of 3 suppliers of cans for the meat processing company end to calculate the mean values for each supplier.
4. ***In this step, the normalized a decision matrix is constructed***. The choice of alternatives. The highest degree of value determines the best solution to the supplier, and vice versa.

Results

As the results of the team discussion on the evaluation of 3 suppliers and 7 criteria and synthesized of previous steps of the multi criterion ranking of alternatives, the best supplier (labeled as an action -alternative) are selected, as the best overall. The synthesis procedure is presented in a table 3, in which values are obtained by multiplying the weight of the criteria with the participation of the action

in these criteria

Table 3. Decision-making problem Synthesis

Criteria	Weights of Criteria	Alternative	Weights of alternative	Weights of Criteria and Alternative
C_1	0.381	a_1	0.697	0.266
		a_2	0.232	0.088
		a_3	0.072	0.027
C_2	0.212	a_1	0.617	0.131
		a_2	0.302	0.064
		a_3	0.081	0.017
C_3	0.168	a_1	0.685	0.115
		a_2	0.247	0.042
		a_3	0.068	0.011
C_4	0.093	a_1	0.467	0.043
		a_2	0.376	0.035
		a_3	0.157	0.015
C_5	0.074	a_1	0.694	0.052
		a_2	0.231	0.017
		a_3	0.075	0.006
C_6	0.049	a_1	0.638	0.031
		a_2	0.281	0.014
		a_3	0.081	0.004
C_7	0.022	a_1	0.522	0.011
		a_2	0.382	0.008
		a_3	0.095	0.002

Source: Authors' calculations

By totaling the value for each *action* (supplier) according to each criteria from table 3, the total value of each share for all the criteria together is observed.

Alternative a_1

$T_{a1} = C_1 * CK_{1a1} + C_2 * C_{2a1} + C_3 * C_{3a1} + C_4 * C_{4a1} + C_5 * C_{5a1} + C_6 * C_{6a1} + C_7 * C_{7a1}$ = 0.381*0.697+0.212*0.617+0.168*0.685+0.093*0.467+0.074*0.694+0.049*0.638+0.022*0.522=0.266+0.131+0.115+0.042+0.052+0.031+0.011=0.650

Alternative a_2

$T_{a2} = C_1 * C_{1a2} + C_2 * C_{2a2} + C_3 * C_{3a2} + C_4 * C_{4a2} + C_5 * C_{5a2} + C_6 * C_{6a2} + K_7 * C_{7a2}$ = 0.381*0.232+0.212*0.302+0.168*0.247+0.093*0.376+0.074*0.231+0.049*0.281+0.022*0.382=0.088+0.064+0.042+0.035+0.017+0.014+0.011=0.268

Alternative a_3

$T_{a3} = C_1 * C_{1a3} + C_2 * C_{2a3} + C_3 * C_{3a3} + C_4 * C_{4a3} + C_5 * C_{5a3} + C_6 * C_{6a3} + C_7 * C_{7a3}$ = 0.381*0.072+0.212*0.081+0.168*0.068+0.093*0.157+0.074*0.075+0.049*0.081+0.022*0.095=0.2027-+0.017+0.011+0.015+0.006+0.004+0.002=0.082

The supplier's total rank relative to the target (composite normalized vector) is: a_1 (0.650); a_2 (0.268); a_3 (0.082). The resulting values represent the final results, are shown in Figure 3.

$T_{a1} > T_{a2} > T_{a3}$

Figure 3. Comprehensive Supplier Ranking Synthesizes

Source: Authors' calculations

Discussions

According to the results of the conducted a process of a multi-criteria decision-making on the selection of suppliers of cans for the meat industry as selected case, it can be seen that the selection was performed according to the defined criteria by the team of the production company. The criteria successfully referred to aspects of an environmental protection, a green economy and standards, a technology, prices and a delivery, as well as finance. The best action – a1 is the supplier who has met the individual criteria, as well as all criteria with the highest rank, then the supplier a2. The worst grades for individual criteria and group criteria were given to the supplier a3.

Conclusion

These conclusions support the justification of introducing the criteria of a green economy, an image and performance as required environmental standards in the supplier evaluation system and encourage the very competitiveness of the meat industry and suppliers in the supply chain. Environmentally-friendly (sustainable) packaging's cans in which meat products (ready meals, cold cuts, meat cuts) are packed, reduce the warming, a carbon footprint and greenhouse gases. They divert tons of metal and plastic and other non-degradable materials from landfills (Mihajlovic et al.2013).

Specific criteria for PMS selection as a risk of a disruption, a volume and product flexibility and an innovation are not included, what could be found as the limitation of this approach

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NOMINAL AND REAL WAGES IN THE REPUBLIC
OF SERBIA 2001-2020

Abstract

The aim of this paper is to present, decompose and analyze time series of average gross and net nominal and real wages in the Republic of Serbia. The paper presents monthly time series of wages for the period from January 2001 to December 2020. Time time series of wages are seasonally adjusted using the software JDemetra +, ver. 2.1.0 and the X13-ARIMA program. Real gross and net wages were obtained by dividing the series of nominal average gross and net wages by the retail price index (until January 2009) and then by the consumer price index (since January 2009). It has been noticed that there are three periods in the movement of time series of wages. In the period before the Global Financial and Economic Crisis (2000-2008), nominal and real wages recorded a strong upward trend. In the post-crisis period, from 2009 to 2017, there was a slowdown in wage growth. In that period, nominal wages were rising, and as a consequence of inflation, real wages stagnated. In the third period, from 2018-2020, due to wage growth in the public sector and low and stable inflation rates, both nominal and real wages have been growing. The beginning of each of these three periods coincides with changes in the methodology of calculating the average wage, which affected the appearance and variability of time series of wages, and especially the seasonal component in the series.

Key words: average gross wages, average net wages, nominal wages, real wages, Republic of Serbia

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НОМИНАЛНЕ И РЕАЛНЕ ЗАРАДЕ У РЕПУБЛИЦИ СРБИЈИ 2001-2020.

Апстракт

Циљ овог рада је приказ, декомпозиција и анализа временских серија просечних бруто и нето номиналних и реалних зарада у Републици Србији. У раду су приказане месечне серије зарада за период од јануара 2001. до децембра 2020. године. Временске серије зарада десезониране су применом софтвера JDemetra+, вер. 2.1.0 и програма X13-ARIMA. Реалне бруто и нето зараде добијене су дељењем серија номиналних просечних бруто и нето зарада индексом цена на мало (до јануара 2009. године) а затим индексом потрошачких цена (од јануара 2009. године). Уочено је да се у кретању временских серија зарада разликују три периода. У периоду пре Глобалне финансијске и економске кризе (2000-2008.) номиналне и реалне зараде бележе снажан растући тренд. У периоду након кризе, од 2009-2017. године дошло је до успоравања раста зарада. Номиналне зараде расту, а као последица високе инфлације, реалне зараде стагнирају. У трећем периоду, од 2018-2020., под утицајем раста зарада у јавном сектору и ниске и стабилне стопе инфлације расту и номиналне и реалне зараде. Почетак сваког од ова три периода коинцидира са изменама у методологији обрачуна просечне зараде, које су се одразиле на изглед и варијабилиет временских серија зарада, а нарочито на сезонску компоненту у серијама.

Кључне речи: просечне бруто зараде, просечне нето зараде, номиналне зараде, реалне зараде, Република Србија

Introduction

Traditionally, time series of wages have always occupied a prominent place in the national statistics of the Republic of Serbia. Except in regular monthly releases, data on wages in Serbia were published for the Socialist Federal Republic of Yugoslavia in the publications of the former Federal Statistical Office entitled *Index* (published monthly) and *Economic Trend* (published quarterly); for the Federal Republic of Yugoslavia, the data were published in the publications of the Statistical Office of Serbia and Montenegro, *Index* and *Economic Trend*, which continued to be published even after the break-up of the SFRY; finally, for the Republic of Serbia, data on wages have been published in the publications of the Statistical Office of the Republic of Serbia (SORS): *Monthly Statistical Bulletin* which is a monthly periodical, and *Trends*, published quarterly.

For many years, since the time of the Socialist Federal Republic of Yugoslavia, within the Federal Statistical Office, the Time Series Database functioned, first on the HOST IBM system, and from January 2014, the Time Series Database on SQL Server, under the IST application started functioning. Transfer of the analog Time Series Database on the PC platform within the IST application on the SQL server was a painstaking task which lasted from August 2011 to February 2015. The abbreviated methodology of the SORS Time Series Database on the HOST IBM system has been described in two issues of *Trends* (Ðerić, Radanov-Radičev, Zlatanović & Milovanović, 2011a; Ðerić, Radanov-

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Radičev, Zlatanović & Milovanović, 2011b). From the first issue of *Trends*, published in 2004, until 2017, every year in the March issue of this publication, a complete list of time series of the Database Time Series was published with the presentation of time series by groups, subgroups and activities, as it has been described in Đerić & Zlatanović (2017). A number of time series, including the series of wages, were presented in graphical, index and analytical form. For selected series, a series of original monthly data, trend-cycle components and base or chain indices for the current and previous two years were published. The *Trends* published time series of nominal and real average gross and net wages in the form of series of base indices. The aim of this presentation was to monitor the dynamics of nominal and real wages.

In 2010, within the Statistical Office of the Republic of Serbia, a Dissemination Database was developed, which can be accessed via the Internet. The Dissemination Database provided access to time series to all interested users. A large number of time series of wages are also available in the Dissemination Database: average monthly wages, average wages by activities, by municipalities, by status of business entities, by qualification level, by gender and age, average wages in the public sector, monthly and annual wages indices. In addition to the Database, the Statistical Office publishes data on wages in the *Statistical Yearbook of the Republic of Serbia*, *Statistical Calendar of the Republic of Serbia*, *Bulletin Survey on the Structure of Wages*, *Monthly Statistical Bulletin*, *Municipalities and Regions of the Republic of Serbia,* monthly *Statistical Releases* and *Trends*, which is still published quarterly. The *Trends* publication today publishes basic data on wages: average wages, wages by economic activities, wages in the public sector, indices of nominal and real wages.

The paper presents time series of nominal and real gross and net average wages in the period 2001-2020. The aim of the paper was to analyse the structure of time series of wages and to show the movement of nominal and real wages. The seasonal character and variability of time series of wages were analysed. In addition, annual wage growth rates for three periods were calculated (for the period before the Global Financial and Economic Crisis, from 2000-2008; for the post-crisis period, from 2009 to 2017, and for the period from 2018-2020). Also the index series of nominal and real wages were analysed in order to gain insight into the dynamics of nominal and real wages.

After the Introduction, the second part of the paper entitled Theoretical Foundations and Literature Review gives the most important definitions used in calculating average wages, presents how the average wages have been calculated and how the methodology for calculating average wages has changed twice, in 2009 and 2018. The papers and authors who dealt with wages in the Republic of Serbia are presented and the aspects of wages they researched are reviewed. The third part of the paper, entitled Research Design and Methodology, presents the methodological details of the research, the process of seasonal adjustment of time series of wages and the model used in this process. It is explained how the indices of nominal and real wages were calculated. The fourth part of the paper, entitled Research Results and Discussions, presents monthly series of average gross and net wages and analyzes their characteristics. Monthly series of indices of nominal and real gross and net wages are also presented here and the dynamics of nominal and real wages are analysed. Finally, in the Conclusion, the most important findings are summarized. The Appendix provides charts showing the time series components of gross and net wages, tables containing descriptive statistics indicators for the series of gross

and net average wages for the period 2001-2008, 2009-2017, and 2018-2020 and also tables with monthly data on gross and net wages for the entire period from 2001-2020. It is of practical importance to know the basic descriptive statistical indicators such as standard deviation, measures of variation and ranges of variation. These indicators of descriptive statistics can be of great use in the analysis and give additional insight into the movement of wages in certain periods.

Theoretical fundamentals and literature review

The significance of time series of wages is great. Wage data are used to monitor the purchasing power of the population and as an indicator of living standards. Wage monitoring gives timely information for the analysis of economic trends and provides analysts and economic decision makers with an adequate starting point for analysing, forecasting and econometric modelling. Average wages are of the greatest importance in the analysis of wages. Average wage is a calculation category that is obtained on the basis of aggregated data on the number of employees and the mass of wages paid at the level of the business entity. Average wages serve as a starting point for calculating a large number of economic and social indicators, adjusting pensions and formulating various policies. The average wage is used to calculate the base for personal income tax, the base for calculating contributions for compulsory social insurance, for calculating the pension base and a number of other financial benefits such as unemployment benefits, severance pay, exercising the right to social assistance and so on.

Until December 2017, data on wages were collected by the Statistical Office of Serbia on the basis of the *Monthly Statistical Survey on Employees and Employee Wages* under the name *RAD-1*. The reporting units that submitted data in the survey were legal entities and entrepreneurs. For legal entities, the sample included 8,000 reporting units or about 65% of employees, and data on employees' wages working for entrepreneurs were obtained from the records of the Tax Administration. The calculation of the average wage included the wages paid in the reporting month, regardless of the month in which they were earned: "Since January 1997, and according to the instructions of the Federal Bureau of Statistics of February 21, 1997, average wages are calculated by the mass of wages paid in the reporting month divided by the number of employees according to the data of personnel records at the end of the reporting month. Data on average wages refer to all employees according to the data of personnel records, regardless of whether all of them received wages in that month" (Statistical Office of Serbia, 2009, 1). The calculation of the average wage did not include the wages of employees in the Ministry of the Interior, the Ministry of Defence, as well as the wages of employees based on contracts for temporary and occasional jobs. Data on average monthly wages were available 25 days after the end of the reporting month.

Since January 2018, there has been a change in data sources and methodology for calculating average wages. Namely, the average wage is calculated on the basis of data on wages from the records of the Tax Administration, which are collected through the electronic Tax return for withholding tax (form PPP-PD). Average wages are calculated on the basis of amounts of computed wages for the referent month and number of employees, expressed as full-time equivalent – FTE. Thus, the survey covered

all business entities that submitted to the Tax Administration an electronically completed form of tax return PPP-PD with calculated wages. In this way, a more complete coverage of wages was provided and the quality of wage data was improved. With the changes in the methodology, average wages are calculated on the basis of wages calculated for the reporting month. Data on average wages are available 55 days after the end of the reporting month. In addition to the average wage, the median wage, wage distribution, wage gap and other wage statistics are calculated.

Prior to this change in the method of collecting data on wages, there was another change in the methodology for their collecting that occurred in 2009. Starting from January 2009, the previous sample for calculating the average wage was expanded, so that in addition to wages paid to employees of legal entities, when calculating average wages, the wages paid to employees working for entrepreneurs (individuals) were taken into account. "Since January 2009, in addition to data on average wages of employees in legal entities (collected by Monthly statistical survey on employees and their wages RAD-1), data on employees' wages working for entrepreneurs (obtained from the Ministry of Finance – Tax Administration) are also included in the calculation of average salaries and wages." (Statistical Office of Serbia, 2009, 1).

In the following, we will see how this coverage expansion, which was done first in 2009 and then in 2018, reflected on the appearance and movement of time series of wages. But before that, let's state how the wage is defined and what is its coverage.

"In the research on wages (in accordance with the Labour Law and the Law on Personal Income Tax), wages encompass all payments to employees on which the corresponding taxes and contributions are paid at the expense of employees (gross wages). Wages excluding taxes and contributions (net wages) are wages without corresponding taxes and contributions. In accordance with Article 105 of the Labour Law, the wage of an employee consists of all benefits for work performed and time spent at work, benefits based on employee contributions to the employer's business success (awards, bonuses) and other benefits based on employment in accordance with the general act and employment contract. In accordance with Article 13 of the Law on Personal Income Tax, wages include compensations for work of employees outside employment (based on contracts for temporary and occasional work - Article 197 of the Labour Law), as well as personal wages of entrepreneurs" (Statistical Office of Serbia, 2019). The wage includes the following incomes: payments for overtime work, night and shift work, compensations for unperformed working hours (annual leave, paid leave), meals during work ("hot meal"), recourse, rewards and bonuses. "Hot meal" and recourse are included in wages by the amendments to the Labour Law from 2001 (Statistical Office of Serbia, 2019). Employees' wages do not include payments based on employment contracts, compensation for arrival and departure expenses (travel expenses), reimbursements for business trips in the country and abroad, severance pay, jubilee awards and similar payments on which taxes and contributions are not paid (Statistical Office of Serbia, 2018, 3).

Wages in the Republic of Serbia have so far been analysed in several scientific and professional papers. In an extensive study sponsored by the International Labour Organization (ILO), Arandarenko and Avlijaš (2011) analysed wage trends in the period 2000-2008 and the wage policy pursued at that time. Đerić and Radović-Stojanović (2012) presented and analysed the movement of wages in the period 1994-2011. Arsić

and Vuksanović (2017) analysed the level and dynamics of wages in the period 2001-2017, with an emphasis on the factors on which wages in Serbia depend. Anić and Vuksanović (2019) gave another analysis, this time with a review of the problems of inequality in the amount of wages. Kostadinović and Stanković (2020) dealt with the level of wages in the Republic of Serbia and regional differences in the amount of wages. The publication *Trends* of the Statistical Office of Serbia regularly publishes basic data on wages and analyses the movement of the index of nominal and real wages (Statistical Office of Serbia, 2021, 34-35). In all these publications, the annual data on wages are presented and analysed.

Research design and methodology

The monthly series of wages are presented here. The monthly data clearly show the characteristics of the time series of wages and the phase in the movement of wages. As will be seen below, time series of wages have a pronounced seasonal character. Seasonal fluctuations are a characteristic of many economic time series, and the course of the time series can be influenced by the effects of working or trading days, the effect of leap year and national calendar holidays and the effect of outliers - values of the series that differ significantly from other observations. The process of seasonal adjustment of time series identifies and eliminates the effects of regular and periodic repetition of these factors, i.e. the seasonal component and the effect of outliers, in order to gain a clearer picture of the dynamics of economic processes. Thus, the everyday, or rather monthly or quarterly reality is transformed into a reality in which the seasonal component is missing. We will see how the seasonal component manifested itself in the time series of wages.

The paper presents monthly data on average gross and net wages in the period from January 2001 to December 2020. Time series of wages are seasonally adjusted using the software JDemetra +, ver. 2.1.0 and the X13-ARIMA program. As a result of the seasonal adjustment procedure, the following were obtained: seasonally adjusted series, trend-cycle component and irregular component of time series of wages.

Since January 2014, the official statistics of the Republic of Serbia have started using the JDemetra + software and the X13-ARIMA program within it. Both programs: X13-ARIMA and TRAMO-SEATS within the JDemetra + software are intended for the analysis and modelling of time series of monthly and quarterly periodicals. They are designed to reliably meet the needs of professional analysts, mostly because they have the ability to work with large sets of time series in a completely automatic way. Version 2.1.0 of JDemetra + software was used in this paper. The main features of the X13-ARIMA program, within this software are forecasting and seasonal adjustment, detection of periodic fluctuations, adjustment and correction of outputs, trend assessment, calendar and seasonal factors, graphical and diagnostic effects.

Of all the models that have been used for many years, the most widely used for most economic monthly and quarterly series in the statistics of the Republic of Serbia was the Airline Seasonal Model (0,1,1) (0,1,1). However, other types of X13-ARIMA-SEATS models can be used, using diagnostic tests and criteria of JDemetra + software, but the nature of the economic series must always be taken into account, i.e. the economic activity it represents. In the seasonal adjustment of time series of wages, the Airline

model was used here.

When seasonally adjusting the time series of wages, the calendar and specifications are made according to the Instructions for seasonal adjustment of time series of the European Union. The series are seasonally adjusted using Eurostat software: Demetre 2.1.0, X13-ARIMA program, RSA5c model, log transformation and ARIMA model type, i.e. Airline model (p, d, q) (P, D, Q) = (0,1,1) (0,1,1), including the National Calendar for the Republic of Serbia, which was made according to Eurostat Recommendations for the construction of the calendar. The overall rating is Good for all 4 series. "Level shift" as a parameter is not excluded during the seasonal adjustment, in order to better notice the effect of the transition to a new methodology for calculating wages. Otherwise, when it (LS) is switched off, the trend becomes smooth even at the point of transition to the new methodology.

In the general case, the designation for the seasonal multiplicative model is ARIMA (p, d, q) (P, D, Q) s, where s represents the season period (s = 4 for quarterly series, and s = 12 for monthly series), p is the order of the autoregressive component, d is the level of integration of the time series, q is the order of the moving average component, P is the order of the seasonal autoregressive component, D is the level of seasonal integration, Q is the order of the seasonal component of moving averages. The Airline model (0,1,1) (0,1,1) stands out as a special case of seasonal ARIMA models that describe the stochastic nature of the seasonal component. This model was used to analyze the time series of the number of transported passengers in air traffic, and therefore it is called the "airline model" in the literature (Kovačić, 1995, 205). This model describes a time series characterized by ordinary and seasonal integration of the first order (d=D=1), i.e. its stationary representation is obtained by simultaneous application of the first difference operator and the seasonal difference operator. After the transformation, the time series then follows a seasonal multiplicative model of moving averages of the first order. At the same time, the Airline model is applied as a default model in several TRAMO/ SEATS and X-13ARIMA-SEATS specifications, as many studies have shown good applicability of this model to explain monthly and quarterly time series that have pronounced seasonal dynamics (Grudkowska 2016, 120).

The dynamics of nominal and real wages in the paper was analysed on the basis of monthly indices of nominal and real gross and net wages. The procedure for calculating the indices of nominal and real wages in wage statistics is standard and well-known: first, nominal wages are converted into indices of nominal wages on some basis (here in the paper based on the 2019 average, since the last available data are from the end of 2020). Real wage indices are obtained by dividing nominal indices by the corresponding deflator. Here, in order to obtain real wage indices, it was necessary to form an appropriate monthly time series that will serve as a deflator of nominal wage indices. The consumer price index, which is the official measure of inflation in the Republic of Serbia and is commonly used as a deflator of nominal values, has been calculated and monitored since January 2007 and since January 2009 is the official measure of inflation in Serbia (National Bank of Serbia, 2009, 13). Until 2009, the official measure of inflation was the Retail Price Index. Accordingly, a series of deflators was formed - until December 2008, nominal wage indices were deflated by the Retail Price Index, and since January 2009, by the Consumer Price Index.

Research results and discussion

The average gross wage in the Republic of Serbia in 2001 amounted to 8691 dinars, and in 2020 it amounted to 82,984 dinars. The average net wage in 2001 was 5,840 dinars, and in 2020 it was 60,073 dinars. In the period 2001-2020. year, the average gross wage increased 9.5 times and the average net wage 10.3 times. At the beginning of the period, net wages amounted to 67.2% of gross wages, and at the end of the period 72.4% of gross wages. Gross wages increased at a rate of 12.6% on average per year and net wages at a rate of 13.1% on average per year (calculated as the geometric growth rate of average annual gross or net wages for the period 2001-2020, with data on average wages for the year taken from the Dissemination Database of the Statistical Office of Serbia).

The monthly time series of average gross and net wages are shown below.

Figure 1 Average gross and net wages in the Republic of Serbia 2001-2020, RSD

Source: Statistical Office of the Republic of Serbia; Author's presentation.

There are three periods in the movement of time series of wages: the first from 2001 to 2008, the second from 2009 to 2017, and the third from 2018 to 2020. The beginning of each of these periods coincides with the transition to a new methodology for calculating average wages.

Time series of wages show a pronounced seasonal character. Every year, wages systematically record a pronounced monthly growth in December due to various payments (bonuses, 13th wage, arrears) and an even more pronounced monthly decline in January due to holidays, celebrations, vacations. February could be marked as the month of the revival of gross wages, after a significant drop in January, which is in fact the result of a low level of wages in January, rather than a real revival of wages. As the average wage increased over the years, the seasonal component in the series of wages became more and more pronounced.

The seasonal component in the series has changed over time. After 2009, with

the inclusion of data on employees' wages working for entrepreneurs in the sample for calculating the average wage, the seasonal component is even more pronounced, especially in the second half of the period from 2009 to 2017. A more representative sample and higher coverage (inclusion in the sample data on employees' wages working for entrepreneurs since 2009) introduced additional seasonal variability in the series of average wages.

The intensity of seasonal influence in time series is affected by composition of calendar and the intensity of seasonal factor. Upon deseasoning and detrending, there remains an irregular component which captures such influences such as strikes, work stoppages, changes of economic policy, foreign trade regime, changes of measuring certain economic values – methodology. The irregular component oscillates around one, more or less depending on some immeasurable exceptional influences. Here, in the series of wages, variability of irregular components is most pronounced in the first period from 2001-2008, while in the remaining two sub-periods it is relatively stable oscillating around one (see in Appendix).

Net wages vary more than gross wages, the greatest variability in both series being recorded in the period from 2001-2008 (coefficient of variation for net salaries, and gross salaries is 53.1% and 51.2% respectively). Standard deviation is also highest in this period (see in Appendix). In the period from 2009-2017 the coefficient of variation for net salaries, and gross salaries is 13.5% and 13.1% respectively. The last period from 2018 to 2020, which covers just three years, is characterized by the smallest coefficient of variation and it is 9.5% for both gross and net salaries.

A new pattern in the movement of the series of wages can be noticed from January 2018. The change in the methodology of calculating the average wage from 2018 reduced the variability of the series and "ironed out" seasonal variations. As the calculation of the average wage now includes the wages that were calculated in a certain month (and not paid, as before), there is no longer that pronounced growth of the average wage in December which characterized the series in the previous period, and the last such seasonal increase was recorded in December 2017. In January 2018, there is no longer that sharp drop in wages after the seasonal growth in December, as before. Time series in the period from 2018 to 2020 are also characterized by an occasional increase in average wages as a result of an increase in wages in the public sector. In January 2018, wages in the public sector increased in the range of 5% to 10% (Law on Amendments to the Law on Budget System, Official Gazette of RS, No. 113/17). The next increase in wages in the public sector followed in January 2019, when these wages increased in the range of 7% to 12% (Law on Amendments to the Law on Budget System, Official Gazette of RS, No. 95/2018). Another increase in November 2019 in the range of 8% to 15% (Law on Amendments to the Law on Budget System, Official Gazette of RS, No. 72/2019) is also visible in the series of average wages, as well as the last increase in December 2020. Since December 2020, the wages of medical workers have increased by 5%, while other employees in the public sector received 3.5% in January and an additional 1.5% from March 2021. The army also received an additional increase of 10%. These last increased wages were to be paid from January 2021 (Law on Amendments to the Law on Budget System, Official Gazette of RS, No. 149/2020).

Wage growth in the period before the Global Financial and Economic Crisis (2001-2008) is characterized by a growing trend. In this period, average gross wages

grew by an average of 26.7% and average net wages by an average of 27.9% per year (calculated on the basis of annual data on wages of the Statistical Office of Serbia, as a geometric growth rate of average annual gross or net wages). However, wage growth in this period is considered to have been somewhat overestimated: "Wage growth recorded by the Statistical Office of Serbia was faster than" true "wage growth, for two reasons: (i) the inclusion of benefits in the tax base in 2001, which led to a one-off increase in gross wages; and (ii) the deviation of the RAD1 survey on companies in which the public sector and large private companies are over-represented when looking at wage developments in Serbia "(Arandarenko, Avlijaš, 2011, 23). Small, newly established private firms with low wages were not included in the sample for calculating average wages during this period. At the same time, wages in the public sector were higher not only in relation to those in the private sector but also in relation to the economy as a whole. Based on the data from the Dissemination Database of the Statistical Office of the Republic of Serbia on Wages in the Public Sector and the Economy as a whole, it can be calculated that in the period from 2003 (from when wages in the public sector are monitored) to 2008, wages in the public sector were higher on average by 20.2% of gross and 19.9% of net wages for the whole economy (calculated as the arithmetic mean of the difference in wages between the public sector and the economy as a whole by years for the period 2003-2008).

That the level of average wages as well as wage growth was to some extent overestimated can be seen from the fact that at the time when in January 2009 the sample for calculating the average wage included data on employees' wages working for entrepreneurs, there was a sharp decline in average wages. If the influence of the season is eliminated, from the seasonally adjusted data for average gross and net wages, it can be calculated that wages in January 2009 were lower than wages in December 2008 by 9.8% for gross and 9.8% for net wages. This transition to a new methodology and the decline in wages manifested itself in the time series of wages as a structural break. After the structural break, partly under the influence of the change in the methodology of calculating average wages and partly as a consequence of the Global Financial and Economic Crisis, the growth of average wages slowed down. In the period that followed the crisis, wages in the public sector were reduced several times, which was also reflected in the level of average wages and the growth rate of average wages at the level of the economy as a whole.

In the period after 2009, there was a slowdown in wage growth under the influence of the Global Financial and Economic Crisis and the stagnation of the economy that followed. Based on the annual data on wages from the Dissemination Database of the Statistical Office of the Republic of Serbia, it can be calculated that in 2008, the year of the crisis, a slightly higher growth of average wages of 17.9% for gross and 18% for net wages was recorded. Immediately afterwards, in 2009 there was a decrease in average wages by 3.3% for gross and 3.1% for net wages. After that, average wages continue to grow, but at a much slower pace compared to the pre-crisis period, while wages in the public sector have been reduced on several occasions.

There is an explanation for the growth of average wages during and after the crisis, despite the occasional decrease in wages in the public sector and the relatively low average wages in the private sector: "The fact that real wages did not fall during the crisis comes as a surprise. This suggests that the adjustment of the labour market in

the formal economy has occurred primarily through a reduction in employment, and not through a reduction in real wages" (Arandarenko, Avlijaš, 2011, 45). This explanation is supported by data on unemployment growth: the unemployment rate rose from 13.6% in 2008 to 16.1% in 2009, then 19.2% in 2010 and continued to grow (Statistical Office of the Republic of Serbia, 2011). The following explanations were offered for the growth of average wages in the period after the end of the crisis: dismissal of lower paid workers in the public sector, increase in the minimum wage at the beginning of 2009, a new methodology for calculating the average wage and, finally, an increase in coverage of wages including those in the private sector (Arandarenko, Avlijaš, 2011, 46-48).

The reduction of wages in the public sector occurred at the beginning of 2009. In January 2009, the *Law on Temporary Reduction of Wages, i.e. Salaries, Net Remunerations and Other Receipts in the State Administration and the Public Sector* (Official Gazette of the RS, No. 31/2009) froze wages, while the wages between 60,000 and 100,000 dinars were reduced for 10% and the wages over 100,000 dinars were reduced for 15%. This measure had the character of a kind of "solidarity tax" in the conditions of economic stagnation that followed the crisis. At the same time, the minimum wage was increased by 11% in January 2009 (Social and Economic Council of the Republic of Serbia, 2009), which to some extent contributed to raising the average wage in the private sector. In the period from 2012 to 2014, there was a policy of limiting wage growth in the public sector as part of a broader fiscal consolidation program, in which "... on the public expenditure side, the key measure was limited wage growth in the public sector ..." (Fiscal Council, 2015, 2). Another significant reduction of wages in the public sector by 10% followed at the end of 2014 and marked the beginning of a new fiscal consolidation (Law on Temporary Regulation of Bases for Calculation and Payment of Salaries, i.e. Wages and Other Permanent Income by Users of Public Funds, Official Gazette of the RS, No. 116/2014).

In the period of the new fiscal consolidation 2015-2017, it was planned to freeze wages in the public sector and pensions by the end of 2017 and reduce the number of employees in the public sector, but "... the decision to freeze wages and pensions was suspended twice, in 2016 and 2017" (Fiscal Council, 2017, 5). Despite the planned, wages in the public sector increased in 2016 in the range of 2-4% (Law on Budget System, Official Gazette of RS, No. 103/15) and in 2017 in the range of 3-5% (Amendments to the Law on Budget System, Official Gazette of RS, No. 99/2016). The end result of all these changes was that in the period from 2009 to 2017, average gross wages for the economy as a whole grew at a rate of 5.2% and average net wages grew at a rate of 5.3% (calculated on the basis of annual data on wages of the Statistical Office of Serbia, as a geometric growth rate of average annual gross or net wages). During this period, wages in the public sector grew more slowly than wages for the economy as a whole and increased by 2.8% (gross) and 2.9% (net) on average per year (calculated on the basis of annual data on wages for the public sector and the economy as a whole of the Statistical Office of Serbia).

In the period from 2001 to 2020, real gross wages (calculated as the ratio of nominal average gross wages and the corresponding deflator - retail price index or consumer price index) grew by 4.8% on average per year and real net wages (also calculated as the ratio of nominal average net wages and the corresponding deflator) grew by 5.2% on average per year. Real gross wages increased 2.4 times and real net wages increased 2.6 times,

which is significantly less than nominal growth - we saw that the average gross wage in this period increased nominally 9.5 times and the average net wage was nominally increased 10.3 times.

The nominal and real indices of gross and net wages are shown below.

Figure 2 Nominal and real gross wages indices (Ø2019 = 100), Republic of Serbia 2001-2020.

Source: Author's calculations

From 2001 to 2008, real wages grew. Calculated on the basis of annual indices of real gross and net wages published by the Statistical Office of Serbia, in this period the real growth of average gross wages was 13.6% on average per year and average net wages recorded a real growth of 13.2% on average per year. Thanks to the growth of nominal wages and the decline in the inflation rate, real wages were growing and the living standard of the population was increasing. The inflation rate in this period dropped from 19.5% in 2002 (Statistical Office of Serbia, 2008) to 8.6% in 2008 (National Bank of Serbia, 2021).

In the conditions of the crisis and immediately after the end of the crisis (except for 2009, as the only year in which there was a decrease in wages), nominal wages continued to grow, thus maintaining domestic demand and consumption at a level that provided GDP growth of 0.7% in 2010 and 2.0% in 2011 (Ministry of Finance, 2021). Real wages in this period remained unchanged. In the post-crisis period, from 2009 to 2017, nominal wages grew but wages stagnated in real terms. Average gross and net wages in this period recorded nominal growth of 5.2% and 5.3% on average per year, but the inflation rate was high. The inflation rate (measured by the Consumer Price Index) in 2009 was 6.6%, in 2010 it was 10.3%, in 2011 it was 7.0% and the highest inflation rate was recorded in 2012, when it reached 12, 2% (National Bank of Serbia, 2021). Slightly lower inflation rates were recorded at the end of the observed period, and as the inflation rate decreased and nominal wages increased, so did the difference between nominal and real wages. Price growth has slowed and inflation has come under control. In 2014, inflation was 1.7%, in 2015 the inflation rate was 1.5%, in 2016 inflation was 1.6%. In 2017, a slightly

higher inflation rate of 3.0% was recorded (National Bank of Serbia, 2021).

From 2009 to 2017, real wages did not increase and the annual indices of real wages (previous year = 100) are around 100. The geometric mean of the annual indices of real wages in this period is 99.9 for gross and 100.0 for net wages. Thus, after the end of the Global Financial and Economic Crisis, real wages always remained approximately at the level reached at the time of the crisis. Expressed in terms of real wages, by 2009 a certain level of living standard was reached, which was then maintained for a longer period of time. Gross domestic product in this period recorded low growth rates and a harsh winter in 2012 (when there was a decline in GDP of -0.7%) and floods (when a negative GDP growth rate of -1.6% was recorded again) hindered the already slow recovery after the crisis (Ministry of Finance, 2021). A slightly higher GDP growth rate of 2.9% was achieved only in 2013.

Figure 3 Nominal and real net wages indices (Ø 2019 = 100), Republic of Serbia 2001-2020

Source: Author's calculations

In 2018, a new growth trend in the time series of wages began. The change in the methodology of calculating the average wage coincided with the increase in wages in the public sector in January 2018. This increase in wages marked the beginning of a new phase in the movement of wages in which there is an increase in both nominal and real wages. Wage growth was due to wage growth in the public sector and an increase in the minimum wage of 10% in 2018 (Social and Economic Council of the Republic of Serbia, 2017), 8.6% in 2019 (Government of the Republic of Serbia, 2018) and 11.1 % in 2020 (Government of the Republic of Serbia, 2019). In 2018, the average wage at the level of the economy as a whole increased compared to the previous year by 4.2% (gross) and 3.7% (net), in 2019 it increased by 10.5% (gross) and 10.6 % (net) and in 2020 wages increased by 9.5% (gross) and 9.4% (net) (calculated on the basis of annual data on salaries of the Statistical Office of Serbia). At the same time, the inflation rate after 2018 was low and stable and amounted to 2.0% in 2018, 1.7% in 2019 and 1.6% in 2020 (National Bank of Serbia, 2021). Thus, thanks to the growth of nominal wages and a low and stable inflation rate, real wages grew.

Real wages increased in 2018 by 2.0% (gross) and 1.7% (net), in 2019 they increased by 8.5% (gross) and 8.6% (net) and in 2020 real wages increased by 7.8% (gross) and 7.7% (net), compared to the previous year (average real annual wages here are calculated on the basis of annual data on wages deflated by the Consumer Price Index). During this period, economic growth accelerated and GDP recorded slightly higher growth rates of 4.5% in 2018, 4.2% in 2019 and finally a smaller decline in the context of the Covid pandemic 19 of -1.0% in 2020 (Ministry of Finance, 2021). As monthly inflation has been stable during these three years, the difference between the index of nominal and real wages remained almost unchanged throughout this period, so their dynamics are uniform and the movement on the chart seems harmonized.

Conclusion

In the last two decades, there are three periods in the movement of wages in the Republic of Serbia. In the first period, from 2001 to 2008, wages grew in both nominal and real terms. The strong growing trend in the wage time series was interrupted by the Global Financial and Economic Crisis, which was felt in Serbia in 2009. In the period following the Global Financial and Economic Crisis, from 2009 to 2017, nominal wage growth continued at a slower pace than before crisis, and real wages have stagnated. Finally, from 2018-2020, time series of wages again recorded a growing trend, and as a consequence of low and stable inflation rates, there was not only an increase in nominal but also an increase in real wages.

Changes in the methodology of calculation of the average wage and the expansion of the coverage of wages, which was made first in 2009 and then in 2018, reflected on the appearance and movement of time series of wages, especially on its seasonal component. Until 2008, the seasonal component in the time series of wages is not too pronounced and grows gradually as the level of the series increases. Since 2009, the inclusion in the calculation of the average data on employees' wages working for entrepreneurs has increased the seasonal component. Finally, a significant expansion of wage coverage in the calculation of average wages from 2018 and inclusion of wages calculated in the month (instead of paid, as was previously the case), significantly mitigated the variability of wage time series and seasonal component in the series.

Real wage growth in the period from 2018 to 2020 enabled the increase of aggregate demand, stimulated economic growth and contributed to the maintenance of production in the conditions of the Covid pandemic 19. However, in the long run, if this growing trend would continue, it could cause the problem of matching wage growth with growth of other important macroeconomic aggregates. It is known that excessive wage growth can cause inflationary pressures. The growth of real wages affects the growth of imports and could affect the increase of the foreign trade deficit. The growth of wages in the public sector that are paid from the budget could affect the amount of the budget deficit. On the other hand, the incentive by wages for economic growth is important for the Serbian economy. There is also the issue of the growth of living standard, which has stagnated over a long period of time and which needs to be raised. Judging by the announcements of economic policy makers, who project the growth of average wages by 2025, the trend of wage growth will continue in the coming period, so such aspects of

analysis will become increasingly important in the future.

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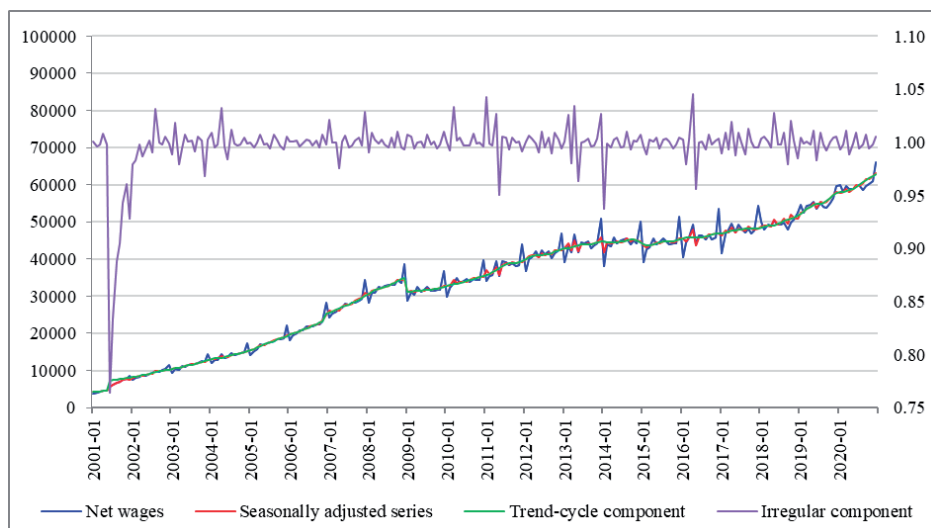
Appendix

Figure 1 Components of average gross wages, Republic of Serbia 2001-2020, RSD

Source: Author's calculations

Figure 2 Components of average net wages, Republic of Serbia 2001-2020, RSD

Source: Author's calculations

Table 1 Descriptive statistics of average gross and net wages,
Republic of Serbia 2001-2020

Period	Number of observations	Gross wages				Net wages			
		Average (RSD)	Standard deviation	Range of variation	Coefficient of variation, %	Average (RSD)	Standard deviation	Range of variation	Coefficient of variation, %
2001-2008	8	25099	12850	36983	51,2	17539	9317	26906	53,1
2009-2017	9	57165	7480	21829	13,1	41346	5562	16160	13,5
2018-2020	3	75809	7178	14355	9,5	54881	5212	10423	9,5
2001-2020	**20**	**47136**	**21720**	**74293**	**46,1**	**33853**	**16010**	**54233**	**47,3**

Source: Author's calculations.Calculated from average annual gross and net wages.

Table 2 Average gross wages, Republic of Serbia 2001-2020, RSD

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual average
2001	6091	6546	6840	7256	7224	7953 (d)	9003	9799	9940	10647	11101	12143	**8691 (d)**
2002	10719	11410	11845	12590	12429	12952	13461	14317	13921	14439	14800	16643	**13260**
2003	13659	14925	14579	16018	15973	16425	17167	16932	17277	17986	17742	20975	**16612**
2004	17498	18414	18681	20807	19451	19700	21495	20823	21130	21472	22043	25392	**20555**
2005	20898	22402	23198	25153	24449	25503	25769	26252	26818	26721	27378	32244	**25514**
2006	26603	28657	29367	30572	30305	31864	31738	32098	32555	32668	33892	41294	**31745**
2007	33770	35219	36148	37117	37668	38916	38712	39302	39308	40082	41010	48122	**38744**
2008	39331	43218	42873	45355	44835	45608	46115	46222	46015	47883	46944	53876	**45674**
2009	40245 (b)	43353	42213	45304	43183	44246	45307	43597	43577	44147	43895	51115	**44147 (b)**
2010	41651	44871	46457	48525	46454	47486	48394	47190	48016	47822	47877	54948	**47450**
2011	47382	49394	49633	54532	49064	54616	54164	53285	53838	52944	53239	61116	**52733**
2012	50829	55505	56125	58465	56206	58712	57240	58503	55903	57733	58914	65165	**57430**
2013	54447	60199	57628	64249	57921	61399	60896	61797	59162	60102	60893	70071	**60708**
2014	52438	60845	59782	63167	60966	61992	62380	62992	60803	61963	60982	68739	**61426**
2015	54208	58992	59141	62532	60487	61302	62687	61538	60503	60767	60913	70763	**61145**
2016	55763	61279	63029	67464	60520	64019	63699	62474	64150	62414	63061	73641	**63474**
2017	57231	64847	65695	68246	64860	67857	66251	65094	66438	64602	65609	74887	**65976**
2018	69218 (b)	66084	68251	67901	69684	68047	68029	68831	66251	69012	69949	72167	**68629 (b)**
2019	75296	72350	74755	75441	76511	74009	76056	74768	74160	76096	77879	82257	**75814**
2020	82836	80288	82320	81486	81464	82572	83016	80901	82515	83106	84201	90849	**82984**

(b) Break in time series
(d) Differences in definition
Source: Dissemination Database, Statistical Office of the Republic of Serbia

ЕКОНОМИКА ƏE

Table 3 Average net wages, Republic of Serbia 2001-2020, RSD

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual average
2001	3821	4087	4262	4531	4497	5530 (d)	6268	6800	6900	7408	7729	8456	**5840 (d)**
2002	7435	7924	8204	8739	8635	8993	9342	9944	9674	10044	10293	11555	**9208**
2003	9468	10367	10126	11148	11043	11346	11865	11680	11953	12432	12254	14528	**11500**
2004	12078	12713	12911	14395	13455	13617	14630	14182	14444	14639	15042	17346	**14108**
2005	14263	15295	15863	17193	16731	17441	17634	17928	18345	18265	18697	22079	**17443**
2006	18191	19567	20094	20887	20713	21777	21774	21925	22259	22340	23148	28267	**21707**
2007	24122	25228	25960	26632	26981	27882	27752	28143	28161	28720	29373	34471	**27759**
2008	28230	30982	30809	32562	32147	32648	33058	33131	32969	34311	33613	38626	**32746**
2009	28877 (b)	31121	30362	32571	31086	31768	32553	31338	31319	31734	31576	36789	**31733 (b)**
2010	29929	32336	33508	34952	33463	34161	34591	33955	34570	34422	34444	39580	**34142**
2011	34009	35538	35777	39298	35362	39322	39127	38389	38763	38167	38363	43887	**37976**
2012	36639	40003	40562	42215	40442	42335	41180	42122	40258	41558	42395	46923	**41377**
2013	39197	43371	41689	46530	41821	44394	44182	44770	42866	43615	44120	50820	**43932**
2014	37966	44057	43452	45847	44184	44883	45216	45610	43975	44938	44206	49970	**44530**
2015	39285	42749	43121	45605	43964	44583	45601	44630	43925	44124	44166	51485	**44432**
2016	40443	44450	45870	49249	43951	46450	46280	45286	46558	45281	45767	53456	**46097**
2017	41508	46990	47814	49635	47136	49238	48101	47220	48212	46879	47575	54344	**47893**
2018	50048 (b)	47819	49400	49117	50377	49226	49202	49773	47920	49901	50556	52372	**49650 (b)**
2019	54521	52426	54271	54645	55380	53633	55042	54115	53698	55065	56331	59772	**54919**
2020	59941	58132	59681	58932	58892	59740	60029	58513	59698	60109	60926	66092	**60073**

(b) Break in time series
(d) Differences in definition
Source: Dissemination Database, Statistical Office of the Republic of Serbia

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RASPBERRY PRODUCTION, TRADE AND MARKET IN THE REPUBLIC OF SERBIA[4]

Abstract

Fruit production has great importance for the Serbian economy, especially the production of berries, where the production of raspberries can be highlighted. Investments in raising raspberry plantations are relatively high, but the invested funds return quickly, given that raspberry fruits have a high market value in both domestic and foreign markets, so the economic risk that accompanies production is much lower than for large fruits. Due to the high value of production on a small area and due to the high position that raspberries have in the total market value, the interest of producers to raise larger areas under raspberry plantations is increasingly pronounced, and therefore its production is constantly increasing. Accordingly, the paper presents the volume of raspberry production in our country for the last ten years (period 2011-2020), trade and foreign trade with other countries, sales and purchase, as well as problems in the market of raspberry purchase in our country.

Key words: *raspberry, production, export, sale, purchase, market*

JEL classification: Q10, Q11, Q17

ПРОИЗВОДЊА, ПРОМЕТ И ТРЖИШТЕ МАЛИНЕ У РЕПУБЛИЦИ СРБИЈИ

Сажетак

Воћарска производња има велики значај за привреду Србије а нарочито производња јагодастог воћа, где се посебно може издвојити производња малине. Инвестиције у подизање засада малине су релативно високе али се

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уложена средства брзо враћају обзиром да плодови малине имају високу тржишну вредност како на домаћем тако и на иностраном тржишту, па је економски ризик који прати производњу знатно мањи него код крупног воћа. Због велике вредности производње на малој површини и због високе позиције коју малина има у укупној тржишној вредности, интерес произвођача за подизање већих површина под засадима малине је све израженији, па је самим тим и њена производња у сталном порасту. Сходно томе, у раду је приказан обим производње малине у нашој земљи за последњих десет година (период 2011-2020. год.), промет и спољнотрговинска размена са другим земљама, продаја и откуп, као и проблеми на тржишту откупа малине у нашој земљи.

Кључне речи: *малина, производња, извоз, продаја, откуп, тржиште*

Introduction

Raspberries can be classified in the group of the most important and most profitable types of berries in our country and in the world in terms of quantity and value of production. It is very adaptable to different conditions in terms of climate and soil, so similarly, only hail and possible late snows can cause damage during its cultivation. The specifics of raspberry as a fruit species are manifold, and are reflected primarily in its favorable biological properties, agroecological growing conditions that it requires, the market value of the production itself, the economic effects of production, etc. Raspberries bear fruit in the first or in the second year after planting, and already in the third year they reach full fertility. Raspberry yields can be extremely high if a balance is established between favorable agroecological growing conditions, the application of modern agrotechnical measures and the use of certified seedlings. With high yields, production costs are reduced and producer profits are significantly increased (Sredojević Z., i sar., 2013).

Raspberries have certain advantages when grown in relation to other crops, and they are: - the possibility of growing on lands with poorer characteristics; - the possibility of using fragmented production plots; - the risk in production is small; - breeding technology is simple; - it is an intensive working plant species because it enables the engagement of physically weaker labor forces such as women, children, the elderly and people with disabilities, - it gives very high quality fruits of exceptional nutritional value, etc. (Kljajić N., 2012).

Raspberry fruits have a high nutritional and technological value. They are extremely healthy because they have protective, dietary therapeutic and dietary prophylactic properties. They contain sugars, acids, minerals, pectin, cellulose, proteins, fatty substances and vitamins. Raspberries are rich in vitamins C, B, E and K, as well as Mg, Mn and Cu. They also have a significant cytostatic effect. Anthocyanins and polyphenols as components of raspberry, of which ellagic acid is especially indicated, have proven to be very beneficial in protecting cells from damage, aging and various forms of cancer. It also contains plant fibers that promote digestion and cleansing of blood vessels. Raspberries also have a positive effect on the regulation of blood sugar. It is a low-calorie fruit that prevents the deposition of fat in the body. Dried raspberry leaves are used to make tea for colds, sore throats, coughs and diarrhea. Vinegar and raspberry juice are used to lower body temperature, etc. (Kljajic N., 2014).

The peculiarity of raspberries is that they are a very important export item. Exceptional biological-pomological properties and production-technological characteristics of raspberries ensure its easy placement on the domestic and foreign markets. Among all types of fruits and vegetables in our country, raspberries occupy a very high place in terms of total exports, because it belongs to the rank of the top 10 export products from Serbia. On the other hand, the production of raspberries in the world lags behind the demand, the needs of the foreign market for frozen raspberries as well as for raspberry products are constantly increasing. All this makes it one of the most profitable crops in the entire plant production, so its production is very attractive for agricultural producers.

Raspberry production in Serbia

Raspberries originate from Asia and began to be grown in Serbia in 1880. Initially, it was grown only as an ornamental plant. Commodity production began after the First World War, ie in 1920, when raspberries were produced for the needs of the local market, mainly for sweets, syrup and pulp. After the Second World War, the demand for raspberries became higher and the prices of fruits were high. Nevertheless, the production of raspberries in Serbia reached a large volume at the end of the 20th century.

In terms of importance, the following regions are: northwestern Serbia (Valjevo, Sabac, Osecina, Ljubovija) and southeastern Serbia (Brus, Aleksandrovac and Kursumlija). Based on the data from the 2012 Census of Agriculture, the largest areas under raspberries are located in the municipalities of Ivanjica (1,249 ha) and Arilje (1,226 ha). Among the municipalities where raspberries are grown on an area of over 500 ha are Krupanj (759 ha), Brus (759 ha), Bajina Basta (694 ha), Osecina (686 ha), Lucani (662 ha), Aleksandrovac (596 ha).), Uzice (548 ha), Ljubovija (539 ha) and Kosjeric (503 ha).

In these areas, autochthonous raspberries with various types are represented. This autochthonous material has an excellent adaptation to the soil and climatic conditions of the environment in which it is located. Various genotypes also have some significant characteristics by which they stand out, especially the pronounced aroma of fruits and a specific pleasant taste (Kljajić N., 2017a).

Raspberries are also grown on smaller areas in other areas of Serbia. In the last few years, the picture under raspberry areas has changed and plantations have been decentralized, given that new raspberry plantations with two-species raspberry varieties are being raised in areas where raspberries have not been traditionally grown, such as Bačka in Vojvodina, Raška District (Novi Pazar, Sjenica) and southern Serbia (Leskovac, Lebane, Vladicin Han), but these attempts to produce raspberries did not yield the expected results.

Raspberry production takes place mainly on family farms. All members of the farm are active and engaged in production, but seasonal labor is also engaged during the harvest. The harvest lasts about a month (3-4 weeks) because the fruits of raspberries do not ripen at the same time. The length of the harvest increases the price of the harvesting process itself, but the market is thus provided with fresh raspberry fruits for a longer period (Kljajić N. et al., 2017b).

The value of raspberry production for the last ten years (period 2011-2020) is shown in Table 1. The table shows data for the native area under raspberry plantations in ha, data for

total production in thous. tons, as well as the average yield in t / ha, including base indices, at the level of the entire Republic of Serbia.

Table 1. Raspberry production in the Republic of Serbia in the period 2011-2020.

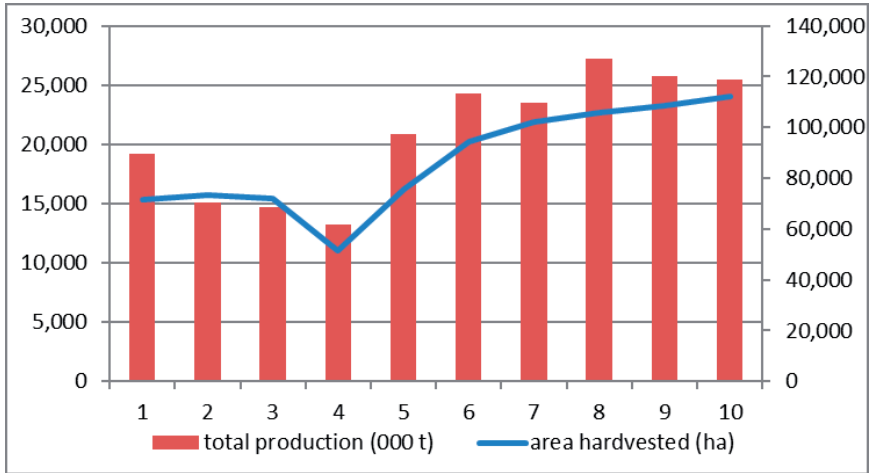| Year	Republic of Serbia					
	Native area under raspberry plantations		Total production		Average yield	
	(ha)	Index (2011=100)	(thousand t)	Index (2011=100)	(t/ha)	Index (2011=100)
2011	15.354	100,00	89.602	100,00	5,8	100,00
2012	15.748	102,57	70.320	78,48	4,5	77,59
2013	15.433	100,51	68.458	76,40	4,4	75,86
2014	11.040	71,90	61.715	68,88	5,6	96,55
2015	16.211	105,58	97.165	108,44	6,0	103,44
2016	20.194	131,52	113.172	126,30	5,6	96,55
2017	21.861	142,38	109.742	122,48	5,0	86,20
2018	22.654	147,54	127.010	141,75	5,6	96,55
2019	23.249	151,42	120.058	133,99	5,2	89,66
2020	24.028	156,49	118.674	132,44	4,9	84,48

Source: Republic Statistical Office, Statistical Yearbooks of the Republic of Serbia, 2008-2020. (for 2020 http://www.minpolj.gov.rs/dokumenti/izvestaji-sa-trzista/?cp_maline=1)

Based on the presented data, it can be seen that the production of raspberries in our country has increased over the years (Graph 1) and that producers are showing increasing interest in this type of fruit. Compared to 2011, when raspberry plantations occupied 15,354 ha of agricultural land, in 2020 the area was increased to 24,028 ha. The average yield is 5.3 t / ha. However, in relation to the realized yield of 5.3 t / ha recorded by official statistics, in practice it has been shown that in Western Serbia there are regular yields of 15 to 20 t/h[5], which corresponds to the genetic potential of raspberries.

In the last few years, in the regions where raspberries are mostly grown, the appearance of early frosts, stormy rains followed by the appearance of the city has been recorded, and in 2020, with all these phenomena, there were floods that hit western Serbia and caused great damage and losses.

[5] Source: https://www.kzk.gov.rs/kzk/wp-content/uploads/2018/01/Analiza-trzista-malina_2017.godine.pdf

ЕКОНОМИКА

Graph. 1. *Overview of raspberry production trends in the Republic of Serbia for the period 2011-2020.*

Source: Creation of graphs on the basis of the data from Table 1.

Foreign trade

For the period 2011-2020., according to the value of exports, frozen raspberries were among the top 10 export products of Serbia. The quantity of exported raspberries from Serbia for the mentioned period is shown in Table 2. In this period, the export of raspberries had a changing trend. Compared to 2011, when exports amounted to 73,548 t, in 2012 and 2013, raspberry exports decreased to 64,268 t, and 61,417 t, respectively, in 2014. year again grows to the level of 73,253 t, or 236,518 (000 USD), and then constantly grows again, until 2019 when the amount of exports reached a value of 114,354 t, or in thousands of USD 234,344,000.

Table 2. *Exports of frozen raspberries (without added sugar), quantity and value from Serbia in the period 2011-2020.*

Year	Rank of frozen raspberries among the top 10 export products from Serbia	Exports, quantity (t)	Exports, value (000 USD)	Unit value of exports (USD / kg)
2011	7	73.548	176.472	2,4
2012	10	64.268	135.648	2,1
2013	10	61.417	187.358	3,1
2014	8	73.253	236.518	3,2
2015	6	93.732	267.566	2,9
2016	9	85.957	247.884	2,9
2017	10	94.000	233.233	2,5
2018	10	103.276	225.764	2,1

2019	10	114.354	234.344	2,0
2020	5	107.745	295.897	2,7

Source: Republic Statistical Office of Serbia http://webrzs.stat.gov.rs/WebSite/public/ ReportView.aspx. https://data.stat.gov.rs/Home/Result/170402?languageCode=sr-Cyrl&displayMode=table&guid=f02d0669-c305-452e-9c06-9fd3153345b8

In 2020, 107,745 tons of raspberries were exported, with an export value of almost 296 million USD.

Raspberries participate in the total export of fruits with a large percentage. For example, in relation to the total export of fruit in 2020, which amounted to 644.6 million euros, raspberries participated with 40.6% (Table 3).

Table 3. *Value share of raspberries in total fruit exports, in euros, for the period 2011-2020.*

Years	The value of raspberry exports		
	Total fruit (mil EUR)	Raspberries (mil EUR)	Percentage of participation
2011	319,4	131,4	41,1
2012	288,0	105,7	36,7
2013	358,4	91,0	25,4
2014	415,8	186,8	44,9
2015	523,4	252,7	48,3
2016	546,6	229,7	42,0
2017	583,2	214,1	36,7
2018	492,9	194,1	39,4
2019	543,3	215,6	39,7
2020	644,6	261,6	40,6

Source: http://www.minpolj.gov.rs/dokumenti/izvestaji-sa-trzista/?cp_maline=1

The largest quantities of raspberries are exported to the countries of the European Union (Germany, France, Belgium, Great Britain, Sweden, the Netherlands, Poland, Austria), then to the USA, Canada, the Russian Federation and other countries. The dominant export markets for frozen raspberries from Serbia are: Germany, France, Belgium and the United Kingdom, and the values of exports in tons for the period 2011-2020 are shown in Table 4.

Table 4. *Dynamics of frozen raspberry exports from Serbia to the leading export markets in the period 2011-2020. (value of exports in Euro thousand)*

States	Years									
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Germany	53.849	49.375	60.353	68.159	88.540	83.421	68.496	63.711	70.393	102.589
France	29.46	27.459	35.393	42.715	55.325	53.131	45.661	37.558	40.316	46.876
Belgium	17.075	18.079	22.521	22.050	26.651	21.421	16.866	15.547	15.886	23.152
United Kingdom	7.396	7.059	6.896	7.831	13.873	15.481	13.706	16.680	16.101	22.838

*/¹ Product code: 081120 - includes frozen raspberries, blackberries, mulberries, berries, currants and gooseberries. Source: I*nternational Trade Centre (ITC), Trade Map, http://www.trademap.org/ Index.aspx. https://www.trademap.org/Country_SelProductCountry_TS.aspx?nvpm=1%7c688% 7c%7c%7c%7c081120%7c%7c%7c6%7c1%7c1%7c2%7c2%7c1%7c2%7c1%7c1%7c1

The high degree of presence and exchange of goods and the presence of the competitiveness on the European Union market are the reason for the great economic importance of our raspberries produced in special geomorphological, pedo-microclimatic and ecological conditions. This is certainly contributed by the long tradition of raspberry production in our country and the long experience of producers.

The orientation of exports to the European Union is conditioned primarily by the deficit of the European Union in raspberries, and on the other hand by the relatively high standard of living that allows a significant level of demand for raspberries as an exclusive fruit. The export perspective is very good, considering that raspberries have the epithet of safe food, so with proper marketing, exports can increase significantly.

According to the export orientation of frozen raspberries, the leading competitor to Serbia is Poland, considering that the export markets of this country largely coincide with the markets where Serbia sells frozen raspberries (Table 5).

Table 5. *Export markets of Serbia's leading competitor (Poland) in the frozen raspberry market for the period 2011-2020. years (value of exports in Euro thousand)*

States	Years									
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Germany	34.501	38.931	47.928	46.003	54.743	51.872	46.551	39.592	37.734	56.406
France	6.534	7.361	9.174	11.694	10.740	11.457	10.925	12.574	10.881	16.220
Belgium	11.767	11.516	20346	19.355	19.830	15.115	15.966	14.306	11.480	15.883
United Kingdom	7.029	8.930	10.858	11.732	11.675	13.710	13.554	11.101	10.501	18.518

/¹ Product code: 081120 - includes frozen raspberries, blackberries, mulberries, berries, currants and gooseberries. Source: International Trade Centre (ITC), Trade Map, http://www.trademap.org/Index.aspx. https://www.trademap.org/Country_ SelProductCountry_TS.aspx?nvpm=1%7c688%7c%7c%7c%7c081120%7c%7c%7c6 %7c1%7c1%7c2%7c2%7c1%7c2%7c1%7c1%7c1

Domestic trade (Internal trade)

Factors that are crucial for the specific economic importance of raspberries are: high and diverse use value of the fruit; relatively high rate of profitability in favorable agroecological conditions; high product robustness; additional employment of labor force and indirect impact on the overall socio-economic development, etc. (Petrović et al., 2002).

It can be said that the production of raspberries is very safe, considering that its fruits, when fresh and frozen, are easily marketed both in our country and in the world.

The fruits of all varieties of raspberries can be used for different purposes: as a frozen raspberry (in the form of a roll, half-block, block, semolina); for the production of juices, concentrates, syrups and jams; for the production of compotes and sweets; as dried raspberries and others (Šoškić A., 1997). Of all the products, raspberries are mostly processed into products in frozen form, and of the frozen forms, raspberry roll is produced the most as the highest quality product.

Frozen raspberries can be used throughout the year, so about 80% of the raspberries produced are frozen, used for various forms of processing or to improve the quality of other products. A small part of production (about 20%) is used for domestic processing, fresh consumption. In more industrialized countries, raspberry fruit is dried and used in powder form.

According to the data of the Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia, all produced raspberries in our country are placed on the market through official market channels (purchase and sale to refrigerators).

Graph 2 and Table 6 show the values of raspberry sales and purchases, market sales and raspberry purchase prices for the period 2011-2020.

Graph 2. Purchase of raspberries and sales at markets

Source: http://www.minpolj.gov.rs/dokumenti/izvestaji-sa-trzista/?cp_maline=1

During 2020, redemption was lower by 8% compared to the previous year. The sale of raspberries at the markets increased 4 times compared to the previous year and amounted to 493 tons.

Table 6. *Purchase prices of raspberries (din / kg), for the period 2011-2020.*

Years	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Redemption price (din./kg)	82,4	124,89	184,23	152,27	192,89	194,23	131,72	96,26	143,64	196,29

Source: http://www.minpolj.gov.rs/dokumenti/izvestaji-sa-trzista/?cp_maline=1

The price of raspberries on the market is not guaranteed, but is defined on the principle of supply and demand. In the period 2011-2020, the purchase price of raspberries ranged from 82.40 dinars (2011) to 196.29 dinars (2020). In 2020, the purchase price of raspberries increased by about 37%, compared to the previous year. The reason for the increase in the price of raspberries is the reduced stocks at the world level of raspberries. Also, during the „COVID – 19" pandemic, there was an increased demand for raspberries worldwide, as well as other berries due to its medicinal properties and as an antioxidant, as a preventative. On the other hand, the weather conditions affected the raspberry harvest.

Raspberry producers in Serbia are facing numerous problems in the purchase market. Some of them are:
- Absence of classification, quality control and health safety of raspberries, then absence of control of the purchase process in terms of purchase conditions and payment deadline, etc .;
- Problems with long-term, standard agreements on business cooperation in production and purchase, which producers conclude with purchasers at the beginning of the year. The contracts are drawn up mainly in such a way that on the basis of them, producers receive pesticides and fertilizers from the purchasers, which they do not pay in cash, but pay as a natural exchange (in raspberries) during the purchase period. At the time of signing the contract, the producers do not know what the price of raspberries will be for the next purchase season and they only know the current price of raw materials. If that contract does not oblige them, the producers generally will deliver all the raspberries during the purchase period to the purchasers (refrigerators) with whom they have already established cooperation and good experience with payment;
- Disorganization of fragmented producers from villages in hilly areas with small holdings, less than one hectare. They do not have a good negotiating position in relation to buyers, and they often need help in financing raspberry production, transferring new knowledge from cultivation technology, information on quality and safety standards required by export markets, etc.;
- Non-existence of redemption at a single redemption price.

Refrigerators as buyers, on the other hand, cannot accurately predict the future selling price of raspberries at the time of purchase. Purchase price decisions are based on estimates of export prices. Some purchasers are often forced to use unfavorable

redemption loans, which is why they buy fruit on deferred payment. Accordingly, producers prefer to pay for buyers who pay as soon as possible or guarantee payment (Republic of Serbia Commission for Protection of Competition. Report on the analysis of competition conditions in the market of purchase and export of raspberries in the Republic of Serbia in the period 2015-2017, December, 2017).

Raspberry production is an exceptional development opportunity for agriculture and the entire Serbian economy. This can be achieved by increasing the economic efficiency of its primary production as well as processing and improving product quality. In all this, the role of the state is extremely important through the provision of favorable loans and other incentives to improve fruit production (raising new perennial production plantations; raising new parent plantations, production of planting material; insurance of crops, fruits, etc.), as well as through protection raspberries as a product of our national interest and more.

The raspberry market development plan should be based, among other things, on the following:

Extension of the growing season through the introduction of new varieties that are suitable for longer storage, modernization of post-technical measures and the introduction of cultivation in semi-closed and closed, ie protected space;

Harvesting and quality control through new harvesting techniques, introduction of international quality standards and certification;

Packaging and logistics through the improvement of packaging facilities and the improvement of transport to the international market; and

Sales and marketing through the improvement of information on the regional and international market of fresh fruit, international promotion from Serbia through the media and direct participation of fruit producers in international fairs (Cecić et al., 2007).

Raspberry production, especially in the region of Šumadija and Western Serbia, indicates that there are realistic preconditions for successful and sustainable development of clusters that would have a positive impact on production. Factors that are suitable for the formation of clusters when it comes to raspberry production and the above area are numerous: favorable natural production conditions, long tradition of production, high production and export of raspberries, high quality raspberries and recognizability of producers in the world market, concentration of producers and cold storage, the existence of numerous scientific and advisory institutions, which could provide support to raspberry producers and more.

At the same time, there are a numrous of negative factors for cluster development such as: lack of advanced vertical integration in the product value chain, lack of innovation in production, lack of specialized knowledge and skills, lack of trust between market participants, short product market and more must be overcome (Paraušić V. et al., 2016).

Conclusion

The potential of fruit growing in Serbia is the excellent quality of fruits and fruit products. Within fruit production in Serbia, raspberry is extremely important because it is one of the most important export products of Serbia. Fresh and frozen raspberries are easily

placed not only on the foreign market where the demand for raspberries is very high, but also on the domestic market.

In 2020, the yield area under raspberry plantations was 24,028 ha, the total production was 118,674 (000) tons, and the average yield was 4.9 t / ha. However, the practice in relation to the official statistics shows that in Zapadna Serbia, an average yield of about 20 tons of raspberries per ha is achieved, which corresponds to the genetic potential of raspberries.

The dominant export markets for frozen raspberries from Serbia are Germany, France, Belgium and the United Kingdom. In 2020, 107,745 tons of raspberries worth almost 269 million USD were exported from Serbia to Germany alone. According to the value and quantity of frozen raspberry exports, the leading competitor of Serbia on the world market is Poland. The export markets of this country largely coincide with the markets where Serbia sells frozen raspberries. Of the total raspberries produced, 80% is frozen while the remaining 20% is used for domestic processing and fresh consumption. All raspberries produced in our country are placed on the market through official market channels. During 2020, redemption was lower by 8% compared to the previous year. The sale of raspberries at the markets increased 4 times compared to the previous year and amounted to 493 tons. The price of raspberries on the market is not guaranteed, but is defined on the principle of supply and demand. In the period 2011-2020, the purchase price of raspberries ranged from 82.40 dinars (2011) to 196.29 dinars (2020). In 2020, the purchase price of raspberries increased by about 37%, compared to the previous year.

Raspberry producers in Serbia face numerous problems. The state has a great role in overcoming these problems through various support measures that it implements in agriculture and within it in the fruit sector, such as: raising new perennial production plantations; raising new parent plantations, production of planting material; insurance of crops, fruits, etc., as well as through the protection of raspberries as products of our national interest, and others.

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