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EDITORIAL

It is our pleasure to inform the academic community that the scientific journal *Economic Horizons* has been included in the List of the Categorized Scientific Journals Published by Domestic Publishers for the year 2023 in the Category M24 – A national journal of international significance.

After conducting the double-blind peer review process, the Issue 1, Volume 26, Year 2024 of the scientific journal *Economic Horizons* contains four original scientific papers, two review papers and the announcement of the scientific conference.

Applying panel unit root tests and the club convergence procedure, the author *Ivan D. Trofimov* analyzes profitability disparities in European economies. The research including aggregate and sectoral data for the period from 1995 to 2019 indicates the fact that there is no convergence at the aggregate level in the majority of the examined sectors, but there is convergence within the clubs themselves at multiple equilibrium levels. A convergence pattern like this is the most typical in the knowledge-intensive service sectors. The influence of exogenous shocks on the profit rate convergence is only of a temporary nature, whereas no convergence has been detected in the case when country- and sector-specific profitability components are included. The research study indicates the importance of the enterprise-specific profitability drivers and local profitability drivers, as well as a limited influence of macroeconomic policies and competition policies on profit rates.

Examining whether or not entrepreneurial and human capital are drivers of regional growth in the Republic of Serbia, the coauthors *Dejan Molnar*, *Sonja Josipović* and *Bojan Baškot* present different regional economic growth models, according to which the educational structure of the working-age population and the entrepreneurial activity significantly contribute to the improvement of economic

performances. The analysis includes 25 subregions at the NUTS 3 level. The research results indicate that entrepreneurial activities play a vital role in the growth of gross value added at the subregional level. It is also concluded that the bearers of the regional development should be the entrepreneurs who possess appropriate knowledge, abilities, creativity and skills. Due to that fact, a recommendation is given to public policymakers to continuously work on the improvement of the business climate and building a stimulating entrepreneurial environment, because it is only such an ambience that may encourage individuals with a university diploma to become the key bearers of entrepreneurial activities.

Starting from the attitude that continuous work on the improvement of quality in all domains of doing business, with a focus on attaining the business excellence level, is one of the key predictors of the survival of enterprises in contemporary conditions of risk and uncertainty, the coauthors *Jelena Erić Nielsen*, *Ana Todorović Spasenić* and *Aleksandra Stevanović* have conducted a research study in the effects of the organizational structure on business excellence in manufacturing enterprises in the Republic of Serbia. As the central dimension of organizational design, the organizational structure has multiple effects in the domain of the generation and improvement of the business excellence level. Pursuantly, the paper identifies the organizational structure parameters that are the most influential with respect to the success of manufacturing enterprises regarding the attainment of the business excellence level. The research results obtained on a sample of 94 manufacturing enterprises are indicative of a statistically significant influence of the organizational structure on every single business excellence determinant, with specialization, coordination, and formalization playing the most important role.

Pursuant to the fact that business models applied in the video game industry have evolved from physical to digital, which has enabled video game producers to pay for additional content in the game thanks to the microtransaction concept, the coauthors *Nenad Tomić*

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and *Marija Mirić* are researching the motives for paying for “loot boxes” as one of the most controversial forms of microtransactions. The research study has the aim to identify the combinations of the factors motivating players in the Republic of Serbia to pay for using loot boxes. For that purpose, the basic technology acceptance model is applied, supplemented with the variables assessed by the coauthors as being potentially important for players’ decision-making. The results of the analysis are indicative of the fact that the “perceived enjoyment”, “customization”, and “perceived ease of use” variables are significant predictors of the “perceived usefulness” variable, and that the “perceived usefulness” and “propensity for gambling” variables are significant predictors of players’ intention to buy loot boxes as well. Apart from the mentioned variables, the results also show that the “intention to purchase” variable exerts a statistically significant influence on the real use of loot boxes.

The coauthors *Predrag Trpeski*, *Kristijan Kozheski* and *Gunter Merdzan* examine the labor productivity determinants in the Open Balkan Initiative countries (Albania, Serbia, and North Macedonia) and in the Southeastern European latest EU entrants (Bulgaria, Romania, and Croatia). In order to identify the labor productivity determinants and discern the differences in the labor market between these two groups of countries, the study applies econometric methods. The results of the analysis are indicative of the significance of the economic development dynamics, the labor freedom degree and the guaranteed minimum wage for an increase in labor productivity in both groups of countries under observation. The influence that variations in the unemployment rate exert on each other appears to be a significant factor giving shape to efficiency and productivity on the labor market. The research emphasizes the complexity of the labor market in the Open Balkan countries, simultaneously highlighting the need to bridge the gap in relation to those economically more developed economies.

Starting from the specific position of Turkey in the contest of the current war between Russia and

Ukraine, as a country with strong economic relations with both confronted states, the coauthors *Ibrahim Halil Ekşi*, *Feyyaz Zeren* and *Samet Gürsoy* examine the influence of war developments on the share market in Turkey and in Russia. Applying the Fourier volatility spillover and Fourier-Granger causality tests, they reveal that there is a bidirectional causality relationship between the analyzed countries in the electricity sectors and a causality relationship between BIST and MOEX in the telecommunication sector. The results of the analysis are also indicative of the presence of a bidirectional volatility spillover in the electricity, finance, and oil sectors between the share markets of the two countries, as well as a volatility spillover between MOEX and BIST in the food sector. It is emphasized in the paper that these findings are a consequence of not only the Russian-Ukrainian war, but also the COVID-19 pandemic. This aside, it is also pointed out that potentially negative developments during the war are likely to affect the Turkish economy unfavorably.

This Issue of the Journal contains the announcement of the international scientific conference on *Contemporary Issues in Economics, Business and Management – EBM 2024*, which was contributed by *Dejana Zlatanović*, Chairwoman of the Program Board. The Conference will be held in Kragujevac organized by the Faculty of Economics of the University of Kragujevac on 16th and 17th December 2024.

On behalf of the Editorial Board of the Journal and on my own behalf, I hereby express my gratitude to the authors of the contributions published in Issue 1 of the Journal. Simultaneously, my special gratitude goes to the reviewers whose constructive and critical comments and suggestions given to the authors of the submitted contributions have contributed to raising the level of the quality of the published papers.

The publishing of the journal *Economic Horizons* is financially supported by the Ministry of Science, Technological Development and Innovations of the Republic of Serbia.

Editor-in-Chief
Milena Jakšić

Milena Jakšić is a full professor teaching at the Faculty of Economics of the University of Kragujevac. She earned her PhD degree at the Faculty of Economics of the University of Kragujevac in the narrow scientific field of general economics and economic growth. The key areas of her scientific and research interests are the financial system, financial markets, financial instruments and financial institutions.

Original scientific paper

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PROFIT RATE CONVERGENCE IN THE EUROPEAN ECONOMIC AREA: A PANEL DATA ANALYSIS

Ivan D. Trofimov

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This paper examines profitability disparities across the European economies using the aggregate and sectoral data for the period from 1995 to 2019 and applying a combination of panel unit root tests and the club convergence procedure. For most of the sectors, no convergence was identified at the aggregate level. Convergence within the clubs to multiple equilibrium levels, however, was identified. This convergence pattern was the most typical in the knowledge-intensive service sectors. The exogenous shocks had temporary effects on the economies' profit rates (thus contributing to convergence), whereas the country- and sector-specific profitability components were characterized by stochastic behavior (attesting to nonconvergence). Overall, the persistence of profitability disparities was demonstrated. The findings suggest the importance of the firm-specific and local profitability drivers and the limited effects of the macroeconomic and competition policies on profit rates.

Keywords: convergence, panel unit root tests, industry, Europe

JEL Classification: L60, L80, N34, O47

INTRODUCTION

The convergence of the distributive variables (wages, a wage share, and capital returns) was examined both in empirical international economics and in industrial organization: in the former case, it was examined as the outcome of international factor mobility (Chou, Izyumov & Vahaly, 2016), whereas in the latter, it was examined as a result of the competitive process, inter-industry variations in wages and capital

intensity, as well as the exogenous shocks that have differential effects on individual industries (Tescari & Vaona, 2014). The empirical research in the profit rate convergence proved to be limited and conflicting in the outcomes. The largely descriptive analyses by A. Bigsten, A. Isaksson, M. Söderbom, P. Collier, A. Zeufack, S. Dercon, M. Fafchamps, J. W. Gunning, F. Teal, S. Appleton, B. Gauthier, A. Oduro, R. Oostendorp and C. Pattillo (2000) and C. Udry and S. Anagol (2006) demonstrated the profit rate disparities across countries and higher rates in capital-scarce economies with no pronounced convergence (divergence) patterns. In the case of manufacturing profits in industrialized economies, A. Glynn (2004)

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likewise identified no convergence despite trade liberalization, the freer movement of capital, and stronger competitive pressures. In contrast, N.-T. Chou *et al* (2016) confirmed the profit rate convergence in developing and transition economies, principally due to convergence in the output-capital ratios and a technological transfer. S. Carter (2003) noted limitations to the profit rate convergence in developed economies after the dismantlement of the Keynesian paradigm of economic governance in the 1980s to the 1990s. In the study on regional convergence in Canada's manufacturing profit rates, D. L. Rigby (1991) rejected the convergence hypothesis and noted the existence of spatial barriers even within a single economy.

In this paper, convergence tendencies in profit rates at both the industry and aggregate levels for the European Economic Area's countries that have undergone political and economic integration over the past decades are examined. The focus is on the two aspects of convergence: the degree of persistence in profitability differentials (stochastic convergence), and heterogeneity in convergence (club convergence). Respectively, a series of panel unit root tests are done, and the club convergence procedure is carried out. The two hypotheses are as follows:

- H1: There is some form of the profit rate convergence across the European economies due to the integration forces, factor flows or underlying forces (convergence in the wage share or capital productivity).
- H2: Convergence is incomplete and imperfect, with heterogeneity in levels, slow convergence speed and the presence of convergence clubs (due to the limitations of the integration and unification processes in Europe and profit determination by local or industry-specific factors).

Section two of the paper examines the theoretical basis of the factor price (return) convergence. Section three defines the variables, describes the data and outlines the econometric methodology. Section four contains the empirical results of the study, while the concluding remarks are presented in the final section of the paper.

LITERATURE REVIEW

The issue of economic convergence in Europe has been subjected to extensive research, with the following aspects being examined: the determinants of the GDP *per capita* convergence, the introduction of the euro, external imbalances, the total factor productivity differences, migration, the COVID-19 effects (Coutinho & Turrini, 2020; Tubić-Čurčić & Stanišić, 2023; Licchetta & Mattozzi, 2023), labor productivity in individual industries (Kijek, Kijek & Nowak, 2020; Borović, Tomaš & Trivić, 2023), the socioeconomic and political aspects of convergence (Collier, 2020), to name but a few.

The analysis of the distributive variable convergence in general and in Europe in particular was more limited. It documented the labor share disparities and related them to the differences in the relative prices and structural change (Kónya, Krekó & Oblath, 2020), identified the substantial share disparities and attributed them to the accession to the EU and the expansion of technological opportunities to work (Prohorovs & Bistrova, 2022), provided the evidence of the profit rate convergence driven by an increase in capital productivity and, to a lesser extent, a decline in the relative price of capital goods (Chou *et al*, 2016), and confirmed the upward trend in profit shares and negative GDP-profit share correlation (Izyumov & Vahaly, 2015).

At the industry level, the pace and outcome of convergence in profit rates is determined by the producer's response to competitive pressures, production techniques, the capital mobility degree, the bargaining power of collective labor, capital intensity and composition, and other exogenous factors. Firstly, competition in product markets lowers profit margins and wages (in neoclassical economics, convergence to the long-term 'normal' level, in heterodox economics, convergence to a positive level, determined by the capital-labor ratio and the exploitation of the labor rate) (Glick & Ochoa, 1990). Secondly, a greater strength of organized labor may keep wages at a higher level at the expense of a profit, while the greater bargaining power of capital (assisted by greater capital mobility) generates the opposite outcome. Thirdly, production techniques

and the innovation pace in individual industries determine the dynamics of the price and factor returns (e.g. more innovative firms and industries earning higher profits and affording higher wages), the process independent from competitive forces and capital and labor relative power. Fourthly, exogenous factors (demographic transition, the business cycle fluctuations, regulatory changes, etc.) may affect profit rates and wages in a variety of ways, e.g. generate stability, stochastic behavior or deterministic trends in either direction, or may change dispersion across industries, etc.). For instance, T. P. Lianos and V. Droucopoulos (1993) demonstrate an increase in the dispersion of profit rates at the cycle expansion stage driven by differences in capital intensity levels. On the other hand, the economic expansion may allow higher profits for low-profit firms, thus bringing a reduction in the dispersion and convergence of profit rates. Alternatively, in the presence of entry barriers or capital requirements, the hierarchy or profit rates may persist. Fifthly and lastly, the speed of profit rate convergence across economies may be more pronounced in manufacturing, given the greater mobility of the production factors, the greater intensity and degree of the class conflict (Glyn, 2004).

Factor price disparities at the national economy or regional bloc levels are likely to be smaller than those on an international scale, given the free trade and movement of the production factors that result in the factor price convergence (Rassekh, 1992). The remaining factor price differentials may be attributed to technological polarization in specific industries, disparities in the physical infrastructure and human capital endowments (e.g. the southern and eastern European regions), and location-specific factors. In Europe, convergence forces may include labor migration (in the 1970s, migrations from Southern Europe, and in the period from 1990 to 2000s, migrations from Eastern Europe); the provision of structural funds from the EU budget to the less developed members; foreign investment from the capital abundant members (e.g. the acquisition of businesses in new members); the relocation of the assembly-type industries to the eastern European members (akin 'maquiladora' industries in the US-Mexico trade).

Regarding the profit rate convergence across economies at the sectoral level, O. M. Amos Jr. (1991) postulated the slowest convergence for the industries with the highest degree of the concentration of productive firms and localization in specific places (e.g. finance in London and Frankfurt), this postulation being based on the US data. These industries, however, are characterized by the fastest rate of technological and organizational change, and (in the case of finance) the intense business reorganization that contributes to the profit convergence. The industries serving and selling to the national market (in this study, the EU market), such as manufacturing, are likely to experience a greater mobility of factors and hence convergence, whereas the industries selling and investing locally (such as various nonfinancial or public services) or the industries relying on the permanent or hardly changeable natural resource endowment of (agriculture and mining) or fixed amenities (tourism) are characterized by smaller mobility and a slower pace of convergence (Testa, 1989; Mallick & Carayannis, 1994). In the case of agriculture, the EU-wide policies (such as the common agricultural policy) and the agro-industrialization process may potentially offset slow convergence or divergence.

In general, the findings with respect to the profit rate convergence are scant and contradictory, thus requiring further empirical testing.

METHODOLOGY AND DATA

The profit rate variable is defined as the net operating surplus, *NOS* (i.e. the operating surplus adjusted for depreciation) divided by the net capital stock *K* at the current replacement costs:

$$\pi = \left(\frac{NOS}{K} \right) \times 100 \quad (1)$$

The operating surplus is taken as a residual from the production accounts and excludes the extraneous items not related to the production process. Capital stock is measured at the current replacement (rather than historical) values, because the vintages of the

capital installed at different points in time and purchased at the different price levels are not additive or commensurate with each other in the absence of the fixed nonmonetary unit of measurement and are not equally productive.

The profit rate series are presented and analyzed in level terms, with no logarithmic transformation, which approach is justified by the fact that a number of the observations are close to zero and the specific interest of the paper in the actual dynamics of the profit rates (that includes outliers, the variation of the data on a relative scale and distribution shapes).

All the data were sourced from the Eurostat databases (the relevant details provided in Table A1, see the Appendix). The time frequency is annual, and the study covers the period from 1995 to 2019. The economies included in the study are Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Slovakia, Spain, Sweden, and the UK. Convergence is conducted for the economy as a whole, as well as for the twelve broad sectors (the list is contained in the 'Empirical results' section).

Given the high degree of the economic and policy integration in the European Union and a possible presence of cross-sectional heterogeneity and dependence, the M. H. Pesaran (2007) and J. Bai and S. Ng (2004) tests capturing these characteristics were applied.¹ The use of the Pesaran and Bai-Ng panel unit root tests was the key methodological element in the studies carried out by C. van Kreveld (2023), and J. E. Payne and N. Apergis (2021).

The Pesaran test takes augmented Dickey-Fuller (ADF) regression and incorporates the cross-sectional averages of the lagged differential y_{it} and its first difference in it, namely as follows:

$$\Delta y_{it} = a_i + b_i y_{it-1} + c_i \bar{y}_{t-1} + d_i \Delta \bar{y}_t + \varepsilon_{it} \quad (2)$$

The cross-sectionally augmented IPS test statistics are calculated as:

$$CIPS(N, T) = \bar{t} = \frac{1}{N} \sum_{i=1}^N \tilde{t}_i(N, T) \quad (3)$$

where $t_i(p_i)$ is the t-statistic for b_i in the cross-sectionally augmented ADF regression.

The null hypothesis $H_0: b_i = 0$ for all i is contrasted against the heterogeneous alternative $H_1: b_i < 0, i = 1, 2, \dots, N_1, b_i = 0, i = N_1 + 1, N_2 + 2, \dots, N$, i.e. the alternative assumes that at least one of the series is stationary, whereas failure to reject the null implies that all the series are nonstationary.

Bai-Ng (2004) test traces convergence (or its absence) to the common, as well as country-specific (idiosyncratic) factors, e.g. if there is no convergence in real wages, that fact may be attributed to the factors affecting all the economies in question (e.g. technological change), or only some of them (e.g. the policies implemented in selected economies). The test treats the panel data as the sum of the deterministic country-specific component D_i , the common component (the product of the country-specific factor loading λ'_i and the vector of the common factors F_t) and the error term.

$$Y_{it} = D_i + \lambda'_i F_t + e_{it} \quad (4)$$

$$F_{mt} = \alpha_m F_{m,t-1} + u_{mt} \quad (5)$$

$$e_{it} = \rho_i e_{it-1} + \varepsilon_{it} \quad (6)$$

where $t = 1, \dots, T$, $m = 1, \dots, r$, $i = 1, \dots, N$.

The test uses transformed data (the first-differenced, if there is a constant in D_i , and the demeaned and the differenced, if there is a linear trend), conducts the principal component analysis in order to extract the factors (r being the number of principal components), the country-specific loadings and residuals, and examines the unit root null hypothesis separately for the common and idiosyncratic components. The number of the components is determined based on the J. Bai and S. Ng (2002) criterion. In contrast to

M. H. Pesaran (2007), the test does not assume that both integrated components are of the same order, thus testing the unit roots in the components separately.

The m common component is stationary if the null hypothesis of $\alpha_m = 1$ is rejected in favor of the alternative of $\alpha_m < 1$. The idiosyncratic component e_{it} is stationary if the null hypothesis of $\rho_i = 1$ is rejected in favor of the alternative of $\rho_i < 1$ for some i .

For the idiosyncratic components, the Fisher-type pooled ADF test is applied as follows:

$$DF_{(\hat{e})}^c(i) = \frac{\sum_{t=2}^T \hat{e}_{it-1} \Delta \hat{e}_{it}}{\left(\hat{\sigma}_{\hat{e}i}^2 \sum_{t=2}^T \hat{e}_{it-1}^2 \right)^{1/2}} \quad (7)$$

where $\hat{\sigma}_{\hat{e}i}^2 = \sum_{t=2}^T (\Delta \hat{e}_{it} - \hat{b}_i \hat{e}_{it-1})^2 / T - 1$ and \hat{b}_i is the OLS estimator from the regression of $\Delta \hat{e}_{it}$ on \hat{e}_{it-1} . To test for the unit roots in the idiosyncratic component, the panel-modified P_a , P_b and $PMBS$ statistics were derived, respectively.

To account for the local version of convergence to multiple levels (at multiple speed), P. C. B. Phillips and D. Sul (2007) club convergence procedure, a nonlinear time-varying factor model capable of capturing transitional dynamics, combining both convergence in levels and growth rates, distinguishing the multiple convergence equilibria, measuring the speed of convergence while not relying on the analysis of the (non)stationarity of the series is employed. The Phillips-Sul club convergence methodology has been applied extensively, e.g. by S. Solarin, S. Erdogan and U. Pata (2023) in the OECD income inequality convergence study, I. Arif (2022) in regional convergence analysis, or M. R. Maulana and H. Aginta (2022) in the regional wage convergence research.

The model is implemented in the panel data setting that gives an additional advantage of comparing the transition path of an individual economy relative to the average level in the panel. The procedure includes

the $\log t$ test for the overall convergence based on time series regression; the stepwise algorithm to identify the number of the clubs and determine their composition; the adjacent test for club merging; and the additional plots to depict the transition behavior of the panel members.

For the country i , the panel data Y_{it} is split into the two time varying components, namely the common factor μ_t and the idiosyncratic factor loading β_{it} as:

$$Y_{it} = \beta_{it} \mu_t \quad (8)$$

The idiosyncratic component is used across time and cross-sections and represents the deviation of the economy i from the common path μ_t and behavior of the economy i in relation to the other economies. Within the framework, all the economies converge to the steady state in the future irrespective of their current position $\lim_{k \rightarrow \infty} \beta_{it+k} = \beta$; however, they may converge to multiple steady states.

To eliminate the common component, P. C. B. Phillips and D. Sul (2007) rescale the panel average and define the relative transition parameter h_{it} as:

$$h_{it} = \frac{Y_{it}}{1/N \sum_{i=1}^N Y_{it}} = \frac{\beta_{it}}{1/N \sum_{i=1}^N \beta_{it}} \quad (9)$$

The cross-sectional average of the individual economies' h_{it} is set equal to unity by construction. In the case of overall convergence to a single steady state, β_{it} moves towards the constant β , h_{it} converges to unity, and the cross-sectional variation of the relative transition paths H_t approaches zero:

$$H_t = 1/N \sum_{i=1}^N (h_{it} - 1)^2 \rightarrow 0 \quad (10)$$

According to the proposed representation, the null hypothesis is the overall convergence of β_{it} to β_i for all non-negative α , whereas an alternative hypothesis is nonconvergence for some i .

$$H_0 : \beta_i = \beta \text{ and } \alpha \geq 0 \quad (11)$$

$$H_A : \beta_i \neq \beta \text{ for some } i \text{ and/or } \alpha < 0 \quad (12)$$

The hypotheses are tested by means of the $\log t$ regression:

$$\log(H_i/H_t) - 2 \log L(t) = \hat{\alpha} + \hat{\beta} \log t + u_t \quad (13)$$

where $t = [rT], \dots, T$, $r > 0$, $L(t) = \log(t)$, $\hat{\alpha}$ is the least-square estimate of α , and $\hat{\beta} = 2\hat{\alpha}$ is the parameter of the $\log t$. The $\log t$ test has an acceptable size and power properties when $r = 0.3$, hence 30% of the earlier observations in the sample are removed, according to P. C. B. Phillips and D. Sul (2007) recommendations.

The null hypothesis is tested through an autocorrelation- and heteroscedasticity-robust one-sided t-test. The null hypothesis of the overall convergence is rejected if $\hat{\beta} < 0$ and is significant, whereas the t-value of $\hat{\beta}$ is less or equal to -1.65 (at the 5% significance level). The speed of the convergence of the units within the clubs is represented by the size and significance of the beta coefficient. The negative and insignificant beta indicate the absence of convergence ($\hat{\beta} < 0$, $t_{\hat{\beta}} < -1.65$), negative but significant beta represents slow convergence ($\hat{\beta} < 0$, $t_{\hat{\beta}} > -1.65$), while positive and significant beta indicates conditional convergence in the growth rate or absolute convergence in levels ($2 > \hat{\beta} \geq 0$, $t_{\hat{\beta}} > -1.65$ and $\hat{\beta} \geq 2$, $t_{\hat{\beta}} > -1.65$, respectively).

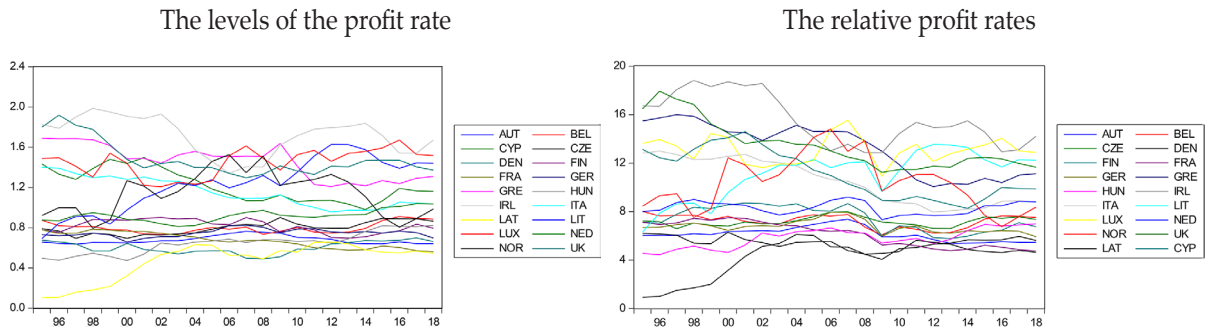
EMPIRICAL RESULTS AND DISCUSSION

The level of the profit rates varied substantially across the sectors (Table A2, Appendix and Figure 1). The highest and lowest mean profit rates (46.5% and 3.8%, respectively) were respectively observed in the financial and insurance services, and real estate activities (in the latter sector, the profit is confined to

the transaction margin). The standard deviation was substantial, reflecting the variation of the rates across the economies and the time (the highest and the lowest deviations being observed in the same sectors as the mean profit rate). The highest profitability and profit volatility in the finance and insurance sectors reflect broader financialization (a complex process that includes the rising power of financial capital, the reordering of the productive sectors and a greater involvement of households in the financial sector), concentration in the financial sector, alongside the instability of the financial sector companies (Nolke, 2017). The profit rate was positively skewed in all the sectors and was close to symmetric in the aggregate economy. The positive excess kurtosis was demonstrated in administrative and support services, the real estate activities and, to a lesser extent, in the other sectors, whereas in the total economy, the profit rate distribution was platykurtic. The null hypothesis of the distribution normality was rejected in every sector, as attested by the Jarque-Bera test.

A reduction in the cross-sectional variation was observed in the level of the profit rates, but not in the relative profit rates (likely pointing to sigma convergence in the former case). A limited number of the economies clustered and co-moved, while certain economies (namely Ireland, Luxembourg, and Lithuania in the top figure) seemed to have substantially higher levels of profitability and arguably distinct fluctuation patterns. Together with the aforementioned broad disparity, this may suggest the absence or weak form of convergence at the panel-wide level and the presence of club convergence.

Among the EU new members, the profit rates were relatively stable in the Czech Republic and Hungary (Figure A1, Appendix). The (relative) profit rates in Latvia exhibited a clear decline in the post-2004 period, while in Lithuania, they grew throughout the period. The case of Lithuania demonstrates its particular success in attracting foreign investment compared to its other Eastern European peers (as manifested in the number of the established free economic zones, tax exemptions to foreign companies, a reduction in red tape) and the growth of the industries with high productivity, and innovation and the human capital

Figure 1 The levels of the profit rate (in %) and the relative profit rates across the European economies

Source: Author

content of the output. These forces contributed to the growth of the mass of profits, while wage growth slower than in the other Baltic states enhanced a profit share. In contrast, the Latvian case is a reflection of dominance in the GDP of the low-productive services, a certain slack in the structural reforms and the ongoing wage growth in the post-accession period (Danilevičienė & Lace, 2017; Krasnopjorovs, 2021). The GFC decline in 2008-09 was observed for Lithuania and less so for Hungary. In Cyprus, the dynamics of the profit rates was principally driven by the level of the labor share, capital productivity and the profits in the financial sector: in the 1990s and the early 2000s, they were driven by the stable labor share and the expansion of financial inflows and profits (hence stable profitability), in the period until 2013-24, that driver was a rapid decline in capital productivity (the falling profit rate), and finally in the post-2014 period (the rising profit rate), they were driven by the severe devaluation of the labor power and reduction in the labor share (Kosmas & Ioakimoglou, 2023).

The comparison of the levels of the profit rates across the sectors may mask the conceptual and statistical differences pertaining to the calculation of the operating surplus and the capital stock. In the financial sector and agriculture, the surplus is attributed to natural capital and the financial assets that do not belong to the fixed reproducible asset category. In the public sector (or the sectors where public enterprises play a substantial role in production), the calculation of the rate of return may be meaningless, given the fact that the governments or government enterprises

are not mandated to operate for a profit (while simultaneously the capital stock may be substantial). Additionally, the government operating surplus may attribute to the other sectors (e.g. a surplus from the public educational institutions or the transport infrastructure). Lastly, the operating surpluses in the wholesale and retail may be due to prior investment in stocks (which are distinguished from fixed capital).

The Pesaran CD test rejects the null hypothesis of cross-sectional independence in every sector and in the aggregate economy, thus indicating the appropriateness of the use of the cross-sectionally augmented Pesaran CIPS test and the Bai-Ng factor-based test. Both tests were implemented on the relative profit rates (the ratio of the country i 's profit rate to the average profit rate in the panel), including the constant or constant plus trend and the maximum of four lags (the Pesaran CIPS test) or a single common factor (the Bai-Ng test).

In the Pesaran CIPS test, the optimal lag is selected using an iterative process, whereby the significance of the lag is determined based on the Portmanteau Ljung-Box test. The Pesaran CIPS test indicated unit roots in the total economy and in most sectors (Table 1). Arguably, the relative profit rate was stationary in mining and quarrying (the rejection of the null at lags zero and one in both specifications) and in transportation and storage (the rejection at lags zero and one in the specification with the constant). There was also some evidence of stationarity for accommodation and food service, and administrative and support services.

Table 1 The results of the Pesaran CD and CIPS tests

Sector	Pesaran CD	Pesaran CIPS (the constant)					Pesaran CIPS (the constant plus the trend)				
		Lag=0	Lag=1	Lag=2	Lag=3	Lag=4	Lag=0	Lag=1	Lag=2	Lag=3	Lag=4
[1]	59.348	-1.473*	-1.733	1.467	-1.605	-1.624	-1.802	-2.358	-2.072	-2.094	-2.011*
	0.000	0.887	0.530	0.892	0.736	0.708	0.990	0.414	0.861	0.838	0.913
[2]	45.462	-1.826*	-1.778	-1.572	-1.759	-1.734	-1.879	-1.966*	-1.647	-1.885	-1.753
	0.000	0.412	0.487	0.786	0.518	0.557	0.967	0.93	0.997	0.965	0.991
[3]	48.345	-1.939*	-1.886	-2.066	-1.762	-1.717	-2.017	-1.855	-1.911*	-1.736	-1.469
	0.000	0.218	0.288	0.096	0.481	0.554	0.896	0.975	0.957	0.993	1.000
[4]	43.249	-1.822*	-1.907	-1.900	-2.097	-1.748	-2.059	-2.195	-2.259*	-2.610	-2.136
	0.000	0.418	0.292	0.302	0.096	0.535	0.862	0.698	0.601	0.114	0.779
[5]	49.950	-2.077*	-1.544	-1.377	-1.235	-1.091	-3.020*	-2.412	-2.164	-2.068	-1.732
	0.000	0.089	0.802	0.938	0.983	0.997	0.001	0.330	0.735	0.851	0.994
[6]	48.285	-1.762*	-2.053	-1.944	-1.518	-1.517	-2.077	-2.450	-2.360*	-1.831	-1.805
	0.000	0.481	0.106	0.212	0.830	0.831	0.841	0.273	0.416	0.980	0.985
[7]	47.451	-1.761*	-1.627	-1.574	-1.405	-1.053	-2.350*	-2.195	-2.317	-2.191	-1.872
	0.000	0.481	0.695	0.766	0.923	0.998	0.432	0.690	0.487	0.695	0.970
[8]	48.414	-1.447*	-1.514	-1.382	-1.281	-1.118	-2.209*	-2.507	-2.462	-2.548	-2.378
	0.000	0.894	0.835	0.935	0.973	0.995	0.668	0.199	0.256	0.153	0.385
[9]	22.041	-2.351*	-2.339	-1.686	-1.970	-1.738	-2.612	-2.704*	-1.851	-2.018	-1.840
	0.000	0.007	0.008	0.605	0.182	0.519	0.097	0.045	0.976	0.895	0.978
[10]	50.542	-1.515	-1.433	-1.237	-1.228	-1.334*	-2.122*	-2.194	-2.015	-1.924	-1.922
	0.000	0.834	0.905	0.983	0.984	0.957	0.790	0.692	0.898	0.951	0.953
[11]	50.520	-0.995	-1.399	-1.354	-1.362	-1.180*	-1.427	-2.062	-1.987	-2.043	-1.663*
	0.000	0.999	0.926	0.949	0.945	0.091	1.000	0.857	0.918	0.874	0.997
[12]	26.914	-2.064*	-2.099	-1.785	-1.813	-1.616	-2.390*	-2.336	-2.073	-2.359	-2.281
	0.000	0.098	0.075	0.443	0.397	0.709	0.366	0.455	0.846	0.416	0.549
[13]	50.787	-1.526*	-1.511	-1.434	-1.465	-1.516	-1.867	-1.953*	-1.734	-1.789	-1.669
	0.000	0.822	0.838	0.904	0.880	0.833	0.972	0.938	0.993	0.987	0.997

Notes: The p-values are in parentheses. Stationarity at 1%, 5% and 10% critical levels is indicated in bold, bold italics, and italics, respectively. * represents the lag length selected by the Portmanteau Ljung-Box test.

Source: Author

The Bai-Ng test (Table 2) indicated the stationarity of the common component in the majority of the sectors, with the exception of the administrative and support service sectors, construction, and wholesale and retail trade, and provided some evidence of non-stationarity in information and communication (the specification with the constant), and in the total economy and real state (the specification with the constant and the trend). The results for the common component suggest the temporary effects of global and regional shocks on aggregate or sectoral profitability. The idiosyncratic components in most sectors were characterized by stochastic behavior (hence nonconvergence was likely a country-specific phenomenon). The agriculture,

forestry and fishing, financial and insurance services, and to a smaller extent administrative and support services stood as the exceptions. According to J. Bai and S. Ng (2002), series are deemed to be nonstationary if one of the common components is nonstationary, or the idiosyncratic component is nonstationary (as was the case with 11 out of 13 series), or both. Noting the greater power of the Bai-Ng test, non-stationarity and a lack of convergence are confirmed for the aggregate economy and all the sectors except the sectors of agriculture, forestry and fishing, and financial and insurance services. In the former sector, stationarity and panel-wide convergence are attributed to the implementation of the Common Agricultural Policy;

Table 2 The results of the Bai-Ng panel unit root test

Sector	The constant					The constant plus the trend					
	ADF	Pa	Pb	PMBS	Outcome	ADF	Pa	Pb	PMBS	Outcome	Overall outcome
[1]	-1.945	-0.739	-0.654	-0.406	UR	-1.584	-2.112	-1.676	-1.209	UR	UR
	0.046	0.230	0.257	0.342		0.108	0.017	0.047	0.113		
[2]	-4.666	-0.775	-0.708	-0.217	UR	-4.700	-0.812	-0.713	-0.566	UR	UR
	0.000	0.219	0.239	0.414		0.000	0.209	0.238	0.286		
[3]	-1.692	0.998	1.340	2.421	UR	-4.317	0.295	0.311	0.366	UR	UR
	0.086	0.841	0.910	0.992		0.000	0.616	0.622	0.643		
[4]	-1.397	-1.769	-1.348	-1.011	UR	-0.952	-1.959	-1.609	-1.131	UR	UR
	0.157	0.038	0.089	0.156		0.302	0.025	0.054	0.129		
[5]	-4.899	-2.041	-1.335	-1.588	ST	-4.899	-1.753	-1.502	-0.991	ST	ST
	0.000	0.021	0.091	0.056		0.000	0.040	0.067	0.161		
[6]	-0.587	-0.350	-0.255	-0.665	UR	-0.635	-0.100	-0.100	-0.027	UR	UR
	0.464	0.363	0.399	0.253		0.440	0.460	0.460	0.489		
[7]	-1.987	-3.782	-2.013	-1.491	ST	-2.357	-1.356	-1.124	-0.821	UR	Inc
	0.042	0.000	0.022	0.068		0.017	0.088	0.130	0.206		
[8]	-1.452	0.958	1.079	1.078	UR	-2.908	-1.170	-1.030	-0.810	UR	UR
	0.141	0.831	0.860	0.860		0.003	0.121	0.152	0.209		
[9]	-4.241	-1.176	-0.978	-0.680	UR	-4.081	-0.710	-0.655	-0.505	UR	UR
	0.000	0.120	0.164	0.248		0.000	0.239	0.256	0.307		
[10]	-2.713	-0.531	-0.432	-0.751	UR	-2.645	-1.265	-1.109	-0.821	UR	UR
	0.006	0.298	0.333	0.226		0.007	0.103	0.134	0.206		
[11]	-4.899	0.562	0.454	-0.633	UR	-0.434	-0.908	-0.807	-0.661	UR	UR
	0.001	0.713	0.675	0.264		0.520	0.182	0.210	0.254		
[12]	-1.835	0.163	0.178	0.634	UR	-1.895	-0.827	-0.743	-0.569	UR	UR
	0.061	0.565	0.571	0.737		0.053	0.204	0.229	0.285		
[13]	-1.156	0.524	0.644	1.404	UR	0.512	0.306	0.328	0.378	UR	UR
	0.221	0.700	0.740	0.920		0.835	0.620	0.628	0.647		

Notes: According to Table 1, stationarity at all critical levels is indicated in bold. UR, ST, Inc indicate the unit root, stationarity, and the inconclusive case. The lag length selection was performed by choosing the specification that minimizes the Bayesian information criterion. The maximum lag length is given by $k_{\max} = \text{floor}(\min\{T/3, 12\} * (T/100)^{0.25})$.

Source: Author

in the latter, however, they are attributed to the dynamics of the industry characterized by a free flow of labor and capital, the high speed of technological change and regulatory unification.

As far as both the common and country-specific (idiosyncratic) dynamics of the profit rates are concerned, the outcomes of both the Pesaran CIPS and the Bai-Ng tests demonstrate a clear similarity (stochastic behavior in the rates for the majority of

the industries, except for agriculture, forestry and fishing), which reflects the common underlying data and the features of the tests (both attend to the cross-sectional dependence, and both estimate the unobservable common components, albeit in different ways). When only the idiosyncratic component is concerned, the similarities are even stronger, with stationarity additionally identified by both tests in the administrative and support services.

The Phillips-Sul club convergence procedure was implemented on the profit rate data in levels (Table 3). Based on the $\log t$ test, the null hypothesis of convergence for all the economies in the panel is rejected in all the cases, with the beta coefficient being negative and significant (Panel A). Panel B contains information on the number of the clubs, the constituent units in each club and the divergent units. The largest number of the clubs were identified in manufacturing, and in the administrative and support services (four clubs in each sector), only to be followed by the accommodation and food services, agriculture, forestry and fishing, and the financial and insurance services (three clubs in each sector). In the other sectors, maximum two clubs were identified (mining and quarrying contained one single club). The number of the divergent units ranged from zero in the total economy, accommodation and

food service, construction, and information and communication, to two in the financial and insurance services and transportation and storage. There was divergence within one of the clubs (Club 1 in the real estate activities). The slowest speed of convergence within the clubs was that noticed in Club 2 in the construction sector (negative but significant beta), whereas in all the other cases, the beta coefficient was positive. The majority of the clubs were characterized by conditional convergence in the growth rate. Only three clubs experienced absolute convergence: Club 3, in accommodation and food service; Club 2, in real estate activities, and Club 2, in transportation and storage. In the majority of the sectors, there was no over-determination of the true number of clubs. In the manufacturing and financial and insurance services, the final number of the clubs after merging stood at three and two, respectively, whereas in the

Table 3 The club convergence tests

Total economy	Manufacturing			Accommodation and food service							
A. Log-t test	A. Log-t test			A. Log-t test							
	Beta	SE		Beta	SE		Beta	SE			
Full sample	-0.540*	0.034	Full sample	-1.247*	0.022	Full sample	-0.978*	0.016			
B. Club statistics	# of units	Beta	SE	# of units	Beta	SE	# of units	Beta	SE		
Club_1	4	1.094*	0.097	Club_1	5	0.242*	0.121	Club_1	6	0.427*	0.035
Club_2	14	0.074*	0.015	Club_2	2	1.754*	0.274	Club_2	8	1.204*	0.171
Divergent	0			Club_3	4	0.288	0.197	Club_3	2	2.119*	1.053
				Club_4	2	0.604	1.835	Divergent	0		
				Divergent	1						
C. Club merging				C. Club merging				C. Club merging			
Nil				Club_1 (C1+C2)	7	-0.131	0.086	Nil			
Administrative and support services	Agriculture, forestry and fishing			Construction							
A. Log-t test	A. Log-t test			A. Log-t test							
	Beta	SE		Beta	SE		Beta	SE			
Full sample	-1.452*	0.013	Full sample	-1.534*	0.028	Full sample	-1.275*	0.142			
B. Club statistics	# of units	Beta	SE	# of units	Beta	SE	# of units	Beta	SE		
Club_1	2	0.176	1.604	Club_1	9	0.194*	0.054	Club_1	4	1.214*	0.238
Club_2	2	1.682	1.555	Club_2	4	0.657*	0.054	Club_2	11	-0.408	0.319
Club_3	2	0.128	0.163	Club_3	2	1.659	1.894	Divergent	0		
Club_4	5	0.471*	0.115	Divergent	1						
Divergent	1										
C. Club merging				C. Club merging				C. Club merging			
Nil				Nil				Nil			

Table 3 (Continued)

Financial and insurance services				Information and communication				Mining and quarrying			
A. Log-t test				A. Log-t test				A. Log-t test			
	Beta	SE			Beta	SE			Beta	SE	
Full sample	-1.266*	0.045		Full sample	-0.805*	0.012		Full sample	-0.552*	0.052	
B. Club statistics				B. Club statistics				B. Club statistics			
	# of units	Beta	SE		# of units	Beta	SE		# of units	Beta	SE
Club_1	7	0.66*	0.130	Club_1	11	0.253*	0.031	Club_1	7	0.926*	0.128
Club_2	4	0.273*	0.113	Club_2	4	0.81*	0.233	Divergent	1		
Club_3	2	0.997*	0.353	Divergent	0						
Divergent	2										
C. Club merging				C. Club merging				C. Club merging			
Club_1 (C1+C2)	11	0.429*	0.089	Nil				Nil			
Professional, scientific and technical services				Real estate activities				Transportation and storage			
A. Log-t test				A. Log-t test				A. Log-t test			
	Beta	SE			Beta	SE			Beta	SE	
Full sample	-0.870*	0.037		Full sample	-1.406*	0.037		Full sample	-1.138*	0.049	
B. Club statistics				B. Club statistics				B. Club statistics			
	# of units	Beta	SE		# of units	Beta	SE		# of units	Beta	SE
Club_1	11	0.301*	0.086	Club_1	13	-0.309*	0.032	Club_1	6	0.304*	0.035
Club_2	4	0.651*	0.097	Club_2	2	3.322*	0.747	Club_2	2	6.72*	1.806
Divergent	1			Divergent	1			Divergent	2		
C. Club merging				C. Club merging				C. Club merging			
Club_1 (C1+C2)	15	-0.074**	0.046	Nil				Club_1 (C1+C2)	8	0.221*	0.064

Table 3 (Continued)

Wholesale and retail trade			
A. Log-t test			
	Beta	SE	
Full sample	-0.389*	0.010	
B. Club statistics			
	# of units	Beta	SE
Club_1	10	0.661*	0.066
Club_2	5	0.252	0.177
Divergent	1		
C. Club merging			
Nil			

Note: (*) and (**) indicate the coefficient significance at the 1% and 10% levels, respectively. SE represents the standard errors.

Source: Author

professional, scientific and technical services, and transportation and storage as well, the merging procedure resulted in the formation of one single club with one or two diverging economies (Panel C).

With regard to the composition of the individual clubs (Table A3, Appendix), substantial heterogeneity was evident, both in terms of the club size (e.g. Club 2 in manufacturing including only two economies versus Club 2 in construction including eleven economies), and the position of the individual economies (e.g. Denmark is placed in the same club as Luxembourg in agriculture, forestry and fishing, but is put together with Greece, the UK and Italy in the financial and insurance services). The interpretation of the specific position of an economy in a particular club warrants in-depth analysis of its own, and the club composition results can only be deemed to be correct insofar as the econometric procedure was adhered to.

For the total economy, Club 1 included the four economies (Ireland, Luxembourg, Lithuania and the UK) that were quite distinct from the core Club 2 that contained 14 economies. The higher aggregate profitability levels in Luxembourg may be attributed to the country's position as a major financial center (financial profits being the major component of aggregate profits). This factor (the City of London as the financial center) may likewise explain higher profitability levels in the UK. In the case of Ireland, the revival of profitability was driven by a combination of pro-business tax policies, foreign investment inflows (manifested in the number of multinational corporations' headquarters), and the expansion of high-tech exports (such as automobiles and pharmaceuticals). Lithuania benefited from the same type of factors as Ireland in ensuring high profit rates, complemented by the lower wage levels, and the emigration of the labor force (and a decline in the wage share of the GDP).

The manufacturing sector did not experience higher convergence (the total number of the clubs being greater than in most other sectors), which contravenes the hypothesis of faster manufacturing convergence due to the internationalization of the production chains in the sector (Glyn, 2004). Limited convergence in manufacturing is in line with evolutionary and innovation economics predictions tracing manufacturing dynamics to the level of individual high-performing firms, the innovation clusters and the other local and regional drivers (Roberts, 2001; Howitt & Mayer-Foulkes, 2005).

A greater number of the clubs in the accommodation and food services, and the administrative and support services may be explained by a smaller degree of the movement of labor and capital and the presence of the local drivers of profitability. The sectors with a higher degree of the mobility of capital and the labor force with transferable skills and/or more intense

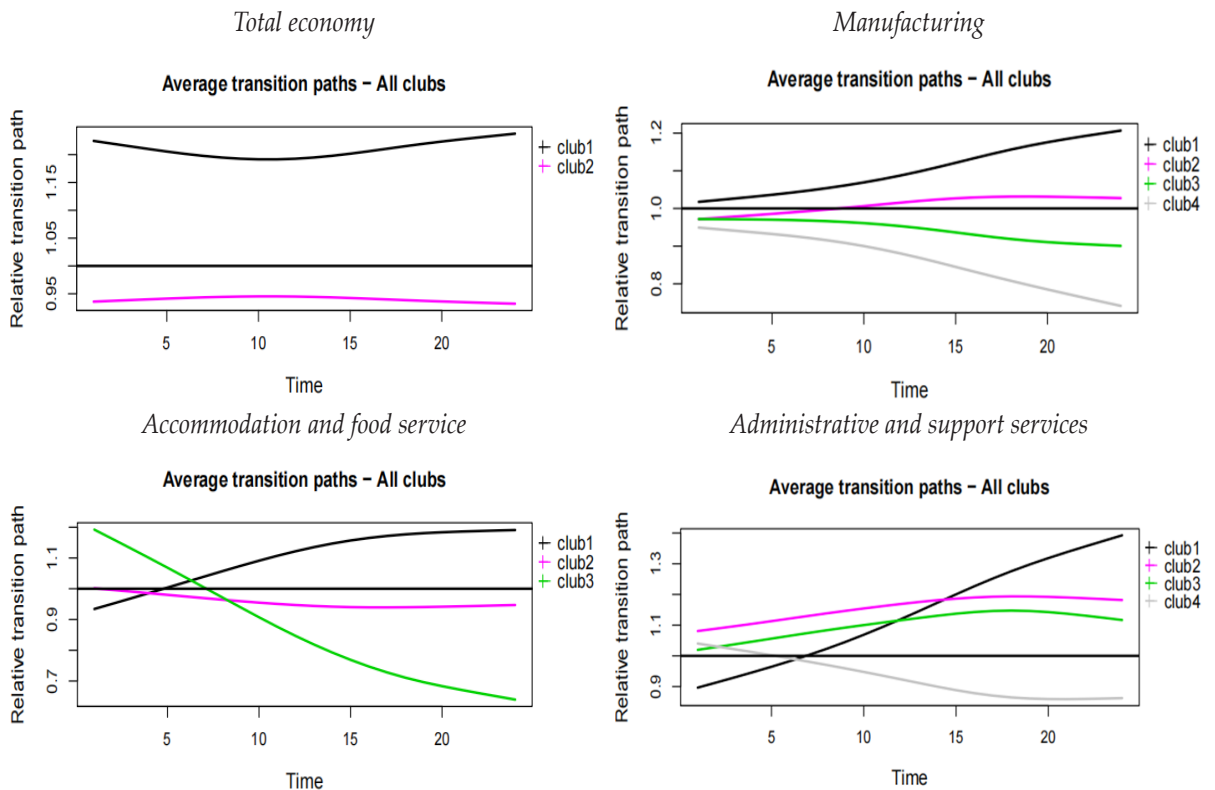


Figure 2 The relative transition paths (the average for the club)

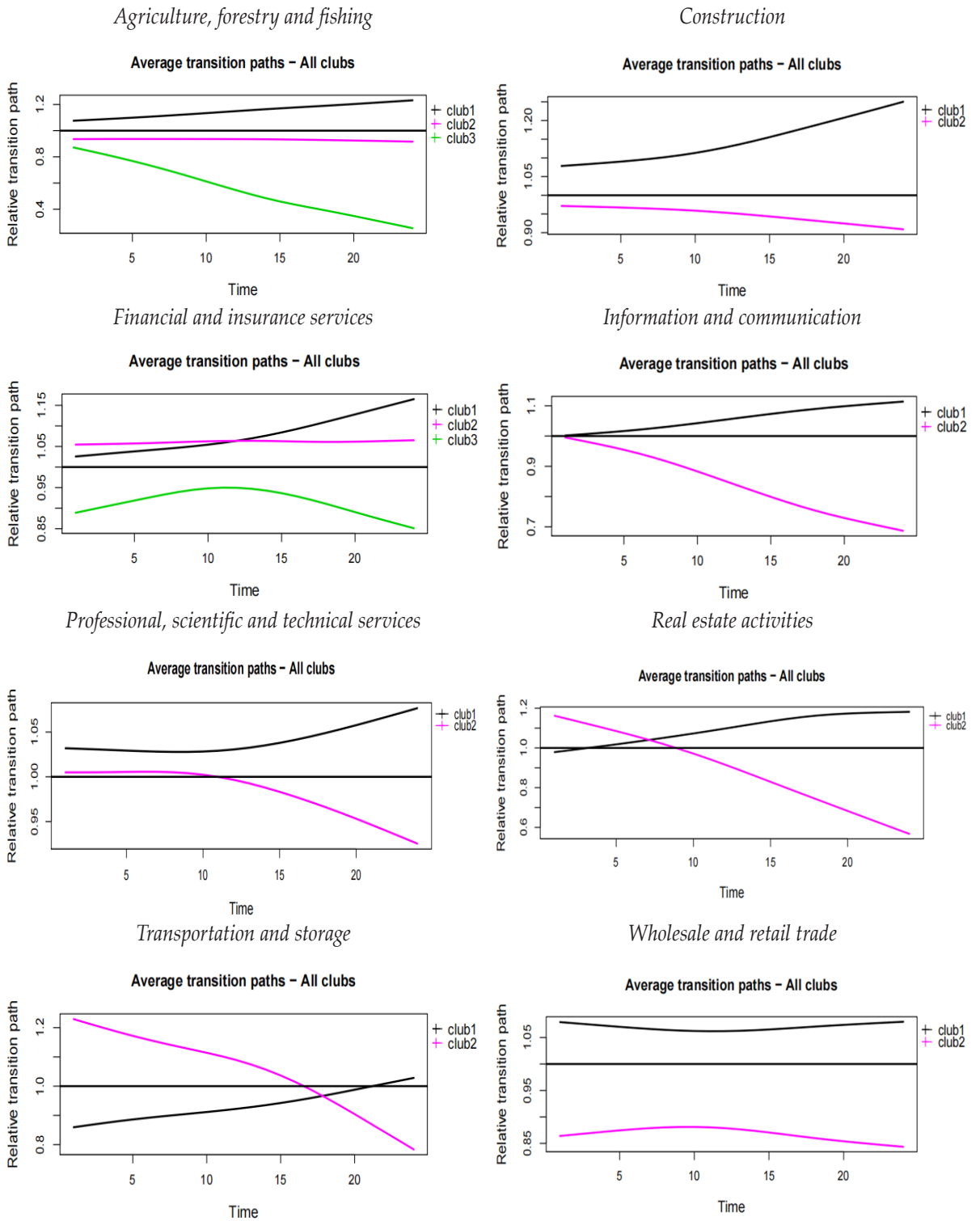


Figure 2 The relative transition paths (the average for the club) (Continued)

business reorganization and regrouping (the financial and insurance, information and communication, and professional services) experienced faster convergence, as was attested by the formation of a smaller number of convergence clubs.

Figure 2 illustrates the average transition paths for the clubs where the transition path towards unity level corresponds to convergence across the clubs. In the total economy and the wholesale and retail trade sectors, there was a very moderate convergence of each of the two clubs towards the unity level in the first decade (1995-2004), only to be followed by moderate divergence. In the five sectors (manufacturing; agriculture, forestry and fishing; construction; information and communication; and professional, scientific and technical services), the initial distance between the average transition paths was small, growing progressively over the years away from the unity level. In the other sectors, the divergence likewise took place; however, the paths tended to change the position, crossing the unity level (convergence followed by divergence) and the other paths.

CONCLUSION

The panels were characterized by cross-sectional dependence, necessitating use of appropriate panel unit root tests (the Pesaran CIPS and Bai-Ng factor-based tests). The former indicated stochastic behavior and the presence of the unit roots for the profit rate in all the sectors (the instances of stationarity at certain lags were more inconsequential). The factor-based test treated the common and idiosyncratic components separately. The common component of the profit rates was stationary in the majority of the sectors, indicating that global and regional shocks had a transitory effect on profitability. On the other hand, the idiosyncratic component contained the unit root in nearly all the cases, suggesting that the profit rate disparities had the domestic and industry-specific origins. The Pesaran-Sul club convergence procedure rejected the hypothesis of a panel-wide convergence. The number of the identified clubs was significant

relative to the limited number of the economies included in the panel.

A number of the sectors (transportation, finance and insurance, information and communication, and professional services) experienced the formation of a limited number of clubs, which is the expected result given the well-integrated infrastructure in Europe, the high speed of organizational and technical change, strong competitive pressures, and significant factor mobility in the knowledge-intensive sectors. Likewise, the sectors with the local determinants of profitability (accommodation and food, administration and support activities) exhibited the formation of a larger number of clubs, which is indicative of more limited convergence. Multiple clubs were observed in the manufacturing and agricultural sectors, despite a relatively higher degree of factor mobility in the former case, and the operation of the common agricultural policy in the latter.

The findings demonstrate the substantial disparities in the levels of the profit rates and nonconvergence, despite the absence of the spatial barriers in the EU, thus having a number of theoretical and policy implications. Firstly, a number of studies documented a steadfast tendency to more competitive markets in the EU manifested in a lower (compared to the other developed economies and blocs) concentration, excess profits, and regulatory barriers to entry pronounced across most industries and member states, both the old and the new (Gutiérrez & Phillipon, 2018).² The process, however, is a relatively new phenomenon, originating in the 2010s, while the present study also covers the older period (characterized by more noncompetitive conduct). The nonconvergence findings are thus the outcome of the adopted approach to measurement and specification. Secondly, the free movement of labor and capital (manifested in FDI flows) did not bring in convergence, thus lending scant support to convergence through international trade and the investment thesis (according to the Heckscher-Ohlin-Samuelson theorem). The source of the inter-country profit and wage differentials are thus likely to be structural, social and political-economic, related to the functioning of the regional (local) labor markets, and the country-specific business financing and innovation modes. Thirdly,

the economic development initiatives and policies that encourage the development of a particular industry implemented at the European Union level without the due consideration of the local economic conditions may prove futile and ineffective. In contrast, the regional policies that correct the local determinants of profitability disparities would likely be more effective in fostering convergence. Fourthly, nonconvergence may be explained in terms of persistent differences in competitive advantage and profitability existing at the firm-level (irrespective of the flows of production factors at the macroeconomic level or competitive dynamics at the industry level). This is a result of a very specific way in which rare, inimitable, and non-substitutable resources are combined and put in use by individual firms, according to the resource-based view of competitive dynamics (Bhandari, Ranta & Salo, 2022). This also reflects the way in which regional (as opposed to national) systems of innovation generate the products and processes that bring in profits. The findings thus highlight the importance of the firm- and location-specific determinants of profitability (and profitability disparities) in line with the resource-based and evolutionary economics (as opposed to the structure-conduct-performance) conceptualization of industry dynamics. Policy-wise, this view of competitive dynamics and this paper's findings likely suggest the persistence of profit differentials in the long run, the limited effect of macroeconomic shocks on profits, and a possible ineffectiveness of anti-trust policies and attempts to bring profits to a 'standard rate of return' given the fact that macroeconomic profits are principally a result of the unique and heterogeneous managerial capacity and resource combinations at the firm level (Joffe, 2022). The local and regional innovation policy may nonetheless play its role. The future research in profit disparities will need to go a level down in order to trace the firm-specific sources of the disparities.

ENDNOTES

1 The Pesaran CIPS proxies the component by averages on the units of the model regressors and the dependent variable. The Bai-Ng test estimates the component directly by the principal component analysis.

2 This in turn is a result of the existence of the more independent regulatory authorities in the EU at the community level, the tougher implementation of anti-trust laws, and weaker lobbying and vested interest penetration in the government.

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APPENDIX

Table A1 The description of the variables

Variable	Measurement	Scope	Source
Net operating surplus and mixed income	At current prices in millions of euros	NACE Review 2 industries (up to NACE A*64)	National accounts aggregates by industry (up to NACE A*64) [NAMA_10_A64_custom_769759]. Available at https://ec.europa.eu/eurostat/databrowser/product/page/nama_10_a64
Net total fixed assets	Current replacement costs in millions of euros	NACE Review 2 industries (up to NACE A*64)	Cross-classification of fixed assets by industry and by asset (stocks) [NAMA_10_NFA_ST_custom_769768]. Available at https://ec.europa.eu/eurostat/databrowser/product/page/nama_10_nfa_st

Source: Author

Table A2 The descriptive statistics

Sector	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	J-B	J-B (Prob)
Total economy [1]	9.058	7.947	18.822	0.932	3.519	0.589	2.579	28.142	0.000
Manufacturing [2]	14.627	12.677	43.033	2.346	8.052	1.672	5.746	262.030	0.000
Accommodation and food service [3]	25.105	20.332	70.307	1.400	15.025	0.931	3.023	55.467	0.000
Administrative and support services [4]	20.696	18.713	142.852	-2.780	18.751	3.436	19.880	4982.307	0.000
Agriculture, forestry and fishing [5]	16.952	15.297	58.895	0.144	10.293	1.266	5.035	168.844	0.000
Construction [6]	46.101	35.631	200.536	0.555	29.965	1.906	8.093	607.103	0.000
Financial and insurance services [7]	46.515	34.079	160.304	2.011	36.104	1.262	3.947	108.988	0.000
Information and communication [8]	18.315	16.332	80.883	-0.445	13.001	1.846	7.607	557.646	0.000
Mining and quarrying [9]	20.462	15.137	68.197	1.033	15.639	0.977	3.182	30.780	0.000
Professional, scientific and technical services [10]	43.874	41.832	177.452	4.567	25.279	1.124	5.544	184.367	0.000
Real estate activities [11]	3.754	3.083	16.490	0.035	2.428	2.585	11.531	1592.048	0.000
Transportation and storage [12]	8.682	6.801	31.494	0.458	6.361	1.568	5.020	139.172	0.000
Wholesale and retail trade [13]	41.478	32.587	140.199	7.099	25.565	1.456	4.934	195.509	0.000

Source: Author

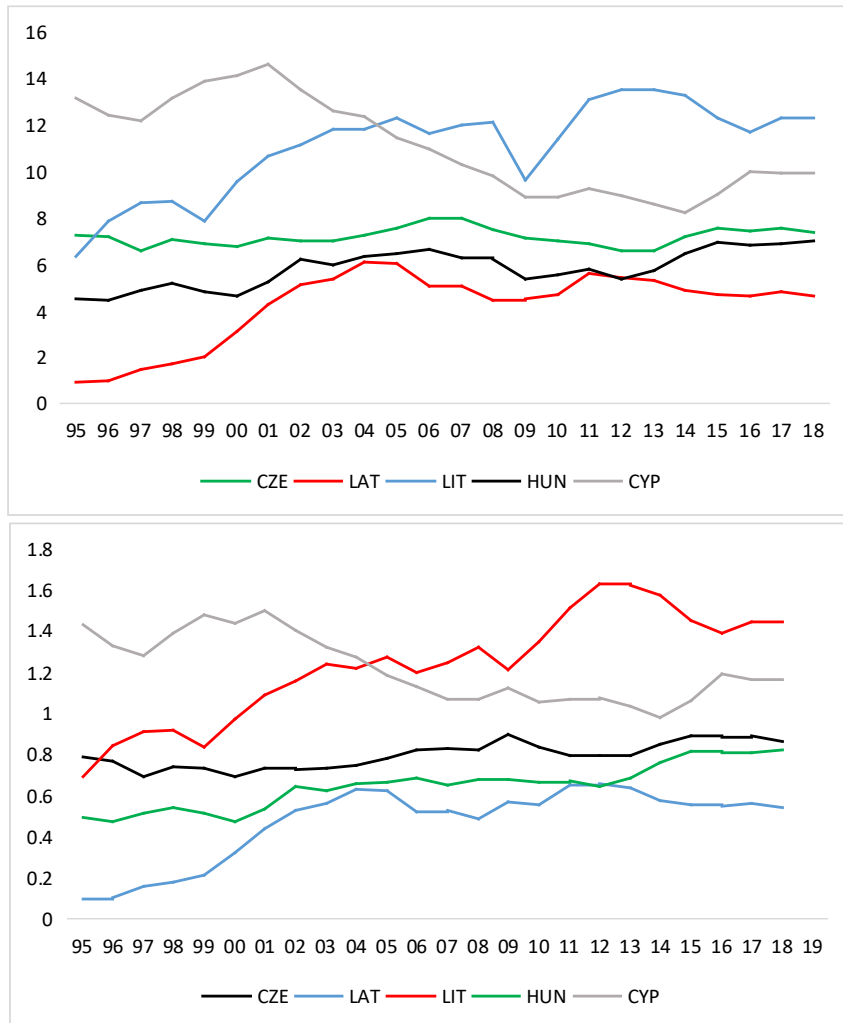


Figure A1 The (relative) profit rates of the new EU members

Source: Author

Table A3 The composition of the convergence clubs

[1]	Club_1 Club_2 Divergent	IRL, LUX, LIT, UK GRE, CYP, NED, ITA, NOR, CZE, BEL, HUN, FIN, GER, DEN, AUT, LAT, FRA None
[2]	Club_1 Club_2 Club_3 Club_4 Divergent	LIT, GRE, UK, GER, DEN NED, CZE AUT, FIN, HUN, BEL FRA, NOR ITA
[3]	Club_1 Club_2 Club_3 Divergent	GRE, FIN, NED, FRA, AUT, NOR LIT, GER, DEN, BEL, ITA, IRL, CZE, UK LUX, HUN Nil
[4]	Club_1 Club_2 Club_3 Club_4 Divergent	UK, FIN HUN, FRA NED, NOR CZE, GRE, GER, ITA, BEL AUT
[5]	Club_1 Club_2 Club_3 Divergent	IRL, NOR, CZE, FIN, HUN, GRE, FRA, BEL, UK ITA, LIT, NED, GER DEN, LUX AUT
[6]	Club_1 Club_2 Divergent	GER, UK, FRA, FIN ITA, DEN, NED, CZE, NOR, LUX, HUN, LIT, BEL, AUT, GRE Nil
[7]	Club_1 Club_2 Club_3 Divergent	LUX, FIN, NOR, NED, IRL, CZE, BEL GRE, UK, DEN, ITA HUN, GER FRA, AUT
[8]	Club_1 Club_2 Divergent	IRL, FIN, GER, NOR, LUX, UK, NED, CZE, BEL, ITA, AUT FRA, LIT, DEN, GRE Nil
[9]	Club_1 Divergent	NOR, NED, DEN, AUT, GRE, LUX, LIT CZE
[10]	Club_1 Club_2 Divergent	BEL, ITA, GRE, LUX, UK, NED, NOR, LIT, DEN, FIN, HUN AUT, GER, CZE, IRL FRA
[11]	Club_1 Club_2 Divergent	UK, GRE, LUX, LIT, HUN, IRL, CZE, ITA, DEN, FIN, FRA, GER, AUT BEL, NOR NED
[12]	Club_1 Club_2 Divergent	FIN, NED, NOR, ITA, FRA, AUT GER, GRE LIT, CZE
[13]	Club_1 Club_2 Divergent	IRL, NED, LUX, LIT, ITA, FRA, GRE, DEN, FIN, NOR BEL, AUT, UK, CZE, HUN GER

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ARE ENTREPRENEURSHIP AND HUMAN CAPITAL THE DRIVERS OF REGIONAL GROWTH? EVIDENCE FROM NUTS 3 SUB-REGIONS IN SERBIA

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The paper presents different concepts of regional economic growth, according to which the educational structure of the working age population and entrepreneurial activity significantly contribute to the improvement of economic performance. It also analyzes the role of the entrepreneurial activity and the quality of human capital in regional economic growth in Serbia in the period from 2011 to 2020 using a sample of 25 NUTS 3 level sub-regions. The results of the evaluation of the three selected panel models indicate that entrepreneurial activities play a vital role in the growth of gross added value at the level of the sub-region. Given the fact that the main theoretical and numerous empirical findings suggest that bearers of regional development should be entrepreneurs who possess the appropriate knowledge, abilities, creativity and skills, the recommendation for the creators of public policies is to continuously work on improving the business climate and building a stimulating entrepreneurial environment. Such an environment can encourage highly educated individuals to become the key bearers of entrepreneurial activities.

Keywords: regional growth, entrepreneurship, human capital, education, NUTS 3

JEL Classification: I25, O110, R580

INTRODUCTION

According to the endogenous theory of growth, developed regions and cities represent geographical areas characterized by a more educated and creative workforce and the development of numerous

innovations. The following factors have the most significant role in their economic development: allocations for research and development necessary for the creation of commercially successful inventions, human capital required for the formation of the so-called "clusters" consisting of highly educated employed individuals, and entrepreneurial capital related to the construction of an environment that encourages the entrepreneurial activity and is

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significant for the successful implementation of new ideas through the initiation of innovative business ventures. Endogenous growth models recognize the significant role of entrepreneurship as an important factor for the successful commercialization of knowledge by improving the success of the existing businesses and launching new entrepreneurial initiatives. Innovations and new technologies can have a double impact on economic growth, a direct impact on the growth of the gross domestic product and an indirect impact on improving economic performance through entrepreneurial capital. In order for developed inventions to be successfully marketed and accepted on the market, there is a need for the entrepreneurs who can ensure the necessary commercialization of the accumulated knowledge capital, i.e. investment in research and development and the availability of human capital.

Since the beginning of the 21st century, various models of economic growth have been presented. They emphasize that highly educated individuals and entrepreneurs can significantly impact the economic growth (the growth rate of gross added value) of the region (area). The paper examines the impact of the entrepreneurial activity and highly educated individuals on regional economic growth in the Republic of Serbia (RS) during the period from 2011 to 2020. Based on the results obtained in terms of the achieved contribution of the entrepreneurial activity and human capital to economic growth, as well as the achieved level of the development of sub-regions in RS, the research aims at indicating the measures, instruments and policies that correspond to the real needs of the NUTS 3 sub-regions in RS. The study is based on the following hypothesis:

H1: The growth rate of the entrepreneurial activity and the growth rate of human capital have a positive and significant effect on regional economic growth, quantified by the gross value added growth rate.

The initial hypothesis was tested using econometric models and panel methods on a sample of 25 NUTS 3 level sub-regions in RS during the period from 2011 to 2020.

Beside the Introduction and the Conclusion, the paper consists of the three other parts. In the first part, relevant empirical research in the field of regional economic growth is presented, which indicates that the growth is largely determined by the joint influence of highly educated individuals and entrepreneurs. In the second part, the applied methodology for testing the starting hypothesis is explained and the research findings are presented. In the third part of the paper, the recommendations for the implementation of the regional policy are provided.

LITERATURE REVIEW

The structure of the industry, the educational structure of the population, the level of income per inhabitant, population density, the development of the transport infrastructure, and the provision of adequate support by local, financial and educational institutions all significantly influence the development of innovation and the development of entrepreneurial activities both at the national and at the regional, as well as at the local levels (at the level of urban areas, rural areas and cities). The countries that invest substantial capital in research and development and which have a significant growth of the entrepreneurial activity also have the highest growth rates of the gross domestic product, employment and wages (Wennekers & Thurik, 1999; Audretsch & Thurik, 2001; Ács, Audretsch, Braunerhjelm & Carlsson, 2005).

Empirical research in the field of regional economic development has contributed to the definition of the new models of economic growth that recognize the important and complementary role of highly educated individuals and entrepreneurs for economic growth (Wennekers & Thurik, 1999; Audretsch & Thurik, 2001; Marlet & van Woerkens, 2004; Skuras, Meccheri, Moreira, Rosell & Stathopoulou, 2005; McGranahan, Wojan & Lambert, 2011; Alehegn, Sacchetti & Tortia, 2013; Josipović & Molnar, 2018; Rikalović, Josipović & Molnar, 2020a; Drobñaković, Stojanović & Josipović, 2022). In the developed economies, the regions characterized by a large participation of employees with higher education achieve the highest

entrepreneurial economic growth. An increase in the participation of entrepreneurs in the total number of companies can be made through the engagement of highly educated individuals who, according to the prior research conducted by (Mathur, 1999; Marlet & van Woerkens, 2004), have the ability to recognize market opportunities and are more inclined to start an independent entrepreneurial venture. In Germany, the largest volume of entrepreneurial capital (quantified by the number of newly founded companies per 1000 inhabitants) is found in the regions characterized by a high volume of human capital, a low unemployment rate, population growth and high population density (Audretsch & Fritsch, 1994; Audretsch & Fritsch, 2002; Audretsch & Keilback, 2005; Alehegn *et al*, 2013).

The term “entrepreneurial human capital” has been formulated and defined in the pertinent literature; it refers to the knowledge and skills (competencies) possessed by entrepreneurs (Skuras *et al*, 2005; Radosavljević, Josipović, Kokeza & Urošević, 2022). A high volume of entrepreneurial human capital can ensure the use of specific advantages of the environment of the region (area) to achieve a high rate of economic growth. During the last four decades, the highest growth rate of entrepreneurial initiatives and employment growth in developed economies has been possible to find in the areas recognized as the areas of significant outdoor amenities. The highly educated individuals who live and work in these areas are creditable for the successful transformation of the local economy, employment growth, the improvement of the living standards and the development of entrepreneurship (Josipović & Molnar, 2018). They inhabit these areas in the desire to ensure a better quality of life for themselves and their families and are the most important bearers of entrepreneurial initiatives. Human capital and entrepreneurial activities should have a complementary role in rural (regional) development and special attention should be paid to improving their synergy. Knowledge, creativity, talent and innovation are more closely linked to the local economy, which is characterized by a high prevalence of entrepreneurial activities. Conversely, entrepreneurial activities can contribute to the improvement of rural (regional) economic

performance if their holders are highly educated, creative and talented individuals.

The study by S. Fölster (2000) recognized entrepreneurship as an important instrument for increasing total employment. Using the example of 24 areas in Germany, this study confirmed that an increase in the share of the self-employed in the total labor force by 1% increased the employment rate by 0.5%. In order to improve the existing businesses and increase the number of entrepreneurs, in addition to the appropriate business climate (the level of taxes and contributions, administrative benefits), it is necessary to provide an environment that promotes and encourages creativity, diversity and the development of innovation and entrepreneurial culture.

In the developing countries, such as RS, highly educated individuals and entrepreneurs can be the key drivers in future economic development. S. Josipović and D. Molnar (2018), S. Josipović (2018) and G. Rikalović *et al* (2020a) analyzed the connection between the concept of human capital and entrepreneurship in RS at the NUTS 3 level of the hierarchical classification of territorial entities during the period from 2008 to 2013. The basis of the developed model of entrepreneurial economic growth is the hypothesis that the educational structure of the population and entrepreneurs contributes to improved economic performance. The model is based on the assumption that entrepreneurial economic growth can be explained by the following factors: the share of the number of employees with higher education in the total number of employees (a traditional measure of quantifying human capital for the purposes of empirical research), the share of the number of entrepreneurs in the total number of companies, the share of the number of employees in the primary sector, the share of the number of employees in the secondary sector, the share of the number of employees in the tertiary sector, the share of the number of employees in the quaternary sector, the share of residents aged 15 to 64 in the total number of residents (an indicator of the working population) and the share of residents up to 14 years of age in the total population (an indicator of the young population).

According to the results of the evaluated pooled panel model with constant regression parameters, the employees who have a college degree, the individuals who start and run their own business, employment in the primary, secondary and tertiary sectors and the young population have a significant and positive impact on entrepreneurial economic growth. Additionally, the studies indicate that, although there is a positive individual impact of human capital and entrepreneurs on the entrepreneurial economic growth at the NUTS 3 level, the two key prerequisites for establishing an appropriate model of economic growth were not satisfied. These refer to the presence in a certain geographical area and a significant part of the employed population that is equipped with human capital and a significant number of employees who are bearers of entrepreneurial activities (Radosavljević *et al*, 2022).

SOURCES OF REGIONAL GROWTH IN SERBIA FROM 2011 TO 2020

Data and the applied methodology

In order to test the importance of human capital and entrepreneurship in the regional economic development of RS (the NUTS 3 level of the hierarchical classification of territorial entities, 25 areas) during the period from 2011 to 2020, the following three types of panel models were evaluated: the model with constant regression parameters with artificial variables related to the years of observation (the pooled model), the fixed individual effects model (the FE model) and the random individual effects model (the RE model). The models are based on the assumption that economic growth (quantified by the gross value added (GVA) growth rate) is significantly influenced by the improvement of the educational structure of the population (the growth rate of human capital, i.e. the share of the highly educated in the total number of employees) and the increase in the entrepreneurial activity (the growth rate of the number of entrepreneurs in the total number of employees).

The pooled regression model was the starting point of the research:

$$y = x_i\beta + \varepsilon_i, \tag{1}$$

where the classical OLS model for panel data was used. Heteroscedasticity in the residual distribution, as well as the residual autocorrelation, were accounted for.

Then the following model specification was applied:

$$y_{it} = x_{it}\beta + \alpha_i + v_{it}, \tag{2}$$

where, compared to the OLS model, the error term is defined as $u_{it} = \alpha_i + v_{it}$. This model can be presented in a matrix form as:

$$y = X\beta + D\alpha + v, \tag{3}$$

where:

$$y_i = \begin{bmatrix} y_1 \\ \vdots \\ y_N \end{bmatrix}, \quad X = \begin{bmatrix} X_1 \\ \vdots \\ X_N \end{bmatrix}, \quad \beta = \begin{bmatrix} \beta_1 \\ \vdots \\ \beta_k \end{bmatrix},$$

$$D = \begin{bmatrix} 1_T & 0_T & \cdots & 0_T \\ \vdots & \vdots & \ddots & \vdots \\ 0_T & \cdots & 1_T & 0_T \\ 0_T & \cdots & \cdots & 1_T \end{bmatrix}, \quad \alpha = \begin{bmatrix} \alpha_1 \\ \vdots \\ \alpha_N \end{bmatrix}, \quad v_i = \begin{bmatrix} v_1 \\ \vdots \\ v_N \end{bmatrix}.$$

It is assumed that there is no serial correlation and no homoscedasticity, nor is there any correlation between v_{it} and the regressors, either. Hence, it can be written in the following manner:

$$V(\alpha_i | X) = \sigma_\alpha^2 \tag{4}$$

$$V(v_{it} | X) = \sigma_v^2 \tag{5}$$

$$E(\alpha_i v_{it} | X) = E(\alpha_i v_{is} | X) = 0 \tag{6}$$

Usually, the OLS estimation is not applicable for panel data because of the error term structure, or to be precise:

$$E(u_{it}u_{is} | X) = E[(\alpha_i + v_{it})(\alpha_i + v_{is}) | X] = E[(\alpha_i^2 + v_{it}v_{is} + \alpha_i v_{is} + \alpha_i v_{it}) | X] = \sigma_\alpha^2 \tag{7}$$

In such a situation, our OLS estimator is inconsistent and biased, or to be precise, it can be written as:

$$plim \hat{\beta}^{OLS} = \beta + \frac{\text{cov}(x_i, \alpha_i)}{\sigma_x^2} \quad (8)$$

The next step usually assumes the application of a fixed effect (FE) estimator, or a random effect estimator (RE). Nevertheless, there are certain situations when pooled regression is actually a better option. Such a situation can be identified by the Breusch-Pagan Lagrange multiplier test, where the null hypothesis is that the variance of the unobserved fixed effects is zero (Breusch & Pagan, 1980). This might result in a situation in which pooled regression is actually a better solution.

Discussion of the obtained results

Table 1 presents the descriptive statistics of the variables from the panel model, while Table 2 shows the results of the estimated three selected panel models. Table 2 contains the pooled regression model (with a dummy variable for each year), FE and RE model results. The Breusch-Pagan Lagrange multiplier test was applied after the Hausman test, where the test statistic 0.8451 implied that the RE was a better option. On the other hand, the modified Wald test for groupwise heteroscedasticity in the fixed effect regression model indicated the following:

- robust (Huber-White-sandwich) standard errors need to be used;
- the Sargan-Hansen test (the test of overidentifying restrictions) needs to be used so as to decide between the RE and the FE.

In the pooled regression model, R-squared is 0.32. As expected, there are some other factors that do affect growth at the regional level in RS, apart from our variable of interest (the entrepreneurship growth rate) and our control variables (the human capital growth rate and year dummies). Also, this setting imposes the following question: Is there an effect of our human capital on the regional level (measured by the proportion of the highly educated in the labor force), our entrepreneurship growth rate at the regional level, and *vice versa*? Furthermore, what is the effect

Table 1 The descriptive statistics of the variables from the panel model

Variable	Mean	Median	Maximum	Std. dev.
GVA growth rate	3.22	-14.55	18.35	5.51
Growth rate of human capital	1.44	-45.93	48.05	15.09
Growth rate of the entrepreneurial activity	-0.59	-28.33	23.41	5.32

Source: Authors

of the growth rate on the regional entrepreneurship growth rate and the regional human capital growth rate?

To answer these questions, there is the need to move on to the models that actually exploit the potential endogeneity issue. The Vector Autoregression Model (the VAR model) was opted for our panel dataset, since it has become one of the basic instruments for analyzing the transmission of shocks through one or more national economies in the last few decades.

The VAR model can be viewed as a dynamic system of equations. Its implementation essentially means that several time series are observed simultaneously. Generally speaking, this approach is suitable for “what if” analysis (Ullah, Wan & Chaturvedi, 2002). The VAR model was originally presented by C. Sims as a framework for defining a monetary policy (Sims, 1980). C. Sims suggested that VAR models were better for forecasting equations based on structural equations. The VAR model essentially consists of “seemingly unrelated regressions” (Greene, 2002). In its first step, the procedure for applying the VAR methodology in general implies the defining of the optimal length of delay (the time lag). The decision on the optimal length of the delay is defined in accordance with the LR test, which implies the application of the Akaike Information Criteria and the Final Prediction Error (FPE).

Table 2 The results of the estimated panel models

Variables	POOLED model		FE model		RE model	
	Coefficient	p - value	Coefficient	p - value	Coefficient	p - value
Constant	0.888	0.336	2.235	0.503	2.713	0.000
Growth rate of human capital	0.025	0.282	5.533	0.743	3.074	0.384
Growth rate of the entrepreneurial activity	0.082	0.015	0.228	0.002	0.214	0.000
2012	6.762	0.000				
2013	4.528	0.006				
2014	-1.333	0.242				
2015**						
2016	1.148	0.352				
2017	6.999	0.000				
2018	2.549	0.078				
2019	1.570	0.374				
2020	-1.212	0.497				
F statistic	92.68 (0.00)		6.15 (0.01)		16.59 (0.00)	
R ² (R ₂ adj.)	0.32 (0.29)					

*Hausman Prob>chi2 = 0.8451; the modified Wald test for groupwise heteroscedasticity in the fixed effect regression model Prob>chi2 = 0.0000.

**Omitted to avoid the dummy trap.

Source: Authors

The observed model can be represented by the following system of linear equations:

$$\begin{aligned}
 Y_{it} = & Y_{it-1}A_1 + Y_{it-2}A_2 + \dots \\
 & \dots + Y_{it-p+1}A_{p-1} + Y_{it-p}A_p + u_i + e_{it}
 \end{aligned}
 \tag{9}$$

where $i \in \{1, 2, \dots, N\}$, $t \in \{1, 2, \dots, T\}$.

Y_{it} is the vector of the dependent variable dimensions ($1 \times k$); u_i and e_{it} are the vectors of the dimensions ($1 \times k$) that refer to the panel fixed effects, i.e. to idiosyncratic errors; $A_1, A_2, \dots, A_{p-1}, A_p$ are the parameters that should be estimated.

The system of equations is solvable based on the restrictions that follow as a result of the Cholesky decomposition, where there are three variables: economic growth (quantified by the GVA growth rate), the growth rate of human capital and the growth rate of the entrepreneurial activity.

As for the shocks, the following characteristics are assumed:

$$E[e_{it}] = 0, E[e'_{it}e_{it}] = \Sigma \text{ and}$$

$$E[e'_{it}e_{is}] = 0 \text{ for } t > s. \tag{10}$$

The parameter estimation method used is the generalized method of moments (GMM) (Abrigo & Love, 2015). The results are presented through a graphical representation of the impulse-response function. Figure 1 shows the above function in a dynamic frame of three years (a 67% confidence interval).

The findings presented in Figure 1 can be summarized as follows:

- The share of entrepreneurs, as a variable, needs approximately two years to materialize a slight positive impact on regional growth.
- The share of entrepreneurs has a positive impact on human capital (measured as the share of the highly educated in the labor force) within a year or two.

- Regional growth has a positive impact on the share of entrepreneurs. This has a low-intensity impact, but considering data limitations (the short time series and the high frequency of the time series), this finding should be noted.
- Growth has an immediate positive impact (the indications are weakly visible) on the share of entrepreneurs, while it also has a positive impact on the share of the highly educated, but it takes a certain time for this to show, at least a year.

Although unexpected to a certain extent, these results indicate the presence of a problem when regional development in RS is concerned. The first impression is that education should encourage people to start their own business, which means that it is expected that, in those (sub)regions where there is a higher quality/educated workforce, the level of the entrepreneurial activity will be more intensive, i.e. economic growth will be stronger. The impact of education on the level of entrepreneurship, which is not statistically significant, can also be explained if the

motives for starting a business are taken into account. If the educational capital of a society increases, the level of the so-called “necessity entrepreneurship” may decline, because educated people have the qualifications to find a job that can bring them a good income. They earn well and are not forced to start a business; instead, they prefer to be employed in “safer” workplaces, such as foreign companies that operate in the region, or the companies in the public sector where earnings are more secure, and so forth.

In addition to analyzing the employees’ education level, it is also necessary for the jobs performed by the employees holding a college degree to be analyzed. This is important in order to see whether highly educated individuals use their knowledge, abilities and skills adequately. Given the fact that entrepreneurial activities play a vital role in the GVA growth at the sub-regional level, creating a stimulating entrepreneurial environment can encourage highly educated individuals to become key bearers of entrepreneurial activities.

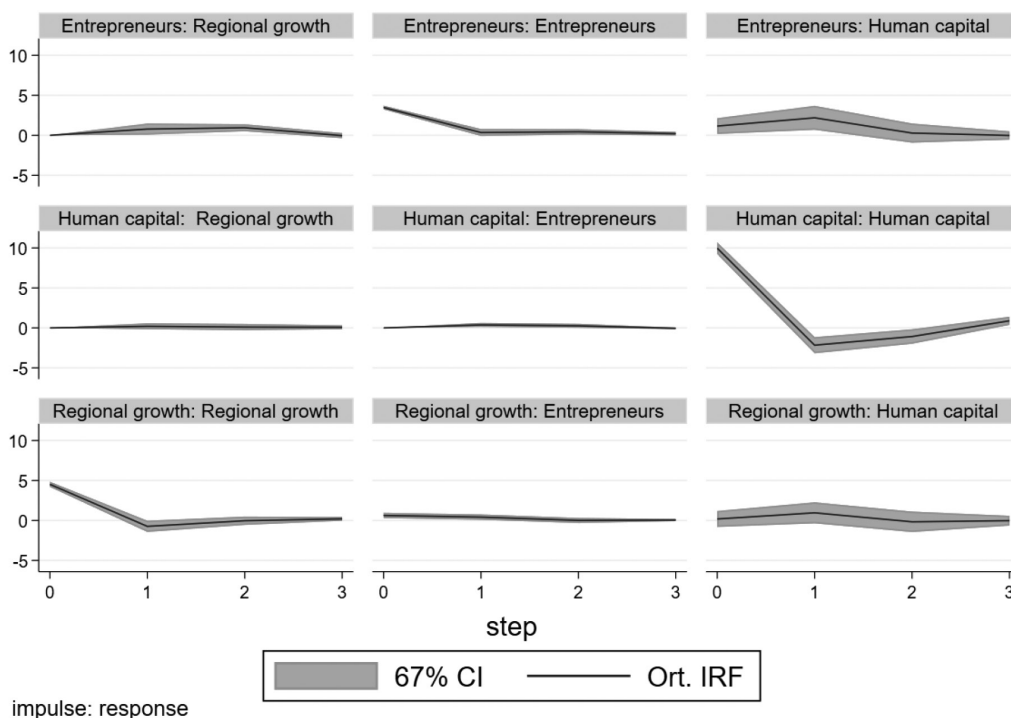


Figure 1 The VAR model results

RECOMMENDATIONS FOR THE REGIONAL POLICY

Since it has been shown above that the entrepreneurial activity contributes to regional growth, the further analysis proceeds with examining the state and potentials in the NUTS 3 sub-regions in RS in terms of the opportunities for improving the business climate and building a stimulating entrepreneurial environment. In order to identify, then implement, adequate measures, policies and support instruments, it is necessary that the basic indicators of regional development should be monitored in compliance with the European approach. Only in this way will the necessary alignment of such measures, policies and instruments with the real needs of the sub-region be ensured, which was often not the case in the past. Table 3 and Table 4 show the basic indicators of development at the level of the NUTS 3 sub-regions in RS.¹

Based on the analysis of the selected demographic indicators (Table 3), a conclusion can be drawn that the Southern Bačka, Northern Bačka, Srem and Raška areas have a more favorable demographic structure. The mentioned areas are characterized by the share of the working age population and population density above and the population ageing index below the national average. The Raška area is the only area characterized by the ageing population index (the ratio of the number of the people in the old population aged 60 and over to the young population between 0 to 14 years of age) below 100. Also, in 2021, this area had the highest share of the young population (between 0 and 14 years of age) in the total number of the inhabitants (17.7%, whereas the national average was 13.61%) and the growth rate of the importance of the young population (27.27%, whereas the national average amounted to 21.20%). From the point of view of the convenience of the environment, which reflects in smaller temperature fluctuations, a different topography, rich water and forest resources, the offer of various recreational activities and the developed traffic infrastructure, the areas are classified into the three groups, namely: high, medium and low convenience of the environment (Josipović, 2018).

Kolubara, Pomoravlje (the Morava River Basin), Bor, Braničevo, Zaječar and Pirot areas have the worst performance in terms of the demographic indicators. Apart from the significantly worse values of the selected demographic indicators compared to the national average in these areas, the share of the young population was significantly below the national average in 2021. The Zaječar and Pirot areas are characterized by the highest average age of the population (48 and 47 years, whereas the national average is 44) and the lowest age dependency ratio (the young population)² (18.50% and 18.93%, respectively). The traffic infrastructure is most developed in the Southern Bačka area, where the share of modern roads is 97.32%. The worst traffic infrastructure is found in the Pčinja area, where the share of modern roadway is only 33.45%. The aforementioned significantly hinders the integration of the Pčinja area at the regional and national levels, as well as access to and the possibility of using the development potential of the rich natural amenities that this area abounds in.

In addition to the demographic indicators and the social well-being indicators, it is necessary to analyze the economic structure and performance indicators (Table 4).

The Southern Bačka and Srem area have the largest share in the creation of gross added value at the level of the national economy (10.2% and 4.30%, respectively). Also, in 2021, these areas achieved the highest gross added value per inhabitant (RSD 857 and 760 thousand, respectively) and had a small number of unemployed persons per 1000 inhabitants compared to the national average (49 and 39, respectively, whereas the national average was 77).

The areas where the largest part of gross added value is created by the secondary and tertiary sectors include the following: Bor (82%), Moravica (74%), Pirot (74%), Srem (72%), Braničevo (71%), Šumadija (69%), Southern Bačka (69%), Zlatibor (68%) and Kolubara areas (68%). Thus, it can be concluded that, in these areas, a significant part of the population earns income outside agriculture as a traditional rural activity. The share of the quaternary sector in the total gross added value of the area ranges from 12.74% in Bor to 34.32% in the Pčinja area.

Table 3 The demographic indicators and the indicators of social well-being at the level of the NUTS 3 sub-regions in Serbia, 2021

Area	Classification according to the outdoor amenity index*	Population density	Ageing index	Working age population	Higher education employees	Modern roadway
Western Bačka	low	66.88	169.10	64.60	18.12	91.04
Southern Banat	low	64.19	146.10	64.70	20.83	89.72
Southern Bačka	medium	153.72	120.10	65.80	33.77	97.32
Northern Banat	low	56.75	156.40	65.30	14.51	93.07
Northern Bačka	low	98.32	143.90	65.80	23.90	87.36
Central Banat	low	52.12	148.40	64.50	21.90	94.01
Srem	low	83.95	149.00	64.90	18.13	90.02
Zlatibor	high	42.21	158.20	63.40	17.48	54.00
Kolubara	medium	64.10	168.80	64.00	10.89	82.46
Mačva	medium	82.80	150.90	64.70	16.05	58.80
Moravica	high	64.35	167.10	62.70	18.76	81.48
Pomoravlje (Morava River Basin)	medium	73.17	179.10	63.00	20.40	81.22
Rasina	medium	80.82	180.90	62.70	25.93	70.05
Raška	high	76.99	96.50	64.90	26.91	50.32
Šumadija	medium	115.55	160.80	64.00	21.12	83.85
Bor	high	30.50	196.50	62.70	26.71	68.03
Braničevo	medium	41.52	175.80	62.90	15.72	77.01
Zaječar	medium	28.21	232.80	60.00	23.07	84.00
Jablanica	medium	69.81	151.50	65.80	17.26	58.27
Nišava	medium	129.80	157.70	63.80	31.18	87.12
Pirot	medium	29.40	208.20	61.80	23.95	70.84
Podunavlje (Danube River Basin)	low	144.32	153.40	64.40	19.50	93.37
Pčinja	high	54.85	101.50	68.90	24.25	33.45
Toplica	medium	36.20	154.50	62.90	26.72	58.06
National average	76.67	158.33	64.11	22.37	75.97	75.97

Notes: * The classification was made according to the results of the research done by S. Josipović (2018) and G. Rikalović & S. Josipović (2018). The indicators are calculated as follows: Population density - people per square kilometers of land area; Ageing index - the ratio of the older population (aged 60+) compared to the pre-productive population (aged 0-14); Working age population - the share of the working age population (aged 15-64) in the total population; Higher education employees - the share of the number of the employees with higher education in the total number of the employees; Modern roadway - the share of modern roads in the total road network.

Source: Authors, based on: G. Rikalović and S. Josipović (2018), Statistical Office of the Republic of Serbia (2022)

Regional development measures and policies should be aimed at ensuring a greater success of entrepreneurial initiatives (e.g. improving the business environment by reducing regulatory and administrative barriers, the possibility of obtaining financial support in the case of starting an independent business venture based on the use of specific local natural, human and cultural resources).

According to G. Rikalović (2004), the role of the regional policy is to help regions create an

entrepreneurial ecosystem that defines the four key elements: policies and development programs should generate a culture of entrepreneurship, education and training for entrepreneurship, business networks that connect entrepreneurs with suppliers and the sources of capital and ensuring access to capital, the infrastructure and institutional support. Improving the educational structure of the population and organizing various training sessions that will provide the knowledge necessary for performing

Table 4 The indicators of the economic structure and performance at the level of the NUTS 3 sub-regions in Serbia, 2021.

Area	The area's involvement in the creation of GVA	Sector's share in the creation of the region's GVA				Unemployed persons per 1,000 inhabitants
		Primary sector	Secondary sector	Tertiary sector	Quaternary sector	
Western Bačka	1.70	5.35	35.73	27.78	31.14	75
Southern Banat	4.00	4.63	35.85	27.93	31.60	65
Southern Bačka	10.20	2.78	28.35	34.83	34.04	49
Northern Banat	1.40	4.65	43.25	23.52	28.58	51
Northern Bačka	2.20	2.89	38.93	31.09	27.10	41
Central Banat	1.90	6.30	36.04	27.50	30.17	68
Srem	4.30	2.87	44.47	30.14	22.53	39
Zlatibor	2.90	1.88	41.92	27.60	28.60	84
Kolubara	1.70	3.84	43.37	26.24	26.55	48
Mačva	2.30	1.72	41.02	28.99	28.27	86
Moravica	2.40	2.16	42.51	30.86	24.47	51
Pomoravlje (Morava River Basin)	1.90	4.28	34.49	29.40	31.83	106
Rasina	2.10	1.57	42.89	26.16	29.39	85
Raška	2.40	2.03	32.37	32.00	33.59	143
Šumadija	3.10	0.93	40.56	27.94	30.57	88
Bor	2.70	18.54	28.82	22.03	30.61	80
Braničevo	1.80	8.21	24.68	29.84	37.27	42
Zaječar	0.90	7.28	28.35	28.21	36.16	83
Jablanica	1.50	1.78	49.02	22.14	27.07	119
Nišava	4.00	0.71	37.73	30.52	31.04	92
Pirot	0.90	1.86	44.04	21.62	32.48	112
Podunavlje (Danube River Basin)	1.60	1.61	45.05	27.15	26.20	50
Pčinja	1.30	1.94	40.49	23.11	34.47	116
Toplica	0.70	1.61	51.89	17.39	29.10	125
National average	4.00	3.72	37.96	27.65	30.67	77

Source: Authors

specific occupations can significantly increase: the productivity of the working age population, the attractiveness of the region for starting new forms of business, the scope of entrepreneurial activities, as well as networking and the exchange of information between different business entities. Due to limited resources, priority should be given to the industries that can provide new jobs and whose development can significantly improve economic performance. In addition, it is necessary to define a development program for the areas of exceptional environmental benefits in RS in order to make the best use of natural resources as a lever for the new regional economic

growth (and development) based on the offer of locally specific, non-marketable products and services. These areas have the potential for the development of organic agricultural production, which can contribute to the improvement of their social, economic and social status (Komazec & Aleksić, 2015). Also, they are particularly attractive for the development of various forms of entrepreneurship, for which it is necessary to ensure the appropriate preconditions defined in the literature as the "four sides of the diamond of entrepreneurship development at the regional level". According to E. Harpa (2017), these refer to: 1) providing, in addition to natural capital, appropriate

human and financial capital and infrastructure; 2) adopting appropriate strategies and policies, taking particular steps in order to develop specific skills and competencies and preserve local culture and traditions; 3) ensuring the appropriate scope of the market (the number of potential customers); and 4) encouraging the cooperation of various actors at the local level (enterprises, suppliers, financial institutions, distributors).

In this sense, the recommendations for conducting a regional policy first of all refer to the necessity of building an encouraging environment for the development of domestic entrepreneurship (Jakopin, 2020), where people would not decide to start their own business only in a situation in which they have no other options. Bearing this in mind, more efforts should be made in the forthcoming period both at the regional and local levels in terms of building better conditions and a greater predictability of business conditions. This implies a number of financial and non-financial support measures. Efforts should be made in order to reduce pronounced regional inequalities (Molnar, Rikalović & Josipović, 2020b; Rikalović & Molnar, 2021) and improve entrepreneurial demography, i.e. ensure that the largest number of newly opened entrepreneurial shops continue to operate in the long run. As a result, educated people would also decide to take up the entrepreneurial activity, which, in the medium and long run, would have a positive impact on regional economic growth, because the creativity, knowledge and skills that these people have could come to the fore. In this way, opting for other, safer options for themselves, they “lock up” the development resources present in the regions (human capital). Naturally, attracting larger investors should not be completely ignored or abandoned, but it seems that the time is ripe to focus on higher quality investments that have a greater potential to employ highly educated workers. In other words, large international companies in all regions that operate in modern activities in which there is a need for highly educated personnel who can further improve, learn and progress, thus contributing to the development of those companies on the local market are needed more. It is obvious that the current model of attracting foreign investors applied in RS did not

produce the desired/expected results in terms of spillover effects on the local market. In this sense, it is important to stimulate the arrival of the companies that operate in high-tech branches (the quaternary and quintile sectors), not exclusively within the primary or possibly secondary production.

CONCLUSION

The results of this research study obtained by the evaluation of the pooled, FE and RE models confirmed the starting hypothesis of the significant and positive effect of the growth rate of the entrepreneurial activity on the GVA growth rate at the level of the NUTS 3 sub-regions in RS during the period from 2011 to 2020. Unlike the entrepreneurial activity, in the case of the growth rate of human capital no statistically significant effect on regional economic growth was found (although the estimated coefficient with this variable had a positive value in all the models). It was confirmed that entrepreneurs contributed to regional growth, which was expected bearing in mind the existing literature and the findings of the previous empirical studies. Based on the VAR model, it was additionally determined that entrepreneurship had a positive impact on regional growth over a period of up to two years. It was also found that entrepreneurship positively affected the share of the highly educated in the labor force within a year or two.

The obtained results indicate the presence of a problem, even a paradox, when speaking about regional development in RS. Namely, although it is expected that education encourages people to start their own business, the findings of this study point to a somewhat different conclusion. If educational capital increases, the level of the “entrepreneurship out of necessity” may decline. For that reason, future research could focus on exploring the sectors and activities in which highly educated individuals work in sub-regions in RS (which are predominantly rural by nature). If they are employed in the state (public) sector or in the privately-owned companies where they do not have the opportunity to engage in modern activities in a creative way, then their contribution is highly questionable. Highly educated individuals seem to be working in those sectors/activities where

it is more difficult to take risks, i.e. they prefer safe jobs with a certain (though not particularly high) salary, and that is often the public sector. According to the findings of this research, it seems that, in the NUTS 3 sample, the assumption that highly educated individuals have the appropriate ability to recognize opportunities on the market is not valid; they are not inclined to start independent entrepreneurial businesses, but rather look for “safer” jobs (primarily in the state sector) that provide them comfort.

Another issue that remains open regards the connection between the level of education and entrepreneurship, i.e. how highly educated individuals can become those who will contribute to regional growth through their own entrepreneurial ventures, which can be one of the directions for future research in this field. On the other hand, wonders may remain whether this particular way of measuring human capital (the share of highly educated people in the total number of employees, which is the way it is measured traditionally) is suitable for RS. Perhaps it would be advisable to take some other variables that would reflect the state of human capital in a better way - such as the share of expenditures for research and development at the enterprise level, investments in additional training and the acquisition of skills and knowledge and so on.

One of the recommendations for the economic policymakers in RS stemming from the results of this research study is that enhancing the conditions that would favor the improvement of the existing businesses and an increase in the number of new entrepreneurs is what should be worked on. This first of all refers to the development of a favorable business environment - an appropriate business climate (the level of taxes and contributions, administrative benefits), as well as the creation of a stimulating environment for creativity, diversity and the development of innovation and entrepreneurial culture. A lot of work needs to be done so as to transform human capital (the potential of highly educated individuals) into entrepreneurial capital (which contributes to economic growth).

ENDNOTE

- 1 The Belgrade area was not treated in this segment of the analysis since it is the only NUTS 3 sub-region that, according to the level of economic development, significantly deviates from the national average. In that sense, it represents an outlier. Furthermore, it is the sub-region that records the largest absolute increase in the number of inhabitants in RS, and hence as such draws human capital from other areas. Therefore, in accordance with this research subject and aim, the focus here is on researching the sub-regions that traditionally have an outflow of the younger-age and more educated population.
- 2 The ratio of the pre-productive population (aged 0-14) to the working age population (ages 16-65).

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DESIGNING AN ORGANIZATIONAL STRUCTURE AS A PREREQUISITE FOR ACHIEVING BUSINESS EXCELLENCE IN MANUFACTURING COMPANIES

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In the contemporary business environment characterized by risk and uncertainty, manufacturing companies need to focus on improving quality in every single aspect of their business model, with a focus on reaching the level of business excellence. As the central dimension of organizational design, organizational structure has the status of important support for achieving business excellence in the following areas: the success of the quality management system, process management, orientation towards employees (their satisfaction and motivation), the development of partnership relations with suppliers and customers, supply chain management, innovation, and social responsibility. The goal of the research is to identify the parameters of the organizational structure which have the highest influence on the success of manufacturing companies in terms of achieving business excellence. The results of the research conducted on a sample of 94 manufacturing companies in the territory of the Republic of Serbia showed the statistically significant influence of the organizational structure on each of the business excellence determinants, whereby the following parameters have the most important role: specialization, coordination (based on a combination of mechanisms) and formalization (based on compliance with QMS requirements - Quality Management System and the ISO 9001 standards).

Keywords: organizational structure, organizational structure parameters, business excellence, determinants of business excellence, manufacturing companies

JEL Classification: M11, M20

INTRODUCTION

Modern business conditions expose manufacturing companies to various challenges. The key to achieving

long-term sustainable business success is continuous work on improving quality in all areas of business while creating value for all stakeholders (Domanović & Janjić, 2018). Generating business excellence implies excellence in the domain of managing information, people, processes, and partner relations, which results in the achievement of the good financial and non-financial indicators of business performance.

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Nowadays, in order to achieve business excellence, the management of manufacturing companies is particularly challenging. On the one hand, there are issues related to product design, given the pronounced tendency to shorten the lifecycle of most products, the choice of the materials that do not harm the environment, as well as the general impact on the environment. On the other hand, the production process itself is specific both in the context of environmental effects and in terms of the relationship between production time and responsiveness to suppliers and customers (Sutherland, Rivera, Brown, Law, Hutchins, Jenkins & Haapala, 2008). For these reasons, many manufacturing companies strive for lean manufacturing, which is largely based on maximizing efficiency. Other companies develop agile manufacturing systems, with an emphasis on flexibility, responsiveness and adaptability, whereas some strive to combine lean and agile manufacturing (Shahin & Rezaei, 2018). All this implies significant changes in business models compared to traditional production systems.

Organizational design is an important incentive factor in achieving sustainable success based on the improvement of all the predictors of business excellence (Edgeman & Eskildsen, 2014). In the previous research, the organizational structure as the central dimension of organizational design stood out as one of the most important organizational factors in stimulating employees to maximally contribute to the improvement of business quality, thus simultaneously improving business excellence (Bauer, Falshaw & Oakland, 2005; Toma & Marinescu, 2018; Stojanović-Aleksić, Erić Nielsen & Bošković, 2019). However, the concrete parameters of the structure that dominantly influence the business excellence of manufacturing companies have not been clearly identified to be able to compare these results with other activities (e.g. the service sector) in future research, thereby drawing relevant conclusions about the specifics of achieving business excellence in various industries. Also, such research is lacking in the Republic of Serbia (RS). Therefore, the subject matter of the research carried out in this paper is the analysis of the influence of the organizational structure parameters on the determinants of

business excellence in manufacturing companies in order to identify the parameters whose support is of key importance for improvements in the domain of each of the following determinants: the quality management system, process management, employee orientation (human resource management resources), building partnership relationships with suppliers and customers (supplier relationship management and customer relationship management), supply chain management, innovation (innovation management) and social responsibility. The performance of the previously listed determinants of business excellence overlaps with the excellence criteria set by both the European Foundation for Quality Management - EFQM (<https://efqm.org>) on the territory of Europe and the Foundation for Quality and Business Excellence - FQCE (<https://www.fqce.org.rs>) on the territory of RS and the former Yugoslav republics.

The qualitative and quantitative methodologies were applied. The paper starts with the Introduction, then proceeds to analyze business excellence as a determinant of long-term sustainable competitive advantage for companies. It highlights the significance of implementing the Total Quality Management (TQM) principles for achieving business excellence. As a factor of business excellence, the analysis of the organizational structure is presented in the second part, and appropriate research hypotheses are formulated based on the analysis. The third part of the paper covers the empirical research conducted, including the methodology, obtained results, discussion, implications, and limitations. Finally, the conclusion briefly summarizes the findings of the research study.

BUSINESS EXCELLENCE AS A DETERMINANT OF SUSTAINABLE COMPETITIVE ADVANTAGE

Business excellence reflects a high degree of the maturity of the company in the relationship between management and achieved results. It is about achieving excellent results in the domain of managing processes, information, people, and partner relations

(Carvalho, Sá, Marques, Santos & Pereira, 2023). The European Foundation for Quality Management (EFQM) has developed a business excellence model that signals to companies what to focus on so as to achieve a long-term sustainable competitive advantage. Based on this model, the Foundation for Quality and Business Excellence in RS has created its model, which is a guideline for companies in the territory of the former Yugoslav republics. Both models are based on the following principles: result orientation, customer orientation, a continuous quality improvement, fact-based process management, employee orientation, partnership development, and social responsibility (Suárez, Calvo-Mora, Roldán & Perriñez-Cristóbal, 2017). The aforementioned principles are the determinants of business excellence and success, and their observance is a reflection of the success of the quality management system, process management, human resource management, supplier relationship management, customer relationship management, supply chain management, and innovation management. The practice of the companies with business excellence (the winners of the FQCE/EFQM awards) indicates the fact that there is a strong connection between the qualitative and quantitative performance indicators of the success of the previously listed areas of management – success in reaching the level of business excellence. The performance of each of these areas of management is a signal of the company's success in terms of their fulfilling the FQCE/EFQM criteria of business excellence.

There is a strong correlation between a successful implementation of the TQM principles and reaching the level of business excellence. The full integration of quality improvement in all the business domains of the company is the basis for reaching the level of business excellence. The key factors of a successful implementation of the TQM concept overlap with the success factors in the domain of the business excellence determinants:

- The engagement of the entire organization. Compliance with this TQM principle generates success within the Quality Management System (QMS). The commitment of the entire company to complying with the QMS requirements, the requirements of the ISO 9001 standard and the TQM principle lead to success in managing processes, information, and people, with a continuous improvement of quality in all business areas (International Organization for Standardization, 2015; Fonseca, 2015; Gray, Ross & Badrich, 2022). Employee orientation is critical for the synchronization of all organizational processes. Commitment to generating job satisfaction and retaining the best (most skilled) workers is an important determinant of employee motivation to contribute to the achievement of a business quality. Thus, the engagement of the entire organization in the field of TQM significantly correlates with employee orientation, result orientation, and quality improvement orientation as the determinants of business excellence.
- Process management. There is a strong connection between this TQM factor and the engagement factor, which is a consequence of the fact that process management is an important determinant of the success of the quality management system and the implementation of TQM, leading to business excellence (International Organization for Standardization, 2015; Jankalová & Jankal, 2020; Zapletalová, 2023). Based on Deming's cycle (the PDCA cycle - Plan, Implement, Check, Act), process management is key to respecting the TQM principles and achieving business excellence. The success of management in the supply, production, and sales processes is determined by the development of partnership relations with suppliers, employees, and customers as important stakeholders, and reflects the degree of the focus on suppliers and customers. In the literature, it is often emphasized that, as a phase of process management, process control is key to achieving business excellence (McDermott, Antony & Douglas, 2021). Therefore, as a factor of TQM implementation, process management overlaps with process management as a determinant of business excellence.
- A focus on suppliers. This TQM factor coincides with the principle of developing partnership relationships as a determinant of business

excellence and reflects the importance of interdependence in the relationship between supplier relationship management - process management (the supply, production, and sales processes) - customer relationship management - supply chain management (Madan, 2010; Luz Tortorella, Cauchick-Miguel, Li, Staines & McFarlane, 2022; International Organization for Standardization, 2022). A timely supply of quality raw materials under favorable commercial conditions is a signal of the level of the development of the partner relations with suppliers, which directly affects the timeliness and quality of production, which spills over into timeliness, quality, and price for customers (Metaxas & Koulouriotis, 2019; Sony, 2019). Partner relationships with suppliers are a determinant of supply chain management success, which is an indicator of business excellence (Oakland, Oakland & Turner, 2020; International Organization for Standardization, 2022).

A focus on customers. Developing long-term partnership relationships with customers is key to generating customer satisfaction and loyalty (Sheikholeslam & Emamian, 2016; Oakland, Oakland & Turner, 2020). The quality management system emphasizes the importance of a detailed analysis of all the antecedents of customer satisfaction and the definition of corrective and preventive measures for improvements in the domain of each of the factors, such as: the price, quality, delivery dates, and so forth. The customer focus also affects supply chain management. The timely delivery of a quality product to satisfied customers under favorable commercial conditions is a determinant of interdependence in the relationship between customer relationship management, and supply chain management and is significant for business excellence (Kanji & Wong, 1999; Sriyakul, Singa, Sutduean & Jermittiparsert, 2019; International Organization for Standardization, 2022).

Strategic planning. Strategic planning is important for each of the previously listed areas. Strategic management is the key link to success in supplier

relationship management - process management - customer relationship management - supply chain management - business excellence (Sader, Husti & Daróczy, 2019).

Many authors emphasize the importance of successful innovation management and social responsibility for achieving business excellence. These determinants of business excellence are not directly covered by the TQM factors, but they overlap significantly with each one of them:

- Innovations are significant for business excellence not only from the point of view of improving process management and customer satisfaction, but also from the point of view of generating cost efficiency and improving product quality (Amponsah & Ahmed, 2017). Therefore, successful innovation management is an important determinant of improvement in the field of compliance with the EFQM/FQCE principles, which directly reflects in the generation of long-term sustainable competitive advantage. Innovations are the core of agile business, which is inevitable for survival and success in modern conditions of risk and uncertainty.
- As a determinant of business excellence, corporate social responsibility (CSR) is a reflection of the company's orientation towards ethical business and satisfying the interests of the social community and all other stakeholders, simultaneously respecting legal regulations and standards (Jankalová & Jankal, 2020; Bergant, 2021; Politis & Grigoroudis, 2022). The corporate image is determined by social responsibility and affects business excellence. The quality management system and the environmental protection management system (an integral part of the ISO standardization ISO 14001 and ISO 26000) both emphasize the importance of business ethics, CSR and transparency for generating long-term sustainable growth and company development (Zink, Steimle & Fischer, 2008; Adámek, 2018).

The parallel analysis of the EFQM/FQCE principles of business excellence (including their connection with the TQM principles, too) and the practices of the

manufacturing companies with business excellence (the winners of the FQCE awards in the domain of quality and business excellence) defined the key determinants of business excellence (Figure 1). The statements that measure a company’s success in the domain of each determinant of business excellence are defined based on the FQCE interviews during the implementation of the competitions in the domain of business excellence - the questions regarding the successful implementation of the quality management system, compliance with the requirements of the ISO standards (primarily the ISO 9001, as well as the ISO 14001, ISO 26000 and ISO 28000) and the principles of business excellence.

THE IMPORTANCE OF THE ORGANIZATIONAL STRUCTURE FOR BUSINESS EXCELLENCE

The organizational structure is the central dimension of organizational design. The overall organizational success depends on its flexibility (Gupta, Drave, Bag & Luo, 2019). The parameters of the organizational structure determine its internal integration (as an indicator of organizational alignment). They also affect the company’s employees’ job satisfaction, motivation, and engagement, directly affecting

competitive advantage (Birasnav & Bienstock, 2019; Soderstrom & Weber, 2020; Bošković, 2021). As a combination of structural parameters, internal organizational integration might affect employee motivation to all the determinants of business excellence: 1) the implementation of innovations, 2) building and maintaining long-term partner relationships with customers and suppliers, 3) a timely delivery of a quality product at a competitive price and 4) corporate social responsibility.

The importance of the organizational structure for reaching the level of business excellence has been the topic of the research studies carried out by a large number of authors. J. Bauer, R. Falshaw and J. S. Oakland (2005) found the significant influence of the organizational structure on the generation of the level of business excellence, where they pointed out the fact that organizations with simple structures reached this level more easily than the companies with complex and more formalized organizational structures. M. Dubey (2016) reached a similar conclusion, with an additional note that the influence of leadership on the interdependence of the organizational structure and organizational culture was important for business excellence. T. Pyzdek and P. Keller (2013) emphasized the importance of the organizational structure for the generation of operational excellence, with a detailed analysis of the impact of the organizational structure support for success in the domain of operational

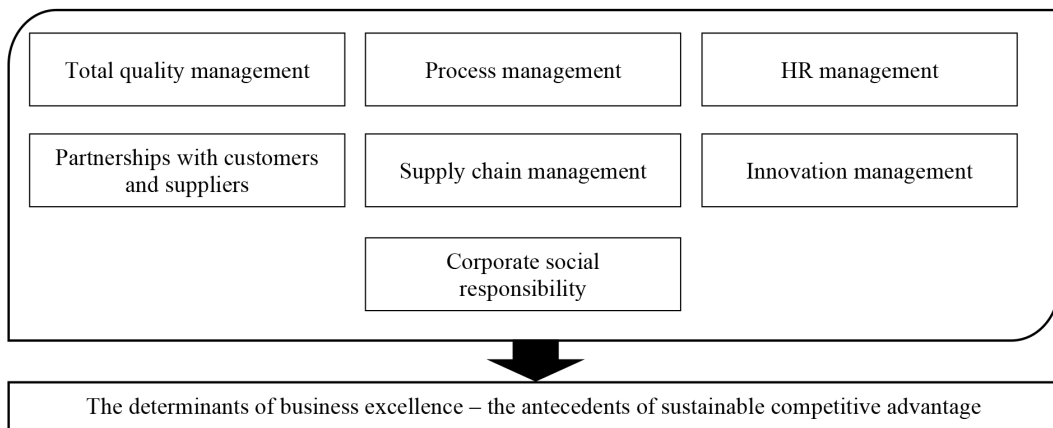


Figure 1 The determinants of business excellence, based on the EFQM/FQCE norms and the TQM principles

Source: Authors

excellence, especially the following determinants: supplier relationship management, process management, customer relationship management, and supply chain management. They confirmed the conclusion presented by L. M. Corbett (2011) that the support of the organizational structure was key to the successful implementation of all operational goals, which directly reflected in reaching the level of business excellence. O. Fok-Yew, H. Ahmad and S. Baharin (2013) highlighted formalization and flexible specialization as the parameters that contributed most to the generation of operational excellence. Through their research, D. More and A. Subash Babu (2008) confirm the importance of the organizational structure for the generation of innovations, which was key to long-term sustainable business excellence in turbulent environmental conditions. The practice of the manufacturing companies with business excellence (the winners of the FQCE awards in the field of business excellence) in the conditions of the COVID-19 pandemic and the current geopolitical circumstances highlighted the alignment between the organizational structure and organizational culture as the most important factor in supporting the maintenance of the achieved level of business excellence.

N. Jabnoun (2005) proved the importance of the support of the organizational structure for the successful implementation of TQM in the companies whose business is customer-oriented, emphasizing the fact that the aforementioned interdependence was one of the critical sources of competitive advantage in the conditions of fierce competition on the market. This research study fully confirmed the conclusion made by R. Mann and D. Kehoe (1995) that the stability of the organizational structure was the basis of successful compliance with the TQM principles. D. I. Prajogo and A. S. Sohal (2006) emphasized the importance of the support of the organizational structure for the successful implementation of TQM, noting the fact that this interdependence was a factor of organizational performance (performance overlaps with the performance of the determinants of business excellence).

The results of prior research also identified the importance of interdependence between the organizational structure and the individual

determinants of business excellence for the generation of the successful implementation of TQM. The most common topic was the influence of the interdependence of the organizational structure and QMS for the generation of improvements in supply chain management, which directly reflected on the implementation of TQM (Llach, Casadesus & Marimon, 2011; Shi, Lin, Chen & Su, 2019). As a process management phase, an efficient and effective process control requires the support of the organizational structure parameters, which directly reflects in the successful implementation of TQM (Biazzo & Bernardi, 2003; Stravinskiene & Serafinas, 2020). J. L. García-Alcaraz, F. J. F. Montalvo, C. Sánchez-Ramírez, L. Avelar-Sosa, J. A. M. Saucedo and G. Alor-Hernández (2021) highlighted the importance of interdependence between the organizational structure and human resource management (primarily employee satisfaction and motivation) for the successful implementation of the customer-oriented TQM concept. Regarding CSR as a determinant of business excellence, CSR has been identified to exert a positive impact on business performance, whereby the successful implementation of TQM has a mediating role in this interdependence (Mehralian, Nazari, Zarei & Rasekh, 2016). According to the research results, decentralization and formalization were singled out as the parameters of the organizational structure that stimulate the successful implementation of the TQM concept (Escribá -Moreno, Canet-Giner & Moreno-Luzón, 2008).

Previous research suggested that there is a direct link between the organizational structure and every determinant of business excellence was identified, namely:

Success in the field of Quality Management System (QMS). J. Pereira-Moliner, E. M. Pertusa-Ortega, J. J. Tarí, M. D. López-Gamero and J. F. Molina-Azorín (2016) show that specialization, formalization, and coordination are the most important supporting factors for successful compliance with the requirements of the QMS and the ISO 9001 standard. M. Á. Escribá-Moreno *et al* (2008) also highlight the importance of these parameters in manufacturing companies by analyzing the mediating role of the

organizational design of the effectiveness of employee teamwork and the successful implementation of the TQM concept.

Process management success. Successful process management is the core of the successful implementation of the requirements of the QMS and the ISO 9001 standard (Biazzo & Bernardi, 2003), which leads to the conclusion that the same parameters of the organizational structure support the success of the quality management system and process management. The EFQM/FQCE model of business excellence emphasizes the importance of successful process management based on the PDCA cycle for the successful implementation of the TQM principles and reaching the level of business excellence. High horizontal/low vertical specialization, the medium level of horizontal and vertical decentralization, a combination of the coordination/control mechanisms and the formalization based on compliance with the QMS requirements, the ISO 9001 standards, the TQM principles, and the business excellence criteria are important for the successful synchronization of all the processes in the company. For manufacturing companies, the most favorable results are expected from a combination of the organic and mechanical design parameters. The purpose of process orientation is to maximize efficiency and effectiveness simultaneously in order to provide maximum value to consumers (Stojanović-Aleksić, 2017). To maintain efficiency in the production process, a certain degree of formalization and control is required, as well as enabling sufficient freedom to employees to apply their knowledge and creativity intensively as well.

Success in generating job satisfaction and employee motivation. The organizational structure has effects on job satisfaction and employee motivation, while human resource management has an important mediating role in these relationships (Galanou, Sotiropoulos, Georgakopoulos & Vasilopoulos, 2011; Manzoor, 2012). E. G. Lambert, E. A. Paoline III and N. L. Hogan (2006) show that a high level of centralization and the dominant role of rules and procedures, along with high vertical specialization, have the greatest negative impact on job satisfaction and employee motivation. Organizations in which

there is the delegation of authority and responsibility in the vertical and horizontal directions and in which employees have an influence on the work tasks they perform invest more in training and formal education of their employees (Adiharja & Hendarsjah, 2020). Hence, higher levels of motivation and satisfaction may be expected.

The development of long-term partnership relations with customers and suppliers as a factor in the establishment of efficient and effective supply chain management. The functional model of the organizational structure is considered to be the model that stimulates employees to develop and maintain long-term partnership relationships with suppliers, which, together with process management, contributes to the development of efficient and effective supply chain management (Kim, 2007). S. W. Kim (2007) emphasized the importance of coordination/control and formalization for the synchronization and control of processes along the entire supply chain. P. J. Daugherty, H. Chen and B. G. Ferrin (2011) indicated the importance of these organizational structure parameters with low vertical specialization and decentralization for the successful implementation of all innovations in the field of supply chain management. Y. Sabri (2019) points out the fact that internal coordination and control are the core of the successful synchronization of all flows in the supply chain. S. Adana, S. Cevikparmak, H. Celik, H. Uvet and Y. Idug (2022) confirm all the previously listed conclusions, emphasizing coordination and control for quality internal communication, which is the main driver of job satisfaction and employee motivation to contribute maximally to the improvement of supply chain management performance. All the considered studies included manufacturing companies in their sample, so the obtained results refer to this industry branch.

Innovation capacity. S. Gentile-Lüdecke, R. Torres de Oliveira and J. Paul (2020) point out the fact that a high degree of horizontal/vertical specialization and centralization are the parameters of the organizational structure with the greatest negative impact on the openness of the company to the introduction and implementation of innovations.

Recent research suggests that the involvement of employees in decision-making has a positive influence on the innovativeness of social enterprises (Aleksić Mirić, Aničić & Petrović, 2023). Based on the QMS requirements, the TQM principles, and the business excellence criteria, formalization has a positive effect on innovation management (Lokhande & Rajapadmanabhan, 2022). The TQM concept and the EFQM/FQCE model of business excellence emphasize the importance of continuous investment in the introduction and successful implementation of innovations so as to generate a long-term sustainable competitive advantage. In manufacturing companies, innovation is an essential factor for survival and growth. Innovation management in these companies is often based on differentiation through innovation in the product itself (Ulusoy, 2003), which is implemented through a process approach (McAdam, Keogh, Reid & Mitchell, 2007). This implies predominant reliance on an organic structure characterized by relatively low formalization, specialization and centralization.

Corporate social responsibility. D. Vazquez-Brust, R. S. Piao, M. F. D. S. de Melo, R. T. Yaryd and M. M. Carvalho (2020) pointed out the fact that high centralization and the dominance of formalization over employees' initiatives are the main obstacles to socially responsible business, which is an important segment of the sustainable growth and development of companies. In the manufacturing company sector, the impact on the environment is a challenging area, and it is especially important to identify critical impacts on stakeholders and make decisions on the ways to optimize or eliminate the harmful effects of the production process on the environment. This often requires the engagement of experts' complex knowledge, implying the fact that experts throughout the organization should be delegated authority and given flexibility in deciding on these aspects of doing business. This research confirmed the conclusions presented by A. Menon and A. Menon (1997), not only from the point of view of the influence of the organizational structure on the company's commitment to reach the social responsibility level,

but also from the point of view of the importance of social responsibility in conditions of risk and uncertainty in the environment.

Given that modern trends in the organization of manufacturing companies suggest combining the lean and agile approaches, the organizational structure should be such that it supports exactly this type of balancing, which means that a combination of mechanical and organic design characteristics can be expected to generate the most favorable results in terms of the determinants of business excellence.

Based on all the aforementioned, the following research hypotheses were set:

- H1: As a parameter of the organizational structure, specialization is a determinant of business excellence in manufacturing companies.
- H2: As a parameter of the organizational structure, centralization is a determinant of business excellence in manufacturing companies.
- H3: As a parameter of the organizational structure, coordination is a determinant of business excellence in manufacturing companies.
- H4: As a parameter of the organizational structure, formalization is a determinant of business excellence in manufacturing companies.

EMPIRICAL RESEARCH

Research methodology

The empirical research was done during the first half of 2023. It was conducted on a sample of 94 manufacturing companies from RS. The survey method was applied, and the respondents were the employees who mainly belonged to the managerial structure at the strategic and operational levels. Earlier research carried out by the authors in the field of the implementation of the TQM concept shows that only these categories of employees are sufficiently familiar with the requirements of the QMS, ISO 9001,

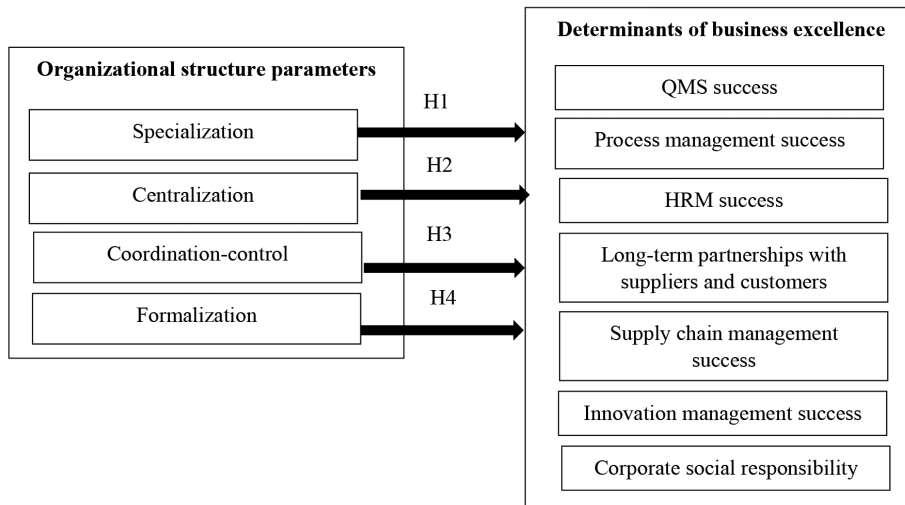


Figure 2 The research model

Source: Authors

and TQM principles, as well as the specifics of the organizational structure and the determinants of business excellence.

The respondents expressed the level of their agreement with the items on a five-point Likert-type scale from 1 to 5 (1 - complete disagreement, and 5 - complete agreement). For data processing, the SPSS software was used.

The structure of the sample implies 55% of small and medium-sized companies, as well as 45% of large companies. The predominant activity of 64% of the companies is the production of the semi-finished products that are inputs in other sectors (e.g. metal processing, as well as companies to which large production companies outsource one segment of the production process). The remaining 46% of the companies produce finished products (spare parts in the field of electrical goods, pneumatics, hydraulics, mechanical engineering, and various types of packaging). The sample is dominated by the companies based in Belgrade and Vojvodina (37%), followed by those from Western Serbia (23%), Central Serbia (16%), Eastern Serbia (15%), and Southern Serbia (9%).

Research results

A descriptive statistical analysis was conducted in order to analyze the organizational structure of the company (Table 1) and success in respecting the principles of business excellence (Table 2). The analysis of the organizational structure indicates high horizontal ($M=4.05$) and low vertical specialization ($M=2.71$), which implies the fact that employees perform a narrow group of related work tasks, which they have a relatively high influence on. Authority and responsibility are to a great extent delegated at the vertical and horizontal levels, as is evidenced by the mean values for the statements measuring centralization ranging from 2.39 to 2.62. Coordination is based on the equal representation of the three mechanisms: the standardization of inputs/work processes/outputs, the internal verification of compliance with the QMS requirements, and direct supervision (for all the three, the value of M is ~ 4.20). Formalization embodied through rules and procedures (first of all, the QMS requirements and the requirements of the ISO 9001 standard) play a significant role (M ranges from 4.19 to 4.21). The employees exert an influence on the work they perform but do not have complete autonomy in performing the work tasks that trigger strategic

Table 1 The descriptive analysis - the organizational structure parameters (n=94)

Variable	Statements	Mean (M)	Standard deviation (SD)	
Independent variables	Specialization	High horizontal specialization.	4.05	1.1394
		High vertical specialization.	2.71	1.3960
		Employees value work with minimal concentration and stress.	2.77	1.4175
	Centralization	High vertical centralization.	2.62	1.3687
		High horizontal centralization.	2.39	1.2023
		The complexity of the communication channels in the company.	2.51	1.2247
	Coordination/control	The standardization of inputs, work processes, and outputs.	4.21	0.7742
		Internal QMS checks - compliance with the QMS procedures.	4.24	0.7716
		The coordination/control of the realization of the target performance of the process in the manager-employee relationship.	4.27	0.7503
	Formalization	The significant role of the rules and procedures in the company.	4.21	0.7742
		Rules and procedures - an easier control and predictability of employee behavior.	4.19	0.7798
		Employees do not have a high level of autonomy and freedom in performing their work tasks - especially those triggering strategic issues.	4.20	0.7701

Source: Authors

issues. The QMS procedures for each process indicate that the employees have an influence on their work to a certain extent but there is a definite list of authorizations and activities whose implementation requires communication with superiors. The standard deviation values indicate the relative homogeneity of the respondents' attitudes about the organizational structure.

Companies pay great attention to business excellence, as is evidenced by the value of M greater than 4.00 for the largest number of the relevant findings. In the human resource management field, there is room for improvement in employee satisfaction and motivation (M=2.88). The innovation management field is rated lower than the other fields.

The reliability analysis was based on the Cronbach alpha coefficient - Table 3. Internal consistency within each scale is good (the Cronbach alpha is above 0.80), while centralization is excellent (the Cronbach alpha value is greater than 0.90).

To identify the relationships between the variables, correlation analysis was made (Table 4). The relationship between specialization and centralization is statistically significant. These parameters of the organizational structure statistically significantly and positively correlated only with the establishment of a successful quality management system as a determinant of business excellence. There is a strong and positive correlation between specialization and the QMS expressed by the correlation coefficient 0.50. Centralization is negatively correlated with all the determinants of business excellence. There are strong negative correlations with process management, supply chain management, and innovation management. The relationship between formalization and the QMS is statistically significant at a level of $p \leq 0.05$, while the relationships between formalization and other business excellence determinants are not significant. Coordination/control has a statistically significant, positive and strong correlation with all the determinants of business excellence. The correlation analysis shows statistically significant, positive, and

Table 2 The descriptive analysis - the determinants of business excellence (n=94)

Variable	Statements	Mean (M)	Standard deviation (SD)	
Dependent variables	QMS & ISO 9001	The company operates in compliance with the requirements of the QMS and ISO 9001 certified QMS.	4.22	0.7355
		The continuous improvement of quality in all the domains of business – one of the key goals.	4.19	0.7798
		Internal and external QMS audit reports are an important input for the implementation of corrective and preventive measures in this domain.	4.15	0.8546
	Process management	The management goals of each process are aligned with the goals at the company level.	4.15	0.8027
		Success in realizing the target performance of each process is monitored and represents the basis for defining corrective and preventive measures.	4.14	0.7979
		Defined corrective/preventive measures in the field of improving the process performance are the basis for defining target performance for next business year.	4.10	0.8807
	HRM	Measuring employee satisfaction and motivation.	2.88	0.9821
		Training - planning, organization, implementation, and monitoring effects.	4.00	0.9837
		Intensive work on the improvement of personnel relationships in the company – with a focus on professional personnel retention.	4.16	0.7938
Partnership – buyers and suppliers	Continuous work on improving partnership relationships with suppliers.	4.04	0.8154	
	Continuous work on improving partnership relationships with customers.	4.07	0.7793	
	The involvement of suppliers and customers in innovation in the domain of the quality of raw materials, processes, and products.	4.09	0.8727	
SCM	The management of relationships with suppliers generates a timely procurement of quality raw materials under favorable commercial conditions.	4.10	0.8174	
	Process management generates the timely production of quality products at acceptable costs.	4.11	0.8095	
	Customer relationship management generates customer satisfaction through the timely delivery of a quality product at an acceptable price.	4.07	0.8327	
Innovation management	Innovations as an integral part of actively flexible business.	3.68	0.9183	
	Innovation planning and innovation budgets.	3.70	0.9255	
	The involvement of partners in the introduction and implementation of innovations – suppliers and customers.	3.68	0.9414	
Social responsibility	The company bears responsibility for its impact on the environment.	3.57	0.8612	
	Ethical conduct and transparency in the domain of decision-making and implementation.	4.09	0.7987	
	Communication and networking in the company-stakeholder relationship are based on generating business stability and avoiding potential conflicts.	4.06	0.7871	

Source: Authors

Table 3 The values of the Cronbach alpha coefficients - the reliability of the statements by the variables

Variable	Values of the Cronbach alpha coefficients
Specialization (S)	0.883
Centralization (C)	0.922
Coordination/control(CC)	0.821
Formalization (F)	0.854
QMS (QMS)	0.832
Process management (PM)	0.820
Human Resource Management (HRM)	0.813
Partnership – buyers and suppliers (RM)	0.817
Supply Chain Management (SCM)	0.819
Innovation management (IM)	0.828
Corporate social responsibility (SR)	0.818

Source: Authors

strong correlations among all the determinants of business excellence (the values of the correlation coefficients above 0.5 at $p \leq 0.01$).

Regression analysis was carried out in order to identify the parameters of the organizational structure with statistically the most significant influence on business excellence (Tables 5-12). The parameters of the organizational structure are the independent variables, and the determinants of business excellence (the QMS, process management, human resource management, partnerships, chain management supply, innovation management, and social responsibility) are the dependent variables. Centralization was excluded from the regression analysis due to the unsatisfactory precondition of multicollinearity ($VIF > 10$) since the correlation showed a negative interdependence with the determinants of business excellence. The goal of the corrected research model (without centralization) is to identify the parameters of the organizational structure that will positively and statistically significantly influence the improvement of all the determinants of business excellence. All the models are statistically

Table 4 The results of the correlation analysis

	S	C	KK	F	QMS	PM	HRM	RM	SCM	IM	SR
S	1	0.46**	-0.22*	0.83**	0.50**	-0.24**	-0.18	-0.03	-0.22*	-0.18	-0.19
C	0.46**	1	-0.47**	0.76**	0.23*	-0.58*	-0.48**	-0.42**	-0.58**	-0.57**	-0.48**
KK	-0.22**	-0.47**	1	-0.05	0.64**	0.95**	0.93**	0.96**	0.90**	0.73**	0.87**
F	0.83**	0.76**	-0.05	1	0.72**	-0.16	-0.06	0.10	-0.17	-0.20	-0.08
QMS	0.50**	0.23*	0.64**	0.72**	1	0.56**	0.62**	0.76**	0.51**	0.38**	0.54**
PM	-0.24**	-0.58*	0.95**	-0.16	0.56**	1	0.93**	0.96**	0.95**	0.81**	0.90**
HRM	-0.18	-0.48**	0.93**	-0.06	0.62**	0.93**	1	0.98**	0.94**	0.82**	0.92**
RM	-0.03	-0.42**	0.96**	0.10	0.76**	0.96**	0.98**	1	0.93**	0.77**	0.91**
SCM	-0.22**	0.58**	0.90**	-0.17	0.51**	0.95**	0.94**	0.93**	1	0.88**	0.94**
IM	-0.18	-0.57**	0.73**	-0.20	0.38**	0.81**	0.82**	0.77**	0.88**	1	0.88**
SR	-0.19	-0.48**	0.87**	-0.08	0.54**	0.90**	0.92**	0.91**	0.94**	0.88**	1

** $p \leq 0.01$; * ≤ 0.05

Source: Authors

Table 5 Regression model results - the QMS as the dependent variable

	Unstandardized coeff.		Standardized coeff.	t	Sig.	VIF
	B	Std. error	Beta			
Specialization	0.038	0.012	0.093	3.128	0.002**	3.571
Coordination/control	0.426	0.010	0.695	41.539	0.000**	1.118
Formalization	0.499	0.021	0.677	23.214	0.000**	3.404
R ² =0.977						

Source: Authors

Table 6 Regression model results - process management as the dependent variable

	Unstandardized coeff.		Standardized coeff.	t	Sig.	VIF
	B	Std. error	Beta			
Specialization	0.162	0.041	0.219	3.941	0.000**	3.571
Coordination/control	1.099	0.035	0.981	31.498	0.000**	1.118
Formalization	-0.389	0.073	-0.289	-5.318	0.000**	3.404
R ² =0.922						

Source: Authors

Table 7 Regression model results - HRM as the dependent variable

	Unstandardized coeff.		Standardized coeff.	t	Sig.	VIF
	B	Std. error	Beta			
Specialization	0.096	0.060	0.117	1.611	0.111	3.571
Coordination/control	1.189	0.051	0.950	23.399	0.000**	1.118
Formalization	-0.164	0.106	-0.109	-1.539	0.127	3.404
R ² =0.867						

Source: Authors

Table 8 Regression model results - partnership with buyers/suppliers as the dependent variable

	Unstandardized coeff.		Standardized coeff.	t	Sig.	VIF
	B	Std. error	Beta			
Specialization	0.104	0.031	0.166	3.361	0.001**	3.225
Coordination/control	0.905	0.026	0.995	34.574	0.000**	1.096
Formalization	0.000	0.056	0.000	-0.002	0.998	3.102
R ² =0.952						

Source: Authors

Table 9 Regression model results - SCM as the dependent variable

	Unstandardized coeff.		Standardized coeff.	t	Sig.	VIF
	B	Std. error	Beta			
Specialization	0.209	0.060	0.280	3.500	0.001**	3.571
Coordination/control	1.068	0.051	0.940	21.006	0.000**	1.118
Formalization	-0.479	0.107	-0.351	-4.493	0.000**	3.404
R ² =0.839						

Source: Authors

Table 10 Regression model results - innovation management as the dependent variable

	Unstandardized coeff.		Standardized coeff.	t	Sig.	VIF
	B	Std. error	Beta			
Specialization	0.342	0.102	0.417	3.344	0.001**	3.571
Coordination/control	0.991	0.087	0.796	11.402	0.000**	1.118
Formalization	-0.758	0.182	-0.507	-4.161	0.000**	3.404
R ² =0.608						

Source: Authors

significant at $p \leq 0.01$. Model 1 explains 97.7% of the variance of the QMS as the dependent variable, and a statistically significant influence of specialization, coordination/control, and formalization is also found. Model 2 accounts for 92.20% of the variance of process management success, with a statistically significant influence of all the independent variables identified. Model 3 explains 86.7% of the variance of the HRM determinants, and coordination/control has the biggest influence. Model 4 explains 95.2% of the variance in the development of partner relationships with customers and suppliers, with specialization and coordination/control having the biggest influence. Also, 83.9% of the variance of supply chain management is accounted for by Model 5, where a statistically significant influence of specialization, coordination/control, and formalization is identified. Model 6 explains 60.8% of the variance of innovation management success, with a significant influence of all the independent variables observed. Model 7 explains 76.4% of the variance of social responsibility, where coordination/control is the only parameter of the organizational structure that has a statistically significant influence.

In Table 12, the original research model was checked, considering business excellence as a unique dependent variable, without centralization as one of the independent variables. The model defined in this way explains 89.3% of the variance of the determinants of business excellence as a dependent variable, where all the three observed parameters of the organizational structure have a statistically significant influence on making improvements in this domain.

Discussion of the research results

The results of the conducted statistical analysis are the basis for drawing a conclusion with respect to the defined initial research hypotheses:

- The results of the regression statistical analysis identified a statistically significant influence of specialization on all the determinants of business excellence, except for the success of human resource management and social responsibility. Therefore, the hypothesis H1 is supported. The relationship between specialization and

the QMS is the strongest. The positive effects of specialization imply that employees should perform a group of related jobs, which increases their expertise in the same area.

- High centralization in the vertical and horizontal directions is statistically significantly and negatively correlated with all the determinants of business excellence, but due to the unsatisfactory determinant of multicollinearity, no statistically significant influence of this variable on each of the determinants of business excellence was identified. Therefore, the hypothesis H2 is partially supported. The results of the descriptive statistical analysis showed a significant degree of the delegation of authority in the sample, with the absence of the complexity of communication channels, which indicates that these companies are well on their way to use the benefits of this factor for the motivation of their employees so as to contribute to improvements in the domain of business excellence.
- The standardization of inputs/work processes, the internal checks of the QMS, and direct

control in the manager-employee relationship is a combination of the coordination mechanisms that determines the achievement of business excellence of the manufacturing companies in RS. Therefore, the hypothesis H3 is supported. This parameter of the organizational structure in business practice has a very important role in defining and monitoring the implementation of corrective and preventive measures in the domain of all processes, which directly reflects in each of the determinants of business excellence. Process management (based on the PDCA cycle), aligned with the requirements of the QMS, ISO standardization (including the standards in the CSR field), and the TQM principles, is a predictor of reaching the level of business excellence, as is indicated by the FQCE and EFQM business models excellence.

- Formalization (based on the QMS procedures) statistically significantly determines the determinants of business excellence, with the biggest influence on success in the fields of the QMS, process management, supply chain

Table 11 Regression model results - social responsibility as the dependent variable

	Unstandardized coeff.		Standardized coeff.	t	Sig.	VIF
	B	Std. error	Beta			
Specialization	0.098	0.069	0.137	1.418	0.160	3.571
Coordination/control	0.971	0.059	0.893	16.493	0.000**	1.118
Formalization	-0.198	0.123	-0.152	-1.604	0.112	3.404
R ² =0.764						

Source: Authors

Table 12 Regression model results - business excellence as the dependent variable

	Unstandardized coeff.		Standardized coeff.	t	Sig.	VIF
	B	Std. error	Beta			
Specialization	0.169	0.047	0.235	3.595	0.001**	3.571
Coordination/control	1.064	0.040	0.969	26.526	0.000**	1.118
Formalization	-0.384	0.084	-0.291	-4.566	0.000**	3.404
R ² =0.893						

Source: Authors

management, and innovation management. Therefore, the hypothesis H4 is supported. Formalization has the strongest correlation with the QMS. The quality management system permeates all the spheres of management, which implies that making improvements in this domain is the initiator of improvement in the domain of business excellence.

The parallel analysis of the conclusions regarding the hypotheses H1 to H4 with the results of the regression analysis for the entire research model leads to the conclusion that the organizational structure has the status of statistically significant support for reaching the level of the business excellence of the manufacturing companies in RS. The parameters of the organizational structure have a dual effect on reaching the level of business excellence in practice: 1) they affect job satisfaction and employee motivation (especially specialization and centralization) to contribute to improvements in the domain of each of the determinants of business excellence, and 2) they affect the success of the QMS and process management (coordination/control and formalization), which spills over to all the other determinants of business excellence (which is confirmed by the high positive correlation between all the determinants of business excellence).

The results of the research study fully confirmed the conclusions presented by M. Birasnav and J. Bienstock (2019) and S. B. Soderstrom and K. Weber (2020), with a more detailed analysis of the influence of the organizational structure parameters on all the determinants of business excellence in the manufacturing sector of RS. Previous research in the influence of the organizational structure parameters on the individual determinants of business excellence has identified low vertical specialization and decentralization as the key factors of making improvements. This research study has confirmed the said conclusion, with the fact that, unlike the analysis of the impact on the individual factors, coordination crystallized in the integrated analysis as a parameter of the organizational structure of essential importance

for successful compliance with the QMS requirements, the ISO standards, and the TQM principles, which reflects in improvements in the domain of each of the determinants that are highly positively correlated with each other. Therefore, unlike the previous ones, this research study has identified the central role of coordination in terms of the importance of the support of the organizational structure for generating business excellence.

CONCLUSION

The paper suggests that the organizational structure has a significant role in supporting the achievement of business excellence in the manufacturing sector of an economy. The parameters of the organizational structure have a statistically significant influence on the determinants of business excellence. It was found that specialization affects the largest number of the determinants of business excellence, thus supporting the Hypothesis 1. The negative correlation between centralization and the determinants of business excellence was identified as statistically significant, while the influence of this variable was not proven by regression analysis, which is why the Hypothesis 2 is only partially supported. The influence of coordination and formalization on most indicators of business excellence is statistically significant, so the Hypothesis 3 and Hypothesis 4 are supported. Since the determinants of business excellence are highly correlated among each other, these impacts are important for the business excellence as a whole, and for long-term sustainable competitive advantage in the manufacturing economy sector as well.

The essential theoretical and practical contribution of the conducted research study reflects in a detailed analysis of the impact of the organizational structure on all the determinants of business excellence, with a parallel analysis of the interdependence of the determinants. The results of the research identified the influence of each parameter of the organizational structure on each determinant of business excellence, which contributes to the literature in several related

areas, such as organizational design, business excellence, and quality management. Such research is rare, especially in manufacturing companies, so the results are particularly relevant for this sector of the economy, and thus the scientific knowledge about the relationship between the organizational structure and the determinants of business excellence has deepened. In a practical sense, the research results guide managers of manufacturing companies in terms of corrections and improvements in the domain of the central structural dimension of organizational design so as to initiate positive changes in the relationship between the QMS - process management - all the other determinants of business excellence. The paper provides information about the specific parameters of the organizational structure that management can use when making decisions at the company level, with the goal of improving the level of business excellence. To increase business excellence, it is suggested that managers of manufacturing companies should adjust organizational design in order to use a combination of different coordination mechanisms, relying on formalization. Additionally, a relatively high degree of specialization should be developed in this context.

The main limitation of the research study reflects in the fact that, in contemporary conditions of risk and uncertainty in the global environment, it is important to analyze the flexibility of the organizational structure, which this research does not deal with (only the current situation is analyzed). For a detailed analysis of the impact of the organizational structure on improvements in the domain of the determinants of business excellence, it is important to analyze the flexibility of the organizational structure (especially in the domain of adaptation to the contextual dimensions of organizational design) because only a flexible organizational structure leads a manufacturing company towards business excellence. Research in the interdependence of the organizational structure and business excellence should move in this direction in the future, which will make a significant theoretical and practical contribution at the international level.

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AN ANALYSIS OF THE ACCEPTANCE OF LOOT BOXES USING THE MODIFIED TECHNOLOGY ACCEPTANCE MODEL: THE EMPIRICAL EVIDENCE FROM VIDEO GAME PLAYERS IN SERBIA

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Business models in the video game industry have shifted from physical to digital. With microtransactions, game producers have been provided with the ability to charge for extra in-game content. Loot boxes are one of the most controversial forms of microtransactions in video games. These are the prize packages that consist of one or multiple virtual items, whose specific content remains unknown to the player prior to opening. This study is aimed at identifying the combination of the factors that act as motivators for players in Serbia to engage themselves in monetary transactions for the purchase of loot boxes. To address the requirements of the study, modifications were made to the fundamental Technology Acceptance Model (TAM) so as to encompass the additional variables that had been perceived as significant for players' decision-making processes. The findings of the study indicate the fact that the "perceived enjoyment, customization", and "perceived ease of use" variables are the important factors that can predict the "perceived usefulness of loot boxes" variable. Additionally, the "perceived usefulness of loot boxes" and "propensity for gambling" variables are significant predictors of players' intention to purchase. Furthermore, the "intention to purchase loot boxes" variable has a statistically significant impact on the "actual use of loot boxes" variable.

Keywords: loot boxes, microtransactions, TAM, gambling propensity, customization

JEL Classification: D91, L82, L83, L86, O33

INTRODUCTION

The emergence of contemporary information and internet technologies has led to a variety of

revolutionary innovations within the video game sector. The widespread adoption of smart devices has resulted in a global user base exceeding two billion individuals (Pitić, Kržić, Vuković & Ilić, 2020), leading to a significant expansion within the entertainment industry. The rapid growth of the sector is illustrated by the substantial profits generated by the largest companies operating within the sector, which are

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measured in billions of US dollars. Based on pertinent statistical data, it is observed that the estimated market value shows an approximate increase of 15% for 2021 in comparison with the preceding year, accompanied by optimistic projections for future growth. The positive values of all the indicators were affected by the pandemic lockdown, working from home and changes in entertainment habits in the absence of sports and cinema content (Bošković, 2021). In line with the advancement of the industry and shifts in user's habits and preferences, new approaches for video game monetization are being established.

The business models employed within the video game industry have gone through a transformation, transitioning from physical distribution to digital platforms. During the pre-digitalization era, companies employed a retail model that involved distributing games in tangible formats such as cartridges and compact discs. This model exhibited issues in terms of efficiency, speed, and costs, as the final iteration of the game had to be designed to full functionality and required rigorous testing prior to its release for commercial purposes (Dillon & Cohen, 2013). Along with the widespread adoption of the Internet, technological advancement has enabled the emergence of a new business model both in terms of hardware and software innovations. Players no longer need to acquire physical copies of the video games, since digital distribution allows them to pay a single fee to download a digital file from an online platform and subsequently install the purchased game on their personal device. The application operates on the "pay-to-play" model, in which the player is required to pay a premium price in order to access the complete content of the game (Davidovici-Nora, 2014; Klimas, 2017; Tomić, 2017). Still, this particular model shows certain imperfections. It makes publishers receive a fixed amount of compensation irrespective of the subsequent popularity of the game and duration of its use. Essentially, publishers did not have the ability to generate revenue from the games that remained popular among gamers for a longer period following their initial release. Hence, the concept of microtransactions emerged, enabling publishers to monetize supplementary in-game content.

Loot boxes represent the most controversial manifestation of microtransactions in the video games world. The critique directed towards these microtransactions arises from their resemblance to games of chance and gambling (Garret, Drummond, Lowe-Calverley & Sauer, 2023; Brooks & Clark, 2023). Loot boxes can be defined as collections of rewards encompassing one or multiple virtual items (Xiao, 2021), whose content is unknown to the player prior to their opening, thereby introducing an element of uncertainty. Loot boxes have received significant attention in both psychological research and legal analysis due to their unique nature compared to other microtransactions. In contrast to alternative microtransaction models, loot boxes involve a level of uncertainty, where players are unaware of the specific content they will obtain. The unique attribute mentioned has sparked an extensive examination of the psychological effects of loot boxes, as well as the imperative for regulatory interventions. Hence, the empirical section of this study will employ the Technology Acceptance Model (TAM) in order to examine the diverse factors that impact the use of loot boxes.

The factors influencing the adoption of loot boxes as prevalent microtransactions in the contemporary video game industry are the subject matter of this research. The goal set by the conducted study is to identify the combination of the factors that serve as motivators for players in the Republic of Serbia (RS) to engage themselves in monetary transactions for the acquisition of loot boxes. The basic TAM will be modified for the purpose of this study so as to include the additional aspects that are recognized herein as potentially significant for players' decision-making.

The paper is organized into three logically interrelated sections. The first section elucidates the notion of microtransactions and provides a definition of loot boxes as a distinct element within this conceptual framework. The second section represents the theoretical background of this research study, explaining the research methodology by introducing the fundamental TAM and clarifying the critical requirement for a modification. The final section of the paper discusses the findings obtained from the conducted research study.

LOOT BOXES AS A CONTROVERSIAL FORM OF MICROTRANSACTIONS

According to E. Markopoulos, P. Markopoulos, M. Liumila, Y. Almufti and V. Aggarwal (2020), the predominant revenue generation strategy employed by publishers is game monetization through microtransactions. While commonly perceived as a substitute for a premium game sale, this model is in fact integrated within the games that require an initial payment from the user (Bank, 2023). Subscription is one of the frequently applied microtransaction models. That model implies that players make periodic payments in order to gain access to the game for a specific duration (Klimas, 2017). In this manner, publishers are able to generate additional revenue by capitalizing on the sustained popularity of the video game. The second model allows the purchase of the supplementary content associated with the primary gameplay, commonly referred to as downloadable content (DLC). This additional content encompasses various elements, including but not limited to new missions in action games, new factions or campaigns in strategy games, additional vehicles or tracks in racing games, the inclusion of classical teams in sports games, the introduction of new characters in fighting games, and similar enhancements. The third model illustrates a comprehensive transition from the conventional premium model to the freemium or free-to-play (F2P) model, wherein free access to the game is provided until a specific level is reached, at which point payment becomes obligatory.

According to N. Tomić (2017), payment may be contingent upon a sudden deceleration of progress within the game or an entire suspension of gameplay, accompanied by an explicit call to make a payment in order to continue playing. The primary objective of the F2P model is to prioritize the player's experience over its monetization, as highlighted by M. Davidovici-Nora (2014). Initially, users are granted free access to the basic content of the video game, which mobilizes a large number of players. It is postulated that an extended duration of playing generates an increased tendency among players to acquire supplementary content, driven by the motivation to protect against losing any of their progress. The fourth model is the

most acceptable in the eyes of the gaming community. It refers to the so-called cosmetic microtransactions, which do not alter the game's balance or the gaming experience. The aforementioned features include visual or audio improvements for a character controlled by a player, which are designed to enhance the player's experience within a video game. Cosmetic microtransactions, for instance, include the alternative appearances of the characters, the availability of alternative costumes (commonly referred to as skins), or the inclusion of corresponding audio components.

Loot boxes represent a prevalent form of microtransactions, known across various genres of video games, even including those sold at a premium price. According to L. Y. Xiao (2021), these prize packages comprise one or multiple virtual items and operate in a manner analogous to the lottery. The boxes hold a sense of enigma, as their contents remain secret until they are opened (Tomić, 2018; Cerulli-Harms, Münsch, Thorun, Michaelsen & Hausemer, 2020). The selection of the virtual item that the player receives occurs in a random manner following the payment authorization (Senate Standing Committees on Environment and Communications, 2018). Therefore, they may contain the objects that only alter the game's appearance, or they may contain items that have a direct impact on the gameplay itself, such as new weapons, armor, skills, or more powerful capabilities.

The level of uncertainty associated with loot boxes is contingent upon the specific design that is employed. Therefore, along with the corresponding probabilities of obtaining specific items, the level of uncertainty is comparatively reduced in the gaming scenarios where players are provided with a catalog of potential rewards from purchased boxes in contrast to the situations where the content of the boxes is entirely unknown to the player. The player does not actually pay for a particular virtual object; rather, they pay for the opportunity to potentially obtain an item from the offered selection. Due to the significantly low likelihood of acquiring the desired item, players will have to engage in the repeated purchase of loot boxes so as to attain the intended content (King & Delfabbro, 2019). This practice effectively fosters a

pattern of regular purchases. Hence, there is concern regarding the potential of this particular video game monetization mechanism to serve as a transitional link between gaming and gambling (Drummond & Sauer, 2018).

The debate on whether the act of purchasing loot boxes can be regarded as a type of gambling involves a broad range of ethical considerations and regulatory implications. The experts specializing in gambling regulation in Belgium and the Netherlands have identified certain loot boxes that are in violation of their respective gambling legislation (King & Delfabbro, 2018; Woodhouse, 2021). The Danish authorities conducted an analysis of several video games featuring loot boxes and determined that the gambling legislation could not be enforced in the cases where virtual items could not be monetized or converted into a real currency (Senate Standing Committees on Environment and Communications, 2018). If purchased virtual items are subsequently traded on external platforms and converted into an actual currency, these loot boxes may be subject to regulations pertaining to gambling. The legal definition of loot boxes as a form of gambling remains unclear in certain jurisdictions due to the absence of the financial loss associated with their purchase and the perception that the virtual items obtained lack real value (Schwiddessen & Karius, 2018; King & Delfabbro, 2019). Due to the great diversity of interpretation in different European legislations, the European Parliament passed a resolution at the beginning of 2023, calling on the European Commission to deal with this issue in detail and issue guidelines, recommendations or a binding act with the aim of harmonizing legislation at the EU level.

THE THEORETICAL FOUNDATION OF THE RESEARCH

Literature review

Previous analyses of the factors impacting video game consumption have primarily relied on the TAM. The

selection made is not arbitrary, since the “perceived ease of use” and “perceived usefulness” variables accurately demonstrate the nature of video game consumption. Engaging oneself in an activity that provides both amusement and relaxation necessitates simplicity in addition to its usefulness for the player. The majority of researchers have decided to adapt the basic model and augment it by incorporating the factors that are unique to the consumption of video games, which on its part enables greater accuracy in assessing the factors that drive the player’s motivation.

In their comprehensive analysis, X. Wang and D. H. L. Goh (2017) made a review of the 50 scientific articles that employed the TAM. Their findings revealed that, alongside the fundamental variables of the model, the “perceived enjoyment” variable emerged as statistically significant in the majority of the examined studies. According to C. C. Chang and P. Y. Chen’s (2018) analysis of social media games, the two most crucial gaming factors perceived are enjoyment and socialization. D. H. Bassiouni, C. Hackley and H. Meshreki (2019) conducted a simultaneous analysis of the various factors that had an influence on both children and parents within the families that engaged themselves in playing video games. The researchers reached the conclusion that social factors were crucial for children, whereas parents prioritized the “perceived enjoyment” variable and the ability to engage themselves in the activities with their children that aligned with their preferences. In their study, Y. Lu, S. Papagiannidis and E. Alamanos (2019) introduced the e-TAM, which was specifically designed to address the emotionally conditioned use of technology, such as in the context of video games. The primary variables in this iteration of the TAM include personal well-being, perceived value, the emotions associated with achievement, and the emotions associated with a loss.

Numerous studies have been conducted in order to assess the phenomenon of loot boxes, with a particular focus on highlighting the harmful effects associated with their consumption. In a study carried out by A. Drummond and J. D. Sauer (2018), it was demonstrated that, within a sample of the 22 video games that had been regarded by the Entertainment Software Rating

Board (ESRB) as suitable for child users, a total of 10 of these games all had the features inherent to gambling. Some researchers argue that the act of purchasing loot boxes should not be classified as gambling due to the assurance that players will receive some content, even if it does not align with their initial preferences (Griffiths, 2018). The study conducted by C. Primi, F. Sanson, M. Vecchiato, E. Serra and M. A. Donati (2022) revealed an association between the purchase of loot boxes and gambling tendencies among adolescents. This relationship was found to be mediated by several factors, including the frequency of video game consumption, problematic video game playing, and regular engagement in gambling activities. According to D. L. King, P. H. Delfabbro and M. D. Griffiths (2011), the reward-related aspects present in video games have the potential to create a significant influence on players' problematic behaviors. In a similar vein, there are concerns that some in-game purchasing systems, such as loot boxes, may lead to the development of gaming disorders.

Based on the available literature, no empirical investigations appear to have been conducted on the phenomenon of loot boxes specifically targeting a sample of players from RS. Furthermore, a comprehensive database of the academic literature concerning the subject matter of microtransactions authored by researchers from RS or those from neighboring countries is currently lacking. References in the domestic literature are primarily limited to the online forums dedicated to video games and specialized magazines that particularly address the issue. This research study will therefore not only be a pioneering effort for future research in RS, but it will also be useful for making comparisons with the work done by researchers from other European countries.

The Technology Acceptance Model (TAM)

TAM is widely recognized as the predominant model used to explain and predict the level of the acceptance shown by users towards novel technologies (Filipović, 2020). The original version of the model was formulated by F. D. Davis (1989), with the primary objective of describing the process by which users

adopt and embrace new technologies, particularly in the context of online environments (Agag, Khashan & ElGayaar, 2019). In the initial framework, F. D. Davis (1989) places an emphasis on the two predictor variables, namely the "perceived ease of use" and "perceived usefulness" variables. The first is defined as "the degree to which a person believes that using a particular system would be free of effort", while the "perceived usefulness" variable is regarded as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320). The variables in TAM are influential in shaping an intention to use a specific technology. The user's self-perception of using a certain technology in the future serves to quantify the behavioral intention to use, which is anticipated to result in the actual use of that particular technology (Kondo & Ishida, 2014).

When speaking about analyzing the acceptance of online video games, TAM was the model of choice in most research studies, as noted by S. Chauhan, M. Mittal, M. Wozniak, S. Gupta and R. Perez de Prado (2021). The reason for such broad acceptance of TAM lies in the model's simplicity and ease of application (Kondo & Ishida, 2014). It is based on the theory of reasoned action, which claims that a person's behavior is influenced by that person's attitude towards a certain course of action (Buabeng-Andoh, 2018). TAM defines technology acceptance as a process in which external factors lead to cognitive reactions in the form of the "perceived usefulness" and "perceived ease of use" variables, thus forming an affective response through the attitude towards using technology and indirectly influencing user behavior (Kondo & Ishida, 2014; Marikyan & Papagiannidis, 2023).

In the initial revision of the TAM, attitude was introduced as a mediating variable between the perceived usefulness and perceived ease of use variables, on the one hand, and the intention to use variable, on the other (Davis, Bagozzi & Warshaw, 1989). However, in the following iterations, the attitude was omitted from the model due to the recognition that it had a limited mediating effect within the model. It was found that the perceived usefulness and perceived ease of use variables directly influenced the

intention to use variable (Aziz, Harun, Baharom & Kamaruddin, 2020). Although it has a direct influence on the intention and behavior, the perceived ease of use variable mostly affects usefulness and has an indirect effect on user behavior (Hsu & Lu, 2004). In other words, if a potential user considers a new technology to be simple to use, he or she is more likely to find it useful, which influences the adoption of that particular technology as the end result of the process. Figure 1 shows the structure of the general TAM.

The modification of the basic model

For the purpose of achieving the goals set herein, the fundamental TAM is modified by the introduction of new factors. These new variables have the purpose to explain in greater depth the reasons why players choose to purchase loot boxes.

Perceived ease of use

This is TAM's source variable with a dual impact. The construct of the "perceived ease of use" variable is identified as a significant predictor of the "perceived usefulness" variable. However, when considered alongside the "perceived usefulness" variable, it also exerts an influence on individuals' intentions to use a technological product or service. The explanation arises from the TAM, whose origins can be traced back to the period of the revolutionary usage of personal computers and the Internet. Almost every technological innovation raised the open question of how much work the user needs to put in in order to obtain the intended benefits from its use. Accordingly, the following hypothesis is tested:

H1: The perceived ease of use variable significantly impacts the perceived usefulness variable.

Perceived enjoyment

The act of opening a loot box generates a sense of personal satisfaction for the player. According to L. Y. Xiao (2021), the experience is enhanced by the inclusion of impactful visual elements and celebratory audio effects, thereby intensifying the

sense of triumph. The presence of such effects is believed to enhance players' tendencies to engage themselves in repeated purchases and eliminating them may facilitate players' concentration on the actual content of loot boxes (King & Delfabbro, 2019). Hence, the construct of the perceived enjoyment variable is inherently subjective by nature. The perceived enjoyment variable was extensively applied in numerous scientific studies in order to modify TAM (Chen, Lu & Wang, 2016; Wang & Goh, 2017; Linares, Gallego & Bueno, 2021). It was used to predict expected usefulness, so the following hypothesis was proposed:

H2: The perceived enjoyment variable significantly impacts the perceived usefulness variable.

Customization

While most items can also be won through gameplay, some of them are only exclusively available in purchased loot boxes (King & Delfabbro, 2019). Thus, players have an impetus to achieve diversity and originality in the characters they control by paying for opening loot boxes. Uniqueness is of the highest priority in online games, where the majority of players try to stand out from a myriad of similar player avatars. Customization is a common variable in numerous video game-related studies (Turkay & Kinzer, 2014; Kristanto, 2019). In the modified model used in this study, it was taken as a predictor of the perceived usefulness variable, as a greater degree of content customization provides participants with a greater subjective sense of utility.

H3: The "customization" variable significantly impacts the "perceived usefulness" variable.

Perceived usefulness

The "perceived usefulness" variable reflects the assessment made by users regarding the extent to which a particular technological solution is expected to enhance their own business performance. In the context of this study, the benefit refers to the enhancement of the gaming experience brought about by loot boxes. In the fundamental TAM, the

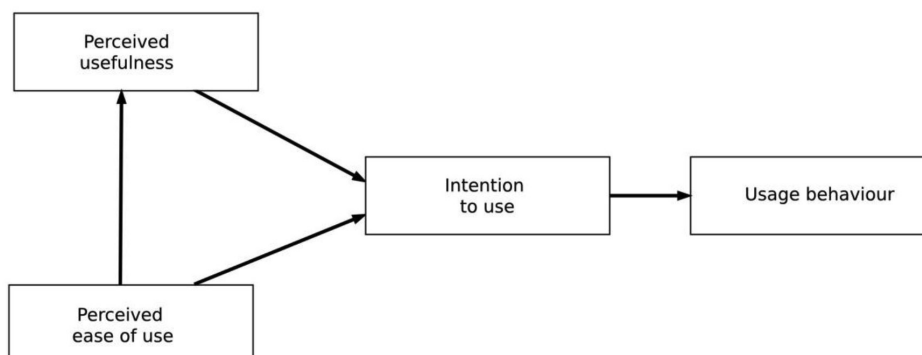


Figure 1 The general TAM

Source: Adapted from F. D. Davis, R. P. Bagozzi and P. R. Warshaw (1989, p. 985)

“perceived usefulness” and “perceived ease of use” variables have a major effect on the intention to use a technological product. In the studies conducted by H. Chen, W. Rong, X. Ma, Y. Qu and Z. Xiong (2017), M. Gawron and A. Strzelecki (2021), and Z. Zhang, Q. Li and Y. Li (2021), both variables have a statistically significant influence on the intention to use variable.

H4: The “perceived usefulness” variable significantly impacts the intention to purchase.

H5: The “perceived ease of use” variable significantly impacts the “intention to purchase” variable.

Gambling propensity

The study conducted by D. Zendle and P. Cairns (2018) discovered a positive correlation between the monetary expenditure on loot boxes by players and the extent of problem gambling. The number of research studies examining the comparability between loot boxes and gambling is steadily expanding. However, it remains uncertain whether the act of purchasing loot boxes consistently stimulates a player’s preference for engaging him- or herself in gambling activities, or the influence operates in the reverse direction. A. Drummond and J. D. Sauer (2018) conducted a study of the 22 gaming instances that incorporated loot boxes, eventually coming to the conclusion that those game features had significant structural and psychological similarities to gambling. According to

M. D. Griffiths (2018), specific menu designs employed in the consumption of loot boxes have the potential to contribute to problem gambling tendencies in those at risk. Due to the potentially significant impact of this variable, it was incorporated into the model to ascertain the potential influence of gambling propensity on players’ tendencies to purchase loot boxes.

H6: The “gambling propensity” variable significantly impacts the “intention to purchase” variable.

Loss aversion

Similar to the other types of microtransactions, loot boxes frequently follow the idea that they can be obtained as a form of reward through dedicated gameplay, patience, or viewing advertisements, without additional payments (Cerulli-Harms *et al.*, 2020). To clarify, the aforementioned boxes are designed specifically to be gained through individual gameplay, thereby attracting an extensive base of the players who do not participate in microtransactions (Stanev, 2020). Nevertheless, the process of accessing loot boxes requires significant commitment, effort, and time (Children’s Commissioner for England, 2019), which is the reason why players frequently turn to microtransactions in order to accelerate the procedure. Loss aversion is a well-known psychological phenomenon in which an individual prioritizes avoiding the loss of what has already

been gained over the acquisition itself. By using this strategy, publishers seek to motivate players to engage themselves in monetary transactions to unlock a loot box, thereby ensuring the retention of the rewards they have already gained through gameplay. In certain cases, most players are unable to think wisely to realize that not opening does not imply a loss of the obtained, because the acquisition is related to the moment of payment itself. The authors are unaware of any previous use of this variable in terms of its influence on players' propensity towards microtransactions. According to Y. Lu *et al* (2019), the consideration of a loss-related emotion is crucial when examining the phenomenon of video game addiction. The loss aversion variable has a significant impact on the intention to purchase loot boxes variable, hence the following hypothesis is proposed:

H7: The "loss aversion" variable significantly impacts the "intention to purchase" variable.

The intention to purchase

According to the original TAM, the intention to use a technological product or service is regarded as a direct determinant of its actual use. The relationship between these two variables should demonstrate the meaningfulness of the overall model. If the intention to purchase loot boxes does not result in their actual usage, then the significance of the preceding variables, which exert an indirect and sublimated

influence through the purchasing intention, becomes irrelevant. A large number of research studies have consistently proven a causal relationship between beliefs, intentions, and behaviors in the domain of technology adoption and usage (Davis *et al*, 1989; Davis, 1989; Igarria, Parasuraman & Baroudi, 1996; Limayem, Khalifa & Frini, 2000; Chen, Gillenson, & Sherrell, 2002). Thus, the following hypothesis is proposed:

H8: The "intention to purchase" variable significantly impacts the actual use of loot boxes.

Figure 2 shows the modified model with the additional variables.

EMPIRICAL RESEARCH

The research methodology

The present study employed the structural equation modeling (SEM) approach so as to simultaneously examine the impact and causal relationships among multiple variables. SEM is the fundamental methodology employed in the models that include the variables representing both dependent and independent factors. In addition to estimating the correlation coefficients between the variables, SEM provides the values of the model fit indicators.

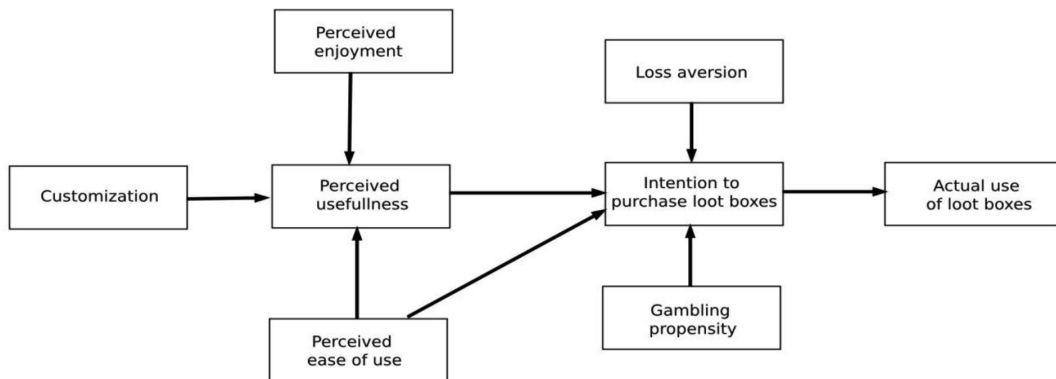


Figure 2 The modified TAM

The research data were gathered through a questionnaire uploaded on a video games forum gathering domestic players in May 2023. In addition to the section that gathers demographic data about the respondents, the questionnaire includes the 24 items that are assessed using a five-point Likert scale. The statements are so designed to incorporate an attitude towards the use of loot boxes, wherein the participant assesses their level of agreement on a scale from 1 to 5, with 1 indicating complete disagreement and 5 indicating complete agreement. According to C. J. McDaniel and R. Gates (2006), the Likert scale is the most effective instrument for obtaining respondents' attitudes. Only players who had previously purchased or planned to purchase loot boxes submitted further information, which was critical to the adoption of the statement(s). A total of 434 replies were obtained in the final phase. The structure of the responders is given in Table 1.

To assess the validity of the formulated questions, an initial pilot study was conducted using a limited sample size. Cronbach's alpha coefficient was employed so as to assess the internal consistency and reliability of the questionnaire items. The low values of this indicator mean the variables had not been formulated using the adequate questions or that it would be better to exclude one of the questions when formulating the variable under observation.

Cronbach's alpha test was conducted on a test sample in order to assess the validity of the formulated questions. The obtained values exceeded the threshold of 0.70 (Taber, 2018), indicating acceptable validity. Consequently, data collection proceeded accordingly. The arithmetic mean, the standard deviation and Cronbach's alpha were computed using the SPSS 22 statistical software based on the collated data. Following that, the analysis was transferred to the Amos 23 statistical software. Table 2 presents the descriptive statistics and Cronbach's alpha values for all the variables.

The research results

Prior to assessing the correlation between variables, it is necessary to evaluate the adequacy of the model. Fit indicators are calculated in order to assess the compatibility of the proposed model with the data collected. Table 3 displays the chosen indicators.

The basic indicator, which is the ratio of the χ^2 test statistic to the freedom degrees, does not indicate a satisfactory level of fit. Nevertheless, this issue is frequently encountered in research as the coefficient level is contingent upon the size of the sample and shows significant growth as the number of observations increases (Schermelleh-Engel, Moosbrugger & Müller, 2003; Vandenberg,

Table 1 The sample structure

Categories	Answers	Number of observations	Frequency
Gender	Male	401	92.40%
	Female	33	7.60%
Age	18-25	157	36.18%
	26-35	142	32.72%
	36-45	104	23.96%
	over 45	31	7.14%
Education	High school	50	11.52%
	Student	158	36.41%
	Bachelor's	148	34.10%
	Master's or Ph.D.	78	17.97%
Loot box use	Intends to use	240	55.30%
	Once	121	27.88%
	Multiple times	73	16.82%

2006). In this study, an expanded set of fit indicators, specifically the NFI, CFI, GFI, and SRMR, were incorporated so as to account for a large sample size. All the four indicators have optimal values, with the SRMR indicator meeting a more rigorous criterion, as is evidenced in the table.

The main results are accounted for in Table 4. The exogenous variable column displays the independent variables within the given relationship, whereas the endogenous variable column represents the dependent variables corresponding to that relationship. The p-value column is essential for determining the significance of the influence exerted by the independent variable. Its low values are indicative of a high level of statistical significance. If the p-value is denoted by the asterisks, it is less than 0.001, thus indicating the confidence level greater than 99.9%.

The analysis confirmed that the “perceived ease of use”, “perceived enjoyment” and “customization” variables had a statistically significant impact on the “perceived usefulness” variable. Moreover, the

statistical significance of the impact of the “perceived usefulness” and “gambling propensity” variables on the “intention to purchase” variable, as well as the “impact of the intention to purchase” variable on the “actual use of loot boxes” variable, was validated. All the perceived effects were statistically significant, as is indicated by the p-value being below the threshold of 0.001. According to the same logic, there is no evidence of a statistically significant relationship between the “perceived ease of use” and “loss aversion” variables on the intention to purchase. Six of the eight hypotheses set herein are confirmed according to the results. Table 5 provides a summary of the hypotheses confirmation.

The intensity of the influence can be assessed by examining the regression coefficients obtained. The “perceived enjoyment” variable is the dominant factor influencing the “perceived usefulness” variable, whereas the influence of the remaining two variables is nearly equal. When examining the “intention to purchase” variable as the dependent variable, it can be seen that the “perceived usefulness” variable

Table 2 The descriptive statistics and Cronbach’s alpha value

Variables	Arithmetic mean	Standard deviation	Cronbach’s alpha
Perceived usefulness	4.156	0.822	0.848
Perceived ease of use	3.850	0.782	0.807
Perceived enjoyment	3.813	0.840	0.756
Customization	3.744	0.859	0.754
Gambling propensity	3.587	1.016	0.762
Loss aversion	3.917	0.874	0.772
Intention to purchase	4.136	0.973	0.813
Actual use of loot box	4.210	1.009	0.891

Source: Authors

Table 3 The model fit indicators

Indicators	Values	Recommended values	Fit
χ^2/df	21.54	<5(3), E. G. Carmines and J. P. Mclver (1983)	No
NFI	0.913	>0.90, P. M. Bentler and D. G. Bonett (1980)	Yes
CFI	0.916	>0.90, P. M. Bentler (1990)	Yes
GFI	0.901	>0.90 K. G. Jöreskog and D. Sörbom (1986)	Yes
SRMR	0.072	<0.10(0.08), P. M. Bentler (1995)	Yes

Source: Authors

has a greater influence. In relation to the association between the “intention to purchase” and “actual use of loot boxes” variables, the coefficient exhibits a significantly high value (marginally below 0.87), which finding holds considerable significance for the model given the fact that the intention to purchase stands as the sole predictor.

CONCLUSION

TAM is frequently employed when examining the hedonic dimension of a technological product consumption. This study has effectively enhanced the model by incorporating the additional variables that are particularly specific to microtransactions. The study reveals a significant relationship between the “perceived enjoyment” and “perceived usefulness” variables, aligning with previous academic research on the subject matter of microtransactions. The

significance of the “customization” variable is also notable, aligning with the numerous studies that emphasize the importance of this aspect in contemporary video games. The overall finding indicates that the “perceived ease of use” variable does not reflect the significance that it potentially could have within the framework of this model. The variable in question is a fundamental component of the foundational model, thus it is incorporated into the expanded model employed in this study. Its influence does not meet the expectations as there was no statistically significant impact on the intention to purchase variable, which can partly be explained by the fact that, in this study, the relative importance of the “ease of use” variable to the other variables is lower than when the basic TAM is used to analyze the acceptance of technological products and services by the general population. In this instance, reference is made to the video game players who are familiar with the purpose and function of microtransactions or

Table 4 The correlation between the exogenous and endogenous variables

Exogenous variables	Endogenous variables	Coeff.	SE	p-value
Perceived ease of use	Perceived usefulness	0.168	0.039	***
Perceived enjoyment	Perceived usefulness	0.526	0.037	***
Customization	Perceived usefulness	0.228	0.034	***
Perceived usefulness	Intention to purchase	0.635	0.057	***
Perceived ease of use	Intention to purchase	0.092	0.054	0.09
Gambling propensity	Intention to purchase	0.271	0.039	***
Loss aversion	Intention to purchase	-0.060	0.047	0.21
Purchase intention	Actual use of loot box	0.868	0.027	***

Notes: *** = statistical significance for $p < 0.001$

Source: Authors

Table 5 The hypotheses status

Hypothesis	Correlation	Outcome
H1	Perceived ease of use - Perceived usefulness	Supported
H2	Perceived enjoyment - Perceived usefulness	Supported
H3	Customization - Perceived usefulness	Supported
H4	Perceived usefulness - Intention to purchase	Supported
H5	Perceived ease of use - Intention to purchase	Unsupported
H6	Gambling propensity - Intention to purchase	Supported
H7	Loss aversion - Intention to purchase	Unsupported
H8	Intention to purchase - Actual use of loot box	Supported

Source: Authors

have already used them. Therefore, the “ease of use” variable is not a significant factor for them.

Regardless of the good values of the model fit indicators and the numerous variables demonstrating statistical significance, there are still opportunities for further enhancements in research. Several studies examining the motivation of the individuals who engage themselves in video gaming incorporate a variable that refers to a social aspect. Nevertheless, the aforementioned variable is excluded in this research due to the inherent characteristics of loot boxes. The loot boxes opening does not foster player cohesion, nor does it enhance social interaction, but rather serves to distinguish individuals as it offers either character customization options or the game-altering enhancements that disrupt the current state of balance. Future research in this subject matter should incorporate a comparative aspect, wherein the findings obtained for RS will be compared with those from another European nation.

One of the limitations inherent in this study pertains to the specific cultural context of playing video games in RS. A large number of players gravitate towards the traditional model of premium game purchases, wherein they make a one-time payment for the game and avoid engaging themselves in microtransactions, without the intention to use them in the future. Furthermore, this was verified during the data collection phase. As a result, the findings of this study should not be generalized and should not apply to the entire Serbian gaming community. The interpretation of the results out of context is a special risk. This mostly relates to gambling propensity as one of the variables, whose individual observation may lead to incorrect assumptions regarding the propensity of all video game players.

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LABOR PRODUCTIVITY IN THE SELECTED SEE COUNTRIES: TRENDS AND DETERMINANTS

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This study examines labor productivity in the Open Balkan initiative countries (Albania, Serbia, and North Macedonia) and Southeastern Europe's latest EU entrants (Bulgaria, Romania, and Croatia). In the study, macroeconomic and institutional factors, including the Gross National Income (GNI) *per capita*, the unemployment rate, the statutory minimum wage, and the labor freedom index are analyzed in relation to labor productivity. The study used econometric methods to identify the labor productivity determinants and discern the labor market differences between the two groups of countries. The key findings emphasize the pivotal role of economic development in Southeastern Europe, especially among the last EU entrants, fostering additional increases in labor productivity. The study reveals the significant influence of the labor freedom index on productivity, with nuanced implications for both groups of countries. Additionally, it highlights the tangible impact of the statutory minimum wage policies on labor productivity in the Open Balkan initiative countries, indicating potential shifts in the wage structures and broader economic landscapes. The interplay of variations in the unemployment rate emerges as a substantial factor shaping efficiency and overall productivity in the labor market across both groups. These findings provide valuable insights into the labor market complexities faced by the Open Balkan countries, underscoring the need to bridge the gaps for economic development catch-up.

Keywords: labor productivity, unemployment rate, Open Balkan initiative, Southeastern Europe

JEL Classification: J21, J31, J88

INTRODUCTION

Countries' material well-being and development are still largely influenced by the productivity levels and growth. A sustainable increase in labor productivity is necessary to improve the performance of national

economies and international competitiveness (Krugman, 1994; Heil, 2018). In the context of advanced economies, preserving the societal standard of living amidst the backdrop of population aging is paramount. However, notwithstanding its pivotal role, there is a prevailing consensus that advanced economies, exemplified by the USA and the European Union, have witnessed a conspicuous deterioration in labor productivity growth rates since the onset of the Great Recession in 2007 (Mishel, 2012; Bivens

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& Mishel, 2015). Nevertheless, the period following the global economic crisis witnessed a sustained economic growth trend in both developed and developing countries, especially after 2015. However, the unexpected onset of the COVID-19 pandemic led to a global economic crisis, which severely destabilized the labor markets and disrupted their previous equilibrium. The pandemic compelled a significant number of workers to face the risk of a temporary or permanent job loss, placing workers with limited skills, low productivity, and qualifications at a higher risk of poverty. The deterioration of the labor market was exacerbated by disruptions in supply chains, a significant increase in energy prices, and the geopolitical tensions arising from the conflict between Ukraine and Russia. Such exogenous shocks caused a deepening of macroeconomic instability, a significant increase in inflation, especially in food prices, as well as insufficient GDP growth rates. The negative repercussions are especially worrying in the countries of Southern and Eastern Europe, which are characterized by extremely low labor productivity and permanently high unemployment rates.

For decades, the countries of Southern and Eastern Europe have been leading the process towards integration and full membership in the EU. Some of the countries such as Bulgaria, Romania, and Croatia have been members of the EU for more than 10 years, while countries such as Albania, Serbia, and North Macedonia, although they have the candidate status, are still "far" from EU membership. In the case of the Central European countries, EU integration influenced changes in the economic structure and productivity through the implementation of the four freedoms of the European Single Market, specifically the free movement of goods, the free movement of capital, the free movement of persons, and the free movement of services (Dobrzański & Grabowski, 2019). With a respect to increasing cooperation and liberalizing economic flows between the EU candidate Balkan countries (Albania, Serbia, and North Macedonia), the "Open Balkan" regional initiative has been created. The basic aim of the initiative is to meet the high challenges facing these countries and improve their competitive standing on their way to full integration in the EU. Also, the regional economic cooperation

called the "Open Balkan", which is based on the free movement of people, capital and goods and services, aims to increase regional cooperation and improve the competitiveness of these countries in order to reduce the gap with the rest of the EU countries.

Since the EU countries from Southern and Eastern Europe differ from the EU candidate countries in terms of economic development, it is important to note that, despite a reduction in differences in economic development over the past decade, the gap still persists. The countries of the European Union (EU) in Southeastern Europe had experienced robust rates of labor productivity in the pre-COVID-19 era, fostering sustainable economic growth. Nevertheless, certain Southeastern European countries, notably Bulgaria, Romania, and Croatia, significantly lag behind the EU average in terms of economic performance, particularly concerning the level of labor productivity. As per the Global Competitiveness Index (GCI), Bulgaria ranks 49th, Romania is 68th, Croatia is positioned as 74th, Albania stands at 75th, and Serbia ranks 78th. According to the GCI, the gaps between these two groups of countries are not particularly big. The level of economic development and labor market performance does not significantly differ between them, either (World Economic Forum, 2017).

This analysis aims to explore the trends in labor productivity in the countries participating in the "Open Balkan" initiative (Albania, Serbia, and North Macedonia), and in the Southern and Eastern European nations that were former EU entrants (namely Bulgaria, Romania, and Croatia). Additionally, the study will assess the influence of distinct macroeconomic variables on labor productivity in both groups of countries. The study has the goal to analyze the influence of specific macroeconomic and institutional determinants (i.e. the statutory minimum wage, the labor freedom index, unemployment, and Gross National Income *per capita*) on labor productivity. Additionally, the study aims to draw comparisons between the countries that are the European Union (EU) members and those participating in the "Open Balkan" initiative.

The examination of labor productivity performance, one of the key indicators of labor market efficiency, necessitates the inclusion of the labor institutional framework. Institutional indicators such as the labor freedom index and the statutory minimum wage are incorporated in this analysis. The institutional framework, the quality of institutions and their impact on economic performance are in the focus of the empirical and theoretical literature (Nissan & Niroomand, 2008). Some authors underscore the importance and quality of institutions in influencing a country's economic performance, particularly in the creation of human and physical capital, as well as technological progress. This connection is also evident in its direct impact on labor productivity (Acemoglu & Robinson, 2008; Bjørnskov & Foss, 2010). Some economists also stress the importance of high-quality labor market institutions in enhancing productivity and fostering sustainable rates of economic growth (Acemoglu, Johnson & Robinson 2004).

In the context of institutional frameworks, the inclusion of the statutory minimum wage as a determinant of labor productivity is especially relevant in the Southern and Eastern European countries. This significance arises from a substantial portion of workers categorized as minimum wage recipients and a considerable proportion of the statutory minimum wage in the average wage (World Bank, 2019). According to the economists supporting the establishment and raising of the minimum wage, this action is expected to augment income for low-skilled workers. Moreover, it is anticipated to enhance labor productivity, especially among the low-skilled workers who will transfer their skills to more productive sectors of the economy (Sabia, 2015). In both theoretical and empirical literature, the adverse impacts of the statutory minimum wage, particularly on low-skilled workers, individuals with limited work experience, and young workers, have been discussed (Neumark, 2018). The raise in the statutory minimum wage leads to the exclusion of certain workers from the labor market. In other words, they encounter difficulties securing employment due to the minimum wage surpassing the equilibrium level. This situation diminishes the potential for utilizing productive employment opportunities (Giuliano, 2013). Hence,

the analysis will incorporate the labor freedom index and the statutory minimum wage as the institutional determinants influencing labor productivity. These indicators will serve as the essential variables in assessing the multifaceted dynamics that contribute to variations in productivity levels across the selected countries.

The incorporation of the macroeconomic variables, such as the unemployment rate and the level of economic development, is crucial as they reflect the characteristics of both the labor market and the economy as a whole. As human capital and the level of technology play a major role in labor productivity, it follows that higher levels of labor productivity correlate with higher levels of accumulated human capital and technology. Thus, higher economic development is associated with higher levels of labor productivity (Syverson, 2011). Hence, the inclusion of the GNI *per capita* is considered as one of the determinants that have a significant impact on labor productivity. In the period from 2014 to 2019, following the mitigation of the negative effects of the financial crisis of 2008-2009, unemployment has exhibited a declining trend in nearly all European countries. Nonetheless, despite this decreasing trend, unemployment persists at notably high levels in certain countries. The countries such as Albania, North Macedonia, and Serbia saw double-digit unemployment rates in 2022 (World Bank, 2022). The additional limiting factors for raising labor productivity include the participation of the long-term unemployed (the people who have not worked for more than a year) in total unemployment (Duell, Thurau & Vetter, 2016). Due to the nature of unemployment, the negative effects on the overall performance of the economy become apparent, particularly so being attributed to the erosion of the skills leading to the destruction of human capital and the challenges associated with reintegration into the labor force. Given the potential negative impact that unemployment may exert on the long-term productivity growth rates of the Southern and Eastern European countries, it seems appropriate to include unemployment as a determinant of labor productivity (Bräuningner & Pannenberg, 2000). The inclusion of the unemployment rate as the determinant influencing the capacity of labor markets to generate productive

employment is considered particularly relevant in the Southeastern European countries characterized by notable unemployment rates. Therefore, high and noticeable unemployment rates have substantial adverse consequences for worker performance (Weisskopf, 1987)

This paper contributes to the empirical literature on the macroeconomic and institutional determinants of labor productivity. The primary contribution of the present study lies in its comparative analysis between the countries participating in the “Open Balkan” initiative (Albania, Serbia, and North Macedonia) and the most recent EU entrants (Bulgaria, Croatia, and Romania), examining the trends in labor productivity in these two groups of countries. The study also analyzes the GNI *per capita*, the statutory minimum wage, the unemployment rate, and the labor freedom index as the determinants of labor productivity in both sets of countries. This research stands out as one of the initial studies to scrutinize labor market performance in the countries of the “Open Balkan” initiative, using a diverse set of macroeconomic and institutional variables and offering comparisons with other Southeastern EU countries.

This paper is structured as follows: after the introduction, the research methodology is presented. Furthermore, a thorough analysis of the pertinent empirical and theoretical literature related to the labor market is provided. The subsequent section discusses the trends of the fundamental labor market indicators. The results of the econometric analysis are presented and elaborated in the subsequent section. The concluding remarks are provided at the end of the paper.

TRENDS ON THE SOUTHEASTERN EUROPEAN LABOR MARKETS

The structural reforms and exogenous shocks that impacted the European economies also left an imprint on developing countries. Consequently, the labor markets in Southern and Eastern European countries have undergone notable changes in both

the structure and performance. In recent years, these nations have made substantial progress in reducing unemployment, increasing employment, and raising the activity rate. Despite the positive trends in the specific segments of the labor market, Southern and Eastern European countries need to persist in their efforts to narrow gaps with comparator nations and anticipate future prospects for their respective labor markets.

Coupled with stagnant or decreasing productivity, unchecked wage pressure is undermining the competitiveness of the Southern and Eastern European countries. The average wage has risen in most of these nations, primarily due to increases in the statutory minimum wage affecting wages in the public sector. Recent years have seen an above-average rise in the statutory minimum wage across the Southern and Eastern European countries. For instance, in 2019, the minimum wage as a percentage of the average wage in the countries of the “Open Balkan” initiative was approximately 50% (World Bank, 2019). Notably, Hungary experienced a significant increase in the statutory minimum wage from EUR 467 to EUR 542, representing a 19.5% rise. Similar increases were observed in Bulgaria, Croatia, and Romania, with statutory minimum wages rising by more than 10% (Eurofound, 2023). Despite nominal increases in minimum wages across Europe, the real wage value growth remains uncertain when accounting for changes in prices. Studies indicate that, due to inflation, these increases did not lead to real gains in the two-thirds of the EU member states (Eurofound, 2023). Table 1 illustrates the statutory minimum wage values from 2013 to 2021 in USD. Albania had the lowest minimum wage at USD 239 in 2020, whereas Serbia had the highest among the non-EU countries participating in the “Open Balkan” initiative, at USD 393 per month. In 2020 North Macedonia’s minimum wage of USD 390 exceeded Albania’s significantly, even surpassing the Bulgarian one. This discrepancy may reflect differing economic conditions and the labor market dynamics between the countries. Comparatively, Bulgaria had the lowest minimum wage among the EU member states, amounting to USD 355 in 2020. Croatia and Romania, both EU members, had the minimum wages USD 614 and USD 525, respectively, in 2020 (Table 1).

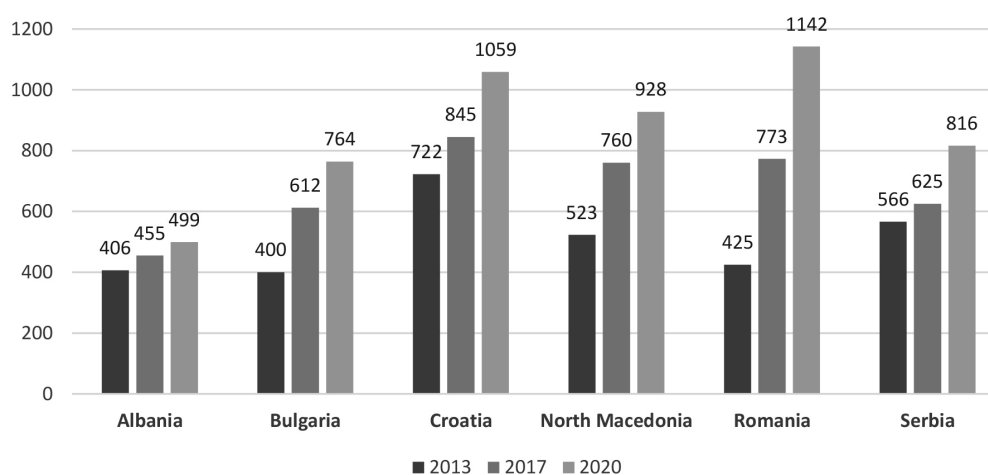
Table 1 The selected countries' statutory minimum wage expressed in USD in the period 2013-2020

Year	Albania	North Macedonia	Serbia	Croatia	Bulgaria	Romania
2013	208.2	264.42	316.77	523.2	210.37	240.39
2015	174.66	251.83	261.03	441.73	215.37	262.13
2016	177.22	261.31	255.03	458.42	237.55	307.94
2017	201.51	313.36	283.84	494.58	265.06	357.8
2018	222.24	333.35	332.97	547.82	307.78	482.04
2019	236.68	382.13	345.51	566.25	320.54	490.81
2020	239.3	389.83	392.6	614.22	355.41	525.45

Source: The ILO database and the national statistics offices.

Despite the period of low inflation, the overall price level has become more prominent since 2021, largely due to the impact of the COVID-19 pandemic on national economies. Disrupted supply chains, labor market destabilization, and job closures, compounded by the conflict in Ukraine and escalating energy prices, have led to increased inflation across nearly all European economies. Therefore, Table 1 presents the nominal values, specifically the minimum wage values established by legal decisions. To analyze changes in the living standard and the purchasing power of the workers receiving the minimum wage, it is necessary to present the minimum wage levels

adjusted for purchasing power. Figure 1 displays the statutory minimum wages expressed in USD, adjusted for the purchasing power parity from 2013 to 2020. During this period, the Republic of North Macedonia's statutory minimum wage adjusted for the purchasing power parity increased from USD 522 to USD 928. Compared to the other countries, North Macedonia's real minimum wage is higher than that of Albania's, Bulgaria's, and Serbia's, with only Romania and Croatia having a higher level of the real minimum wage. In 2020, Albania had the lowest statutory minimum wage USD 499 (Figure 1).

**Figure 1** The statutory minimum wage expressed in USD (Purchasing Power Parity (PPP))

Source: International Labour Organization (2023) and the national statistics offices.

The rise in the statutory minimum wage significantly impacts labor costs, influencing wage distribution and employment dynamics. Studies generally indicate a compressive wage distribution with minimal positive correlation between the minimum wage and employment. The research done in the minimum wage effects on gross national income, unemployment, and labor productivity provides comprehensive insights into the trends of these variables. Figure 2 illustrates the labor productivity trends in USD adjusted for the purchasing power parity from 2013 to 2021, thus facilitating country comparisons and conclusive inferences. For the "Open Balkan" countries (Albania, North Macedonia, Serbia), labor productivity stagnated from 2014 to

2019, but increased in 2020, despite the pandemic's adverse effects. In Southeastern EU countries (Bulgaria, Romania, Croatia), labor productivity had demonstrated an increase until 2020, with significant declines in Croatia and Romania attributed to the pandemic. However, Romania experienced a notable rebound in labor productivity in 2021. In terms of the purchasing power parity, Bulgaria's labor productivity remained consistently low compared to Romania's and Croatia's.

The GNI *per capita* data adjusted for the purchasing power parity spanning from 2013 to 2021 is visually presented in Figure 3, thus facilitating comparative analysis among the countries participating in the

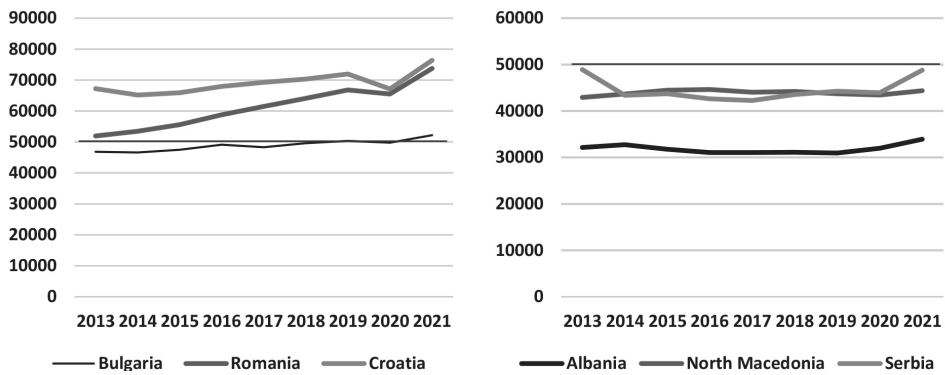


Figure 2 Labor productivity, in USD (Purchasing Power Parity (PPP))

Source: International Labour Organization (2023) and the national statistics offices.

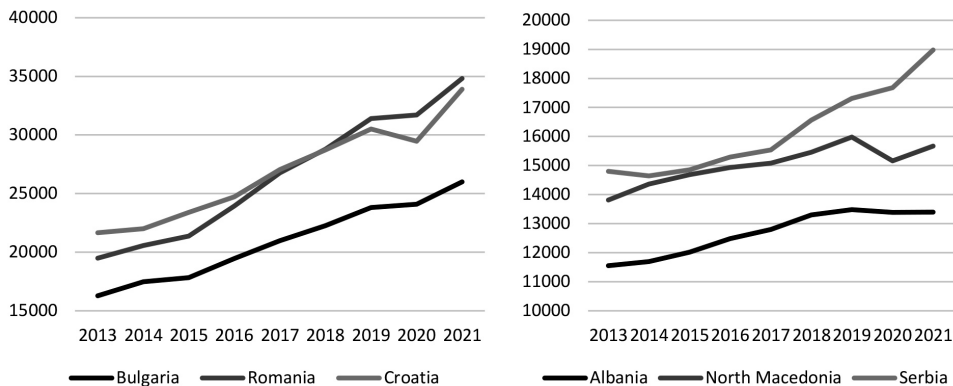


Figure 3 Gross national income *per capita* in USD (Purchasing Power Parity (PPP))

Source: International Labour Organization (2023) and the national statistics offices.

“Open Balkan” initiative (Albania, Serbia, and North Macedonia) and the most recent Southeastern EU entrants (Bulgaria, Romania, and Croatia). The data elucidates a positive economic trend overall. Romania consistently leads in the GNI *per capita*, simultaneously showcasing substantial growth over the years. Notable increases are observed in Serbia and North Macedonia, particularly in 2021. In stark contrast, Albania consistently maintains the lowest GNI *per capita* within the examined timeframe. These disparities accentuate the diverse economic conditions among the nations. The influence of the external factors, notably the COVID-19 pandemic, is discernible, and intriguingly, certain countries managed to sustain or augment their GNI *per capita* despite adverse economic circumstances.

Before the crisis, most European countries experienced a declining trend in unemployment rates, including the Western Balkan nations, despite the relatively high unemployment percentages. Albania, North Macedonia, and Serbia all had unemployment rates exceeding 10%, with North Macedonia experiencing a 13-percentage-point decrease from 2013 to 2021, although the rate slightly increased in 2021. Serbia generally saw a decreasing unemployment trend, reaching its lowest rate of 9% in 2020, but increasing to 10.06% in 2021. Albania’s unemployment rate remained around 11% from 2018 to 2021. Furthermore,

the COVID-19 pandemic moderately affected the labor market in the Western Balkan countries, mitigated by economic policymakers’ interventions through various aid packages. Conversely, the EU member states experienced more pronounced pandemic effects on the labor market. Bulgaria, Romania, and Croatia recorded increased unemployment rates since 2019. Bulgaria’s rate decreased from 12.94% in 2013 to a low of 4.23% in 2019 but rose to 5.6% in 2021. Romania’s rate ranged from 3.9% to 7.1%, with a low of 3.9% in 2019 and 5.6% in 2021. Significantly higher than that of its counterparts, Croatia’s unemployment rate decreased from 17.3% in 2013 to 6.6% in 2019 but rose to 7.6% in 2021. The impact the pandemic had on the labor market, especially in the sectors such as tourism and retail, led to increased unemployment and reduced working hours in many countries. North Macedonia experienced a 10% decrease in working hours in 2020 compared to 2019, with a further 3.35% decrease in 2021. Serbia’s working hours decreased by 0.61% in 2020 but increased thereafter. Romania saw a substantial decrease of 5.87% in 2020 and a further 6.05% decrease in 2021. This trend was observed globally, with an average of 8.8% of working hours lost in 2020, particularly impacting low-to-middle-income countries.

The Labor Freedom Index quantifies the various components of the legal and regulatory legislation

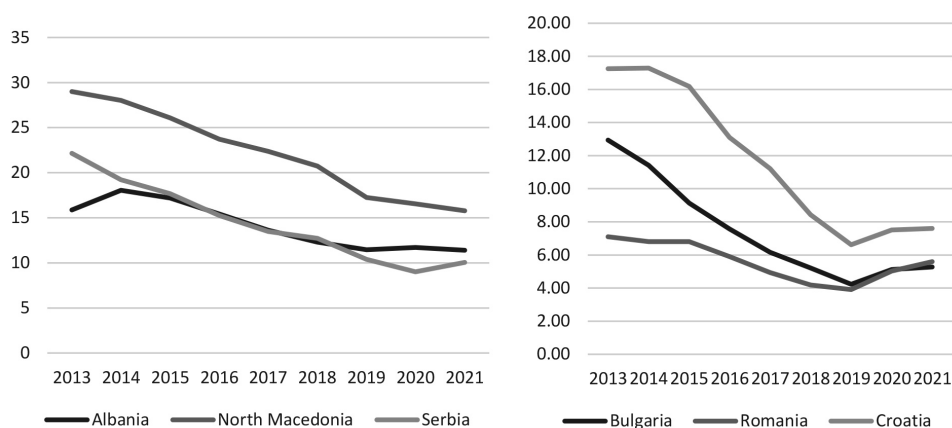


Figure 4 Unemployment in % (2013-2021)

Source: International Labour Organization (2023) and the national statistics offices.

related to the labor market in a country. Hence, this index also includes the regulations relating to minimum wages, labor legislation, i.e. the laws that determine workers' rights, namely the regulation of dismissals, determining the amount and period in which the employee should receive severance pay, as well as the rest value-expressed restrictions on employment, as well as working hours. Hence, the Labor Freedom Index is composed of the following six components: the minimum to the average added value per worker ratio; the legal framework and legislation that represent rigidities in hiring workers; rigidities in

working hours; difficulties in dismissing workers due to redundancy; the legally regulated notice period; the mandatory severance pay. The Labor Freedom Index ranges from 0 to 100, implying a proportional ratio of the value to the workers' freedoms and the labor legislation flexibility. On the example of North Macedonia, a decreasing trend in the workers' freedoms index can be seen. Its highest value of 78.8 index points in 2014 decreased to 66.7 in 2017. After the previous downward trend in 2021, the workers' freedoms index in North Macedonia recorded the lowest value of 65.2 index points. Serbia's workers'

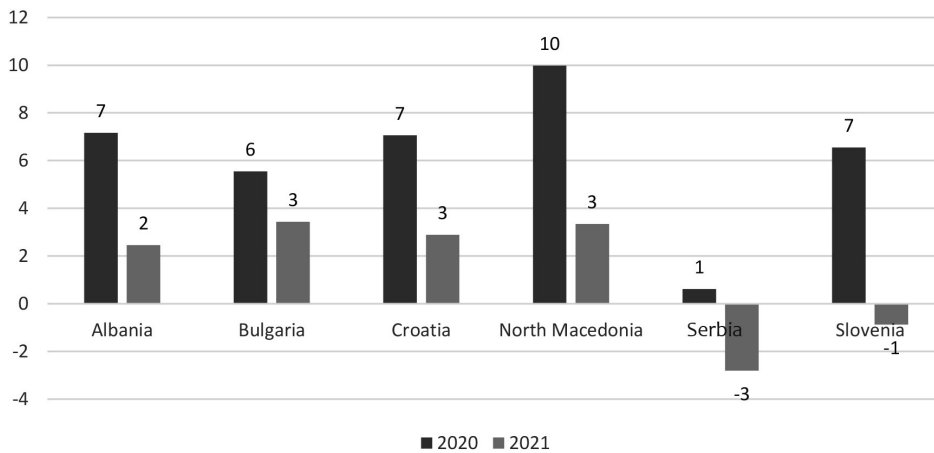


Figure 5 The loss of working hours as a result of the COVID-19 pandemic (%)

Source: International Labour Organization (2023) and the national statistics offices.

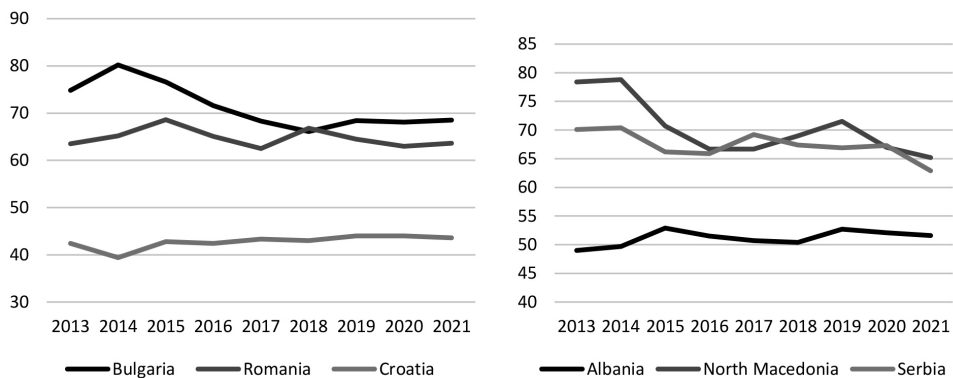


Figure 6 The labor freedom Index (2013-2021)

Source: The Heritage Foundation (2022).

freedoms index movement trend follows a similar trajectory as that in North Macedonia. However, workers' freedoms in Albania hover around 50 index points, indicating the low levels of flexibility in labor laws. The value of the workers' freedoms index for the example of the second group of countries shows that the lowest value is noticeable in the case of Croatia, ranging from 39.4 index points to 44 index points.

Furthermore, this index records a value of 68.5 index points in the case of Bulgaria and 63.6 index points in the case of Romania. The Labor Freedom Index movement trend shows that labor legislation rigidity, insufficient flexibility, and barriers to entrance onto and exit from the labor market is most pronounced in Albania and Croatia. On the other hand, the rest of the countries record the workers' freedoms index higher than 60 index points, which implies that the labor market flexibility is at a higher level compared to the world average.

LITERATURE REVIEW

The decoupling phenomenon between labor productivity and workers' compensation has been studied extensively since the mid-1970s, with early explorations by J. Alterman (1971) and G. Sleight Lynn and W. Gruebele James (1973) highlighting this trend. This period marked a significant divergence between labor productivity and workers' compensation, prompting economists to delve into the underlying causes and consequences. J. A. Mincer's analysis in 1974 emphasized the causal relationship between human capital growth, labor productivity, and wages, indicating that increased human capital led to higher wages. Research studies leading up to the Great Recession in 2008, such as F. Roth and A. E. Thum (2013) and A. M. Stansbury and L. Summers (2018), suggest a weakening link between labor productivity and wages. For instance, P. Oreopoulos (2007) found that education investments in Greece did not increase labor productivity, simultaneously leading to delays in wage growth. J. Konings and S. Vanormelingen (2015) studied the correlation between labor

productivity and wage disparities at the individual company level, revealing a positive relationship. D. Nikulin (2015) analyzed the wage, labor productivity, and unemployment trends in the new EU member states, indicating significant differences among the countries. Additionally, empirical studies have confirmed a positive relationship between minimum wage increases and labor productivity, as shown by M. F. Owens and J. H. Kagel (2010). However, conflicting conclusions were drawn by N. T. Dickerson (2009) and R. Riley and C. R. Bondibene (2017), suggesting no significant relationship between minimum wage increases and labor investment. Furthermore, the augmentation of minimum wages does not effectively spur economic growth and, in times of economic downturns, may adversely affect vulnerable workers (Neumark & Wascher, 2010; Sabia, 2015).

E. Brynjolfsson and A. McAfee (2014) discussed the Great Decoupling between labor productivity, workers' earnings, and unemployment since the 1970s, attributing it to technological advancements. A. M. Stansbury and L. Summers (2018) analyzed the impact of productivity improvement on workers' wages, showing a positive association but indicating a decoupling trend. The significance of the decoupling phenomenon extends to the Western and Eastern European countries, with studies such as B. Trenovski, D. Gligorić, K. Kozheski and G. Merdzan (2023) highlighting the relationship between labor productivity and workers' compensation. Moreover, studies by V. Bucevska and K. Kozheski (2022) in Southeastern European countries emphasize the correlation between the rising GDP, labor productivity, and reduced youth unemployment. The high rate of NEET youth in the Western Balkan countries underscores the need to address youth disengagement from the labor market or education (Bojadjieva, Cvetanoska, Kozheski, Mujčinović & Gašparović, 2022). Overall, these studies shed light on the complex dynamics between labor productivity, wages, and economic growth, highlighting the need for further research and policy interventions so as to address the challenges posed by the decoupling phenomenon in various contexts.

DATA AND METHODOLOGY

This section outlines the methodology employed to assess the impact of the individual macroeconomic and institutional variables, namely the GNI *per capita*, the labor freedom index, the statutory minimum wage, and the unemployment rate on labor productivity. The analysis focuses on the selected countries from Southern and Eastern Europe, covering the period from 2013 to 2021. The countries under analysis, namely Albania, Serbia, North Macedonia, Bulgaria, Croatia, and Romania, are categorized into two distinct groups. The first group comprises the candidate countries for the EU membership and the participants in the “Open Balkan” initiative - Albania, Serbia, and North Macedonia. The second group encompasses the last EU entrants - Bulgaria, Romania, and Croatia. A segment of the empirical research delves into the developed countries of the EU (Artige & Nicolini, 2006), as well as the countries in both

western and eastern Europe (Trenovski *et al*, 2023; Borović, Tomaš & Trivić, 2023). Additionally, there are empirical studies investigating labor productivity between the USA and Europe (Blanchard, 2004), with some works concentrating on the economic perspectives of the Balkan countries (Sergi, 2001). The examination of the economic perspectives and characteristics of the countries included in the “Open Balkan” initiative, particularly focusing on analyzing the gap with the EU and exploring possibilities for its reduction, constitutes the subject matter of the analysis in the empirical literature (Kulo & Novikau, 2023). The classification of countries into those participating in the “Open Balkan” initiative and the most recent EU entrants in Southeastern Europe will serve as a valuable addition to the previously conducted empirical analyses that center on the labor market performance, specifically emphasizing labor productivity. Table 2 provides the explanation of the variables used in the analysis.

Table 2 The description of the variables

Variable	Explanation	Source
Labor Productivity/ GDP per person employed (constant 2017 PPP \$)	Labor productivity is a key measure of economic performance. Labor productivity is a fundamental metric that quantifies the efficiency and effectiveness of the utilization of labor in the production process. It is defined as the ratio of the total output generated to the input of labor employed in the production of goods or services. The utilization of labor productivity as an indicator can facilitate the development of effective labor market policies and enable the monitoring of their outcomes.	World Bank (2022)
GNI <i>per capita</i> , PPP (current international \$)	Gross National Income (GNI) <i>per capita</i> is calculated as the aggregate value added by all resident producers, inclusive of any product taxes (excluding subsidies) not incorporated in the valuation of the output, in addition to the net receipts of primary income (encompassing compensation for employees and property income) from abroad. This total is then divided by the midyear population.	World Bank (2022)
Labor Freedom Index	Labor freedom encompasses the capacity for both workers and businesses to enter into employment contracts, to engage in their rights within the context of an employment relationship, and, for companies, the freedom to freely hire or terminate workers based on operational requirements. The concept of labor freedom involves the ability of individuals to secure and maintain employment in accordance with their preferences within a chosen work environment.	The Heritage Foundation (2022)
Statutory nominal gross monthly minimum wage (2017 PPP \$)	Minimum wages refer to the lowest compensation that an employer is obligated to pay wage-earners for the services rendered within a specified time frame, and this remuneration cannot be diminished through either collective agreements or individual contracts.	European Commission (2023)
Unemployment, total (% of total labor force)	The unemployment rate is one of the basic indicators of the performance of the labor market in a national economy. Unemployment is the percentage of the people in the labor force who are unemployed. Therefore, identifying those in the labor force is necessary to determine the unemployment rate. A person who is employed or unemployed is considered to be a part of the labor force.	World Bank (2022)

Source: Authors

In order to determine the (non)stationarity of the panel or longitudinal data, the integrative characteristics of the used variables were tested using the LLC test. The null hypothesis of this test is that the variables that have a unit root are nonstationary. Based on the results of the LLC test conducted for the integrative characteristics of the variables in the model of this research study, it can also be said that, except for the minimum wage variable, all the variables are stationary in this model (Table 3). During that differentiation level, the statutory minimum wage is considered as nonstationary according to the additional test for integrative characteristics, but becomes stationary after the first differentiation.

A panel regression between labor productivity as the dependent variable, on the one hand, and changes in the statutory minimum wage, the labor freedom index, the GNI *per capita*, and the unemployment rate as the independent variables is conducted in the case of the two groups of countries (the “Open Balkan” countries and the last Southeastern EU entrants). This is done not only in order to analyze the determinants of labor productivity, their impact, but also to make a comparative analysis of the perspectives of the labor market in these two groups of countries. The econometric panel analysis was conducted using the Panel EGLS (period random effects) model. In order to analyze the justification for using the random effects model (random effects model), a Lagrange Multiplier test (LM test) was conducted. Along with the consideration of the number of cross-sections and independent variables, the results of the LM

test indicate that the inclusion of cross-section fixed effects and period random effects is justified for parameter estimation. To account for the rise in the overall price level in the preceding period and focus on the genuine increase in labor productivity, all the variables under examination are presented in USD, adjusted for the purchasing power parity. Based on the review of the relevant empirical literature, the following hypotheses regarding macroeconomic and institutional determinants on labor productivity are posited:

- H1: The GNI *per capita* has a significant impact on determining labor productivity.
- H2: The labor freedom index is a significant determinant of labor productivity.
- H3: The statutory minimum wage has a statistically significant influence on labor productivity.
- H4: The unemployment rate represents a significant determinant of labor productivity.

For this purpose, two mutually independent panel analyses are conducted for the individual groups of countries. The estimated equations are given below:

$$\gamma_{it} = \mu + \beta_1 \cdot x_{it} + \beta_2 \cdot z_{it} + \beta_3 \cdot i_{it} + \beta_4 \cdot j_{it} + \alpha_i + \varepsilon$$

$$i=1,2,\dots,N; t=1,2,\dots,T \quad (1)$$

where μ represents the common constant term of all the units under examination and the random effect for each individual unit. It should be noted that, in this model, it is assumed that α_i are the independently and

Table 3 The results of the integrative characteristics of the used variables - the order of integration (LLC test)

Variable	Labor Freedom Index	Statutory minimum wage	Unemployment rate	GNI <i>per capita</i>
SEE EU countries (Group 1)	Level [-6.47923] (0.0000)	Level [-2.93399] (0.0017)	Level [-4.21102] (0.0000)	Level [-3.22295] (0.0006)
“Open Balkan” countries (Group 2)	Level [-6.24753] (0.0000)	1 st difference [-3.15699] (0.0008)	Level [-5.73179] (0.0000)	Level [-1.46079] (0.0720)

Notes: The coefficients are presented in brackets, and p-values in the parentheses.

Source: Authors

identically distributed variables with the mean 0 and the variation δ , while β_1 is an independent parameter that is subjected to analysis. The β_1 parameter aims to show the increase in labor productivity per unit increase in the legal minimum wage, that is to say it provides an account of the marginal dependence between the individual variables. Pursuant to said, it should be stated that the logarithmic value for both variables is used in the model. Namely, the model measures the percentage change in labor productivity as a result of a 1% change in the level of the legal minimum wage. A straightforward approach for the examination of the panel data involves the estimation of pooled regression. The combination of cross-sectional fixed effects and period random effects in pooled regression allows for a flexible modeling approach. The fixed effects address the individual-specific differences, whereas the random effects capture the unobserved time-specific factors that are not constant across all the entities. The panel EGLS pooled regression with cross-sectional fixed effects and random period effects is a powerful method to control individual-specific characteristics and time-specific factors, providing the robust analysis of such panel data with potential heterogeneity across entities and over time.

DISCUSSION OF THE RESULTS

Based on the findings the regression analysis for the Southeastern countries that are the latest entrants to the EU, it can be inferred that labor productivity in this cohort is significantly influenced by gross national income *per capita*, the labor freedom index, the minimum wage, and the unemployment rate. These variables collectively play a substantial role in shaping the productivity landscape in these countries. The results underscore the multifaceted nature of the factors contributing to labor productivity, ranging from the economic indicators such as the GNI *per capita* to the institutional aspects such as labor freedom and the minimum wage policies. The results reveal an inverse relationship between the statutory minimum wage and the labor freedom index, both of which exert discernible impacts on the

dynamics of labor productivity. Given the fact that the statutory minimum wage is part of the components that influence the formation of the value of the labor freedom index, the inverse interdependence seems quite logical and justified. Hence, the increase in workers' freedoms analyzed through the prism of increasing workers' flexibility and reducing legal legislation, affects the decline of labor productivity. In this direction, the increase in the statutory minimum wage has a negative impact on the movement of labor productivity within the last EU entrants (Bulgaria, Romania, and Croatia). In the previous period, there was a significant increase in the statutory minimum wage, which was parallelly followed by an insignificant increase and stagnant labor productivity growth rates in these countries. The increase in the statutory minimum wage signifies a noteworthy increase in a company's expenses, especially within the sectors such as personal services, tourism, manufacturing, and retail trade, which collectively employ a substantial portion of the workforce in these countries. This, in turn, contributes to a further decline in labor productivity.

Among economic dynamics, there is a positive correlation between the increase in gross national income and the increase in labor productivity. Further increases in labor productivity are influenced by the growth of gross national income *per capita*. The analysis also encompasses the level of unemployment, with a focus on examining the changes it induces and its impact on alterations in labor productivity. Nevertheless, while there is an observable positive and statistically significant impact on labor productivity, its intensity is relatively weak. Consequently, it can be inferred that the rise in unemployment does not exert a substantial influence on the overall increase in labor productivity. Hence, there is a noteworthy prevalence of unproductive employment in these countries, particularly in the "Open Balkan" initiative countries. In this context, it is noteworthy to observe a trend in these countries where there was a simultaneous increase in employment and a decrease in labor productivity during the preceding period. Therefore, positing the thesis of an upswing in unproductive employment, characterized by a rise in employment coupled with a concomitant decline in labor productivity, appears to be justified.

Moreover, within the countries of the Open Balkan initiative (Albania, North Macedonia, and Serbia), the outcomes of the regression analysis (Table 4) substantiate the hypothesis regarding the statistically significant impact of gross national income *per capita*, the labor freedom index, the statutory minimum wage, and the level of unemployment on the determination of labor productivity. Certainly, even within this group of countries, a statistically significant and negative causal relationship is evident between the labor freedom index and the improvement of labor productivity. Specifically, the findings indicate a reduction in labor productivity by 0.003% with each one-point increase in the labor freedom index. Hence, although it is a matter of weak causality with low intensity, it should be emphasized that in the case of these countries, the increase in the flexibility of workers and the decrease in the rigidity of legal legislation have a negative impact on the determination of labor productivity. In this direction, because an above-average increase in the legal minimum wage was realized in these countries in the previous period, it is considered valuable to analyze its impact in determining labor productivity. Hence, the results show that the increase in the legal minimum wage positively impacts labor productivity in this group of countries (Albania, North Macedonia, and Serbia). An increase in the statutory minimum wage of 1% contributes to an increase in labor productivity of 0.24%. Furthermore, statistically

significant, positive causality is also observed in the increase of the gross national income *per capita* and the level of unemployment. Table 5 summarizes the main empirical findings.

CONCLUSION

This research study examined the level of labor productivity among the countries of the “Open Balkan” initiative (Albania, Serbia, and North Macedonia) and Southeastern Europe’s latest EU entrants (Bulgaria, Romania, and Croatia). Additionally, it explored the macroeconomic and institutional determinants influencing labor productivity, including the GNI *per capita*, the unemployment rate, the statutory minimum wage, and the labor freedom index.

The results indicate a discernible slowdown in the growth rates of labor productivity over the past decade in Southern and Eastern European countries. This deceleration, attributed to the factors such as the repercussions of the 2008-2009 recession, the 2013 debt crisis, and demographic changes, hampers progress towards achieving comparable levels of efficiency with the highly developed European nations. Despite the overall positive trend in labor productivity, the current pace of growth remains insufficient to close the gap with Western Europe. These countries continue

Table 4 The regression analysis results

Variable	Dependent variable: Labor Productivity			
	Country Group 1: Bulgaria, Romania, Croatia		Country Group 2: Albania, North Macedonia, Serbia	
	Coefficient	Prob.	Coefficient	Prob.
c	4.182782	0.0001	7.623215	0.0000
LOG(GNI <i>per capita</i>)	0.684502	0.0000	0.148736	0.4126
Labor Freedom	0.002623	0.0536	-0.004331	0.0323
LOG(Minimum Wage(1))	-0.058562	0.3504	0.240247	0.0302
Unemployment	0.014075	0.0000	0.015235	0.0002
R-squared	0.985430		0.988203	
Adjusted R-squared	0.981059		0.984039	
Number of Observations	24		27	

Source: Authors

Table 5 The summary of the main findings

Hypothesis	Hypothesis is supported	Implication
H1	The first hypothesis finds support in the case of Southeastern European (SEE) last EU entrants (Bulgaria, Romania, and Croatia), but it is not supported in the countries of the “Open Balkan” initiative (Albania, Serbia, and North Macedonia).	The level of economic development in Southeastern European (SEE) countries provides room for additional increases in labor productivity. A higher level of economic development signifies a robust foundation for intensive technological progress, the migration of workers to the industries generating greater added value, and substantial involvement in the tertiary industry, facilitating the establishment and maintenance of the elevated levels of labor productivity. In contrast, the countries of the “Open Balkan” initiative still allocate a notable share of production to traditional sectors, primarily the agricultural sector. Some industries in these countries lack sufficient technological intensification of production, limiting opportunities for more robust growth rates in labor productivity.
H2	The second hypothesis finds support in both groups of countries.	The labor freedom index is a relevant predictor of labor productivity in both groups of countries. However, on the example of the SEE last EU entrants, the labor freedom index has a statistically significant and positive impact on labor productivity. The labor freedom index comprises six equally weighted quantitative factors, each accounting for one-sixth of the overall labor freedom score. These factors, including the ratio of minimum wage to average value added per worker, hindrance to hiring additional workers, the rigidity of working hours, the difficulty of firing redundant employees, the legally mandated notice period, and the mandatory severance pay, are regarded as the positive determinants of labor productivity. A lower ratio of the minimum wage to value added, reduced hindrance to hiring, flexibility in working hours, the ease of workforce adjustments, shorter notice periods, and the lesser mandatory severance pay are associated with a more favorable environment for labor productivity. The equal weighting underscores their collective significance in evaluating and fostering labor market flexibility and efficiency, thereby contributing positively to overall labor productivity. In the context of the countries belonging to the “Open Balkan” initiative group, the observed relationship suggests that the labor freedom index exerts a negative influence on labor productivity. This implies that, as the labor freedom index increases indicating a higher degree of labor market regulation and potential constraints, there is a corresponding adverse impact on labor productivity. The negative influence may be attributed to the factors such as increased hindrance to hiring, the rigidity of working hours, challenges in workforce adjustments, longer notice periods, and higher mandatory severance pay, all of which contribute to a less flexible and adaptable labor market. This finding underscores the importance of considering the intricate dynamics between the labor market regulations and their implications for productivity in the specific context of the “Open Balkan” initiative countries.
H3	The third hypothesis finds support in the countries belonging to the “Open Balkan” initiative (Albania, Serbia, and North Macedonia).	The findings indicate that the statutory minimum wage has a noticeable impact on labor productivity in these countries. This observation carries significant implications, encompassing potential adjustments in the wage structure that may affect various segments of the workforce. Moreover, there could be notable changes in the cost of labor for businesses, influencing their operational dynamics. The implications extend to alterations in the overall economic landscape, reflecting the intricate interplay between statutory minimum wage policies and their consequences for both workers and the broader economy.
H4	The second hypothesis finds support in both groups of countries.	Variations in the unemployment rate exert a considerable influence on the overall efficiency and productivity of the labor market in these nations. The dynamism of the unemployment rate plays a pivotal role in shaping the workforce landscape, affecting not only the availability of the skilled and unskilled labor force but also influencing the overall utilization of human capital. High levels of unemployment may lead to the underutilization of available skills, hindering the productive capacity of the labor force. Conversely, lower unemployment rates often coincide with enhanced efficiency, as a more fully utilized workforce contributes to increased productivity and the economic output.

Source: Authors

to lag behind Western Europe in terms of efficiency, with a persistent disparity in both productivity and income levels. It is imperative for these countries to prioritize the initiatives that enhance productivity and efficiency, fostering a successful catch-up in productivity to align with international standards and ensure sustained economic development.

In the aftermath of substantial disruptions to working hours, primarily attributed to the COVID-19 pandemic, workers have experienced significant income declines in the recent period. Across the analyzed countries, labor income in 2020 witnessed an average decrease of 10% compared to the levels recorded in 2019. The pervasive impact of the pandemic on various sectors and industries has resulted in widespread economic challenges, leading to diminished earning potential for the workforce. Workers situated within the contingent receiving the statutory minimum wage, specifically those positioned in the first quartile of the wage distribution, have suffered a disproportionate impact from the repercussions of the COVID-19 pandemic. These individuals face the looming prospect of struggling to meet their basic needs. In the period preceding the crisis, there had been a discernible reduction in income inequality within the analyzed countries, particularly in the incomes of workers with lower earnings, influenced in part by policies such as increases in the statutory minimum wage. Regrettably, the onset of the COVID-19 pandemic has undermined these positive trends, contributing to a reversal in the trajectory of narrowing wage disparities and a simultaneous downturn in both the GDP and labor productivity.

In the preceding period, particularly in the years leading to the crisis, the statutory minimum wage in the countries under analysis has witnessed an above-average increase. This trend is notably pronounced in Bulgaria and Romania, where the statutory minimum wage has seen multiple increments. However, recent disruptions in economic flows, especially within the labor market, suggest that future adjustments to the statutory minimum wage should be approached with caution. The involvement of social partners and engaging in social dialogue, based on objective criteria and analyses, is crucial. Criteria for adjusting

the minimum wage should account for workers' and their families' needs, as well as economic factors. While it is essential to ensure that low-paid workers can maintain their living standard by adjusting wages so as to compensate for rising inflation, implementing additional increases in the minimum wage may pose challenges for some countries. The risks associated with further increases in the statutory minimum wage are multifaceted. Setting the legal minimum wage at a high level, particularly when the relative ratio to average (median) wages is elevated, carries the objective risk of disrupting the labor market balance. This could lead to some workers either leaving their workplaces or experiencing reduced working hours. Moreover, in addition to the existing challenge of low labor productivity in these countries, the repercussions of the COVID-19 pandemic further contribute to a decline in labor productivity. This raises a significant question of whether and to what extent a further increase in the legal minimum wage will compel companies to optimize their work processes. Consequently, employment and labor productivity are contingent on adjustments to the level and scope of the legal minimum wage in the analyzed countries, potentially facing adverse effects from additional increases in some nations.

There are minor differences in the labor freedom index among the individual groups of countries, but there is a significant contrast between the two analyzed groups, notably with Albania and Croatia displaying distinctiveness. These countries exhibit a notable level of labor market regulation, akin to the recent EU entrants, influenced by the factors such as low trade union organization and worker qualifications. In contrast to the Western European economies with high labor productivity and low unemployment, further labor market liberalization is seen as beneficial for competition and growth. However, the findings of both groups of countries suggest that excessive flexibility, reduced barriers to market entry, and legal rigidities may negatively affect labor productivity. Therefore, considering labor productivity, the institutional capacity, and structural imbalances, some degree of regulation is deemed to be necessary and beneficial for companies and workers alike. Future labor market reforms should be

tailored to each country's economic and institutional capabilities. In Southeastern European countries, the labor market liberalization is essential for fostering new job opportunities and wealth creation amidst globalization and demographic changes. This underscores the need for change, emphasizing that improved social conditions and labor market flexibility may coexist harmoniously.

The analysis of the labor productivity determinants provides valuable insights into the factors influencing labor productivity in Southeastern European (SEE) countries, with a particular focus on the Southeastern European (SEE) last EU entrants (Bulgaria, Romania, and Croatia) and the "Open Balkan" initiative countries (Albania, Serbia, and North Macedonia). The findings support the first hypothesis, emphasizing the fact that the level of economic development in the SEE countries, especially among the SEE last EU entrants, allows for additional increases in labor productivity. The second hypothesis, supported in both groups, underscores the crucial role of the labor freedom index as a determinant of labor productivity, with implications varying between the two groups. The third hypothesis finds support in the "Open Balkan" initiative countries, indicating a discernible impact of the statutory minimum wage on labor productivity, with potential far-reaching consequences for wage structures and the overall economic landscape. Finally, the fourth hypothesis, supported in both groups, highlights the considerable influence of variations in the unemployment rate on the efficiency and productivity of the labor market, emphasizing the critical role of the workforce dynamics in shaping overall productivity.

The economic crisis primarily caused by the COVID-19 pandemic, supplemented by the military crisis in Ukraine, as well as the crisis that occurs as a lack and increase in the price of energy, has a direct impact on hindering the increase in labor productivity. Also, the expectations of business agents, that is to say the perceptions about the duration and extent of the crisis, are still being determined, which will further contribute to the slowdown of economic growth. Hence, considering the objective need to improve labor productivity, on the one hand, and workers' earnings,

on the other, additional active policies on the labor market in these countries are necessary, especially those that will contribute to the establishment and retention of productive employment. Furthermore, it will affect the establishment of the balance in the labor market at a higher level.

The main limitation of this research study is due to a lack of data, which prevented the inclusion of the other relevant microeconomic determinants of labor productivity. Additionally, the constrained timeframe serves as yet another limitation, particularly so given the availability of the data on the statutory minimum wage over a relatively short period. The second limitation concerns the optimality of comparing results between the groups of countries, especially considering their intensive economic relations. Further research could focus on the analysis of additional microeconomic determinants, facilitating a comparison of labor productivity levels and the extent of economic development convergence across countries.

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THE RELATIONSHIP BETWEEN RUSSIA'S AND TURKEY'S SECTORAL STOCK MARKETS: THE EFFECTS OF THE RUSSIA-UKRAINE CONFLICT

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In this paper, the effects of the Russia-Ukraine conflict on the stock markets of Turkey (BIST), which has strong economic relations with both countries, and Russia (MOEX), one of the parties to the conflict, are investigated. The relationship between the stock indices for the overlapping sectors of both stock markets (namely the consumption, electricity, financial, oil and telecom sectors) are examined using the Fourier volatility spillover and Fourier-Granger causality tests. The findings of the paper indicate that there is a bidirectional causality relationship between both countries in the electricity sector, and a causality relationship between BIST and MOEX in the telecom sector. In addition, there is a bidirectional volatility spillover in the electricity, finance and oil sectors between the stock markets of the two countries. However, there is also a volatility spillover from MOEX to BIST in the food sector. The COVID-19 epidemic and the Russia-Ukraine war can be quoted as the reasons for this situation. This volatility spillover between the countries seems likely to harm the Turkish economy in the case of possible negative developments during the war. The results obtained in this study provide valuable information for portfolio diversification to the investors who will invest in these sectors as long as the war conditions continue.

Keywords: Ukraine-Russia conflict, Fourier volatility spillover, Fourier-Granger causality, MOEX, BIST

JEL Classification: E44, F51

INTRODUCTION

Globalization has increased the rapidly growing interplay between financial markets. The shocks of

the financial market in one country cause such price changes in that country which can also influence foreign financial markets (Jebran & Iqbal, 2016; Afolabi, Olanrewaju & Adekunle, 2022). In addition to financial integration, an increase in electronic communication, the liberalization of capital controls, financial innovation and increased political and

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economic integration are also relevant (Berben & Jensen, 2005). This effect appears in the literature as a volatility spillover.

A volatility spillover is defined as the process which causes the volatility resulting from a shock in one market to potentially transfer onto another. This situation can also be expressed as a transfer of financial events from one market to another or the effect of financial variables in the economy on different variables (Darrat & Benkato, 2003). Factors such as the liberalization of capital movements, the internationalization of stock markets, direct and indirect (portfolio) investments make financial markets interdependent and increase volatility spillovers between such markets (Habiba, Peilong, Zhang & Hamid, 2020).

Making sense of the sources of volatility in financial markets is important in pricing domestic financial assets, implementing global hedging strategies, and making asset allocation decisions (Ng, 2000; Laborda & Olmo, 2021; Mensi, Al Rababa'a, Alomari, Vo & Kang, 2022; Vidal-Llana, Uribe & Guillén, 2023). For policymakers, a volatility spillover is important in terms of ensuring the continuity of financial institutions, the efficiency and functioning of financial markets (Mwambulu & Xianzhi, 2016).

Events such as wars, occupations and political conflicts between countries affect almost every country to different extents under the influence of globalization. However, the academic literature illustrates that the impact of these negative developments on financial institutions has received little attention. The occupation of Ukraine by Russia on February 24, 2022, which is the main subject matter of this paper, caused turmoil on stock markets. Early papers on the subject provided the evidence of how global financial institutions responded to the invasion (Beraich, Amzile, Laamire, Zirari & Fadali, 2022; Gaio, Stefanelli, Pimenta, Bonacim & Gatsios, 2022; Yousaf, Patel & Yarovaya, 2022; Ahmed, Hasan & Kamal, 2022; Lo, Marcelin, Bass'ene & S'ene, 2022). Moscow's MOEX index fell nearly 9 percent in the week following the conflict. Not only the Russian stock market (MOEX), but the important stock market indices such as the

MSCI World and S&P 500 as well recorded significant losses globally (Izzeldin, Muradoglu, Pappas, Petropoulou & Sivaprasad, 2023). It is expected that the conflict will have a deeper impact on the countries with strong commercial and financial ties, especially with Russia. In this context, this paper is focused on the volatility spillover between specific sectors in Russia and Turkey. Accordingly, the following research question is empirically examined:

Is there a causality relationship between the Turkish and Russian stock markets for the consumption, electricity, finance, oil and telecom sectors during the observed period of the Russia-Ukraine conflict?

Economic cooperation between Russia and Turkey covers especially the trade, tourism, construction and energy sectors. The role of the two countries in both regional and global terms is important. Russia is the sixth largest economy in the world and Turkey is the 13th largest economy in the world (Masumova, 2018), Russia being a representative of the BRICS group and Turkey being a promising power close to this group. Compared to the 1990s, there is some degree of interdependence between the two countries. Among the reasons for the development of these relations, the general resemblance of the foreign policies of both countries with the 2000s comes to the fore (Öniş & Yılmaz, 2016).

On the other hand, speaking politically and financially, Turkey and Russia are among the leading countries in the world. Especially in recent years, economic and political processes in the Turkish-Russian relations have attracted attention. The foreign policies pursued by both countries in the last two decades have also been important. This common policy is also reflected in the volume of trade and finance between the countries.

The aim of this paper is to analyze the interdependencies between the stock market sector indices in this period of the great uncertainty created by the conflict. The global energy sector emerges as a potential shock multiplier due to the connection of oil prices with the other economic sectors (Laborda & Olmo, 2021). To the best of our knowledge, there is no research that investigates the effect of this conflict on

sectoral interdependence with Turkey, an important partner of Russia's. Considering the importance of both countries in the context of developing countries and that sectoral interdependence in stock markets is especially important for policymakers and portfolio managers. It will help portfolio managers to make effective decisions on portfolio diversification in this process. Links between economic sectors are known to affect portfolio distribution (Laborda & Olmo, 2021).

The main goal of the paper is to empirically examine whether there are a causal relationship and a volatility spillover among a broad set of sectors. Testing this relationship and its spread will be a reference that can be used by the policymakers and market actors of both countries. It is especially important for investors to know whether there is a causal relationship between which sectors or which volatility spillover comes from one market to another. On the other hand, considering the importance of the examined sectors not only for the two countries, but also for the world financial markets, the value of the findings increases even more.

The paper is organized in sections. In the second section, a literature review is provided, only to be followed by summarizing the data set and the methodology used in the third section. Finally, the findings obtained from the empirical analysis are presented in the conclusion.

PREVIOUS EMPIRICAL STUDIES

Studies testing volatility spillover are of great interest in the academic literature. In addition, the model group based on the ARCH/GARCH model has often been preferred in measuring volatility between variables. Multivariate GARCH models such as CCC-MGARCH, DCC-MGARCH, BEKK-MGARCH are used for the volatility dependence and spillover relationships between the time series of markets.

Previous studies mainly focused on the volatility spillover between the markets of two countries. Thus, it can be concluded that the studies conducted on the

basis of country groups are limited. So far, studies on the subject have tried to understand international spillovers and market interconnectedness between markets. These studies used a very high level of clustering. Therefore, national and sectoral indices are seen to have come to the fore in those studies.

This research focuses on the global repercussions and interconnectedness among markets. Prior studies predominantly employed a sophisticated clustering approach. Consequently, the emphasis in these studies tends to shift towards national and sector-specific indices (Hammoudeha, Yuana & McAleer, 2009; Arouri, Jouini & Nguyen, 2012; Acemoglu, Carvalho, Ozdaglar & Tahbaz-Salehi, 2012; Wang & Wang, 2019; Laborda & Olmo, 2021; Mensi *et al*, 2022; Izzeldin *et al*, 2023; Vidal-Llana *et al*, 2023).

Prior studies are mainly related to developed markets. A. Rua and L. Nunes (2009) used Germany, Japan, the UK and the US as sample. T. C. Chiang, L. Lao and Q. Xue (2016) used China's, Hong Kong, Korean, Japanese and US stock markets. In addition to these papers, some papers used developed and emerging markets together. For example, K. Phylaktis and L. Xia (2009) investigated the regions of Europe, Asia, and Latin America. Similarly, R. Brooks and M. D. Negro (2006) used data for developed and emerging markets in 20 countries.

D. Acemoglu *et al* (2012) explored how sector-specific shocks can cause aggregate fluctuations in the presence of intersectoral input-output linkages. In this this paper, the energy (metals and mining, oil - gas), technology (telecom, software), bank and insurance, and cyclical sectors (retail) are analyzed. The volatility spillover among the five-sector index in the Russian (MOEX) and Turkish (BIST) stock markets are investigated. The sectors that stand out and are discussed in both countries' stock markets on the basis of the index are the consumption, electricity, financial, oil and telecom sectors.

Considering the results of these studies, a conclusion can be drawn that the findings are different and the relationship at the sectoral level differs from one country to another. In addition, the sectors are found

not to have shown any structural change in general. S. B. Lee and K. J. Kim (1993) made an application using weekly stock market data in 12 major markets and found that there was a higher rate of contamination among the stock markets. The average weekly intermarket correlations rose from 0.23 to 0.39 before the crash of 1987. S. Calvo and C. Reinhart (1996) focus on the emerging markets during the 1994 Mexican peso crisis and find increased correlations between the stock prices and the Brady bonds. R. Kizys and C. Pierdzioch (2009) found the evidence of the increased international joint movement of stock returns since the mid-1990s among the leading developed countries.

Regarding the Russia-Ukraine conflict, M. Donadelli and A. Paradiso (2014) conducted a study for the Asian, Eastern European, and Latin American stock markets; E. Nivorozhkin and G. Castogneto-Gissey (2016) for the Russian Federation and global financial markets; M. Irandoust (2019) conducted a research study for the stock exchanges of the Russian Federation, Estonia, Latvia, Lithuania, Belarus and Ukraine, and R. Tajaddini and H. F. Gholipour (2023) did research in the stock markets of 83 selected countries.

O. Shnyrkov and O. Chugaiev (2023) carried out a study for the Ukrainian and EU stock markets; B. Bagchi and B. Paul (2023) did research in the G7 countries' stock markets; P. Pardal, R. T. Dias, N. Teixeira and N. R. Horta (2023) conducted a study on the stock markets of Germany, USA, France, England, Italy, the Russian Federation, Japan, Canada and China; M. Babar, H. Ahmad and I. Yousaf (2023) considered the stock markets of India, China, Indonesia, Argentina, Mexico, Malaysia and Korea. S. Ahmed, R. Assaf, M. R. Rahman and F. Tabassum (2023) conducted a research study on the stock markets of the 27 selected countries. The findings show that, after the Ukraine crisis of 2014, risk transfer was observed with dynamic integration between returns in the Russian stock market and the global stock markets. Additionally, there was a sharp decline in the stock exchange price index. If the efficient market hypothesis is weak, its prestige will increase for the Russian market, which is in equilibrium during the crisis. The stock markets of developing countries were also seen to be weaker than those of developed

countries. The return and volatility spillover tends to increase. The integration process of global financial markets on a country and industry basis shows heterogeneity. This situation causes investors to diversify their portfolios, evaluate risk transmission opportunities, and in the case of uncertainty, suspend investments or redirect them to other markets in different periods. As a result, risk transfer between highly interconnected and dynamically distributed global financial markets is of great importance in terms of short-term interconnectedness. Additionally, geopolitical risk indirectly caused structural change in the stock markets after the war.

M. K. Alam, M. I. Tabash, M. Billah, S. Kumar and S. Anagreh (2022) conducted a study examining the relationship between the prices of the five commodities (namely oil, gas, platinum, gold and silver) in the stock markets of the G7 and BRIC countries. Due to the ongoing crisis, a strong dynamic and hyper-connectedness was perceived between all the commodities and the entire market, the connectedness being at a high level, which provides important footnotes for policymakers to ensure regional economic integration.

A. Pretorius (2023) shows that the stock markets of 11 developed and emerging market groups and the situation of individual countries affected by the Ukraine crisis are more vulnerable in the period of instability and uncertainty. K. Sohag, R. Vasilyeva, A. Urazbaeva and V. Voytenkov (2022) tried to measure the joint mobility between the stock market synchronization of the USA, China's and the Russian Federation's markets. The connectedness degree was found to be 26.15%. Simultaneously, the US-Chinese and US-Russian stock markets have negative reactions to the GPR. However, the degree of the connectedness between the Russian-Chinese stock markets is less sensitive to the GPR. G. Malhotra, M. P. Yadav, P. Tandon and N. Sinha (2023) investigated the dynamic connectedness of their financial markets in the short term for the 10 countries that import the largest number of agricultural commodities from Russia and Ukraine. He found a dynamic connection between Iraq's, Pakistan's and Tanzania's stock markets, based on which he found that it negatively affected

the agricultural products of Turkey, Bangladesh, Pakistan, Brazil and Iraq. However, he noticed a bigger spillover among the variables in the short run than in the medium run and in the long run.

R. Dias, C. Revez, N. Horta, P. Alexandre and P. Heliodoro (2022) examine capital markets and financial contagion, showing that capital markets have mostly increased correlations. It is anticipated that investors will have difficulty in diversifying risks in this market during the periods of uncertainty in the global economy. This situation is becoming an important guide for financial markets for correct and efficient policies of achieving a sustainable economy and in-market regulations.

Regarding the Russia-Ukraine conflict, Beraich *et al* (2022) conducted a study on the US, European, and Chinese stock markets; I. Yousaf, R. Patel and L. Yarovaya (2022) carried out a research study on the G20 and the other selected stock exchanges; S. Ahmed *et al* (2022) did research in the European stock market; H. A. Mahran (2023) conducted a study on the Egyptian stock market. Additionally, Lo *et al* (2022) analyzed 73 countries dependent on Russian goods.

Considering sector-based studies, Mensi *et al* (2022) evaluated 10 sectors (information technology, energy, financial, industrial, utilities, communication services, consumer staples, healthcare, materials, and consumer discretionary) for the S&P 500. H. A. Mahran (2023) discussed education, banks, healthcare, food, information technology, real estate, industry,

resources, transportation and travel. R. Laborda and J. Olmo (2021) used energy, healthcare, biotechnology, banking and insurance, pharmaceuticals, the cyclical sector, and technology. X. Wang and Y. Wang (2019) used stock indices for 11 sectors: real estate, consumer discretionary, telecommunications services, industrial, utilities, energy, finance, consumer staples, information technology, healthcare, and Chinese stock market materials.

Unlike all these studies, this study focuses on the MOEX and BIST exchanges. Considering the importance of the examined sectors in terms of countries' economies and stock markets, this study offers a novel insight into policymakers and investors.

DATA AND METHODOLOGY

The data used in the paper consist of the daily data made up of 976 observations for the period from 2nd January 2019 to 24th November 2022. The data set of the research study covers both the COVID-19 pandemic period and the Russia-Ukraine conflict period. In this regard, the considered data originate from the consumption, electricity, financial, oil and telecom sectors. These sectors' data are compatible with each other in terms of the content in both BIST and MOEX. In other words, no exact equivalents of some indices in BIST seem to be included in MOEX, whereas some other indices in MOEX are not included

Table 1 The descriptive statistics

	BIST SECTORS					MOEX SECTORS				
	Electric	Consumer	Finance	Oil	Telecom	Electric	Consumer	Finance	Oil	Telecom
Mean	149	4252	2030	3742	1233	7292	1775	9479	7617	1893
Median	108	3720	1745	3167	1238	7462	1820	10801	8184	1906
Maximum	479	8006	4844	10600	2441	9596	2296	14638	10024	2434
Minimum	75	2963	1171	1825	808	4499	1136	5124	5117	1261
Std. Dev.	89	1347	862	1881	313	1758	372	3500	1469	344
Skewness	1.83	1.364	1.30	1.456	1.26	-0.10	-0.02	-0.04	-0.14	-0.07
Kurtosis	5.83	3.725	3.74	4.924	5.19	1.27	1.33	1.21	1.41	1.53

Source: Authors

in BIST. The sectoral data for both stock markets were obtained from the Refinitiv Eikon Database (www.eikon.refinitiv.com). In order to eliminate possible purchasing power parity effects, all the data obtained were expressed in dollars. The descriptive statistics of the data used in the paper are presented in Table 1.

In time series analysis, regime change over time is effective on the results. Therefore, the model should be preferred considering the regime changes in the series for more reliable results. This paper uses the Fourier models that consider both smooth and sharp regime changes to account for regime changes in the series. Accordingly, the Fourier-Granger causality and Fourier volatility spillover tests were used, which is one of the methods that take into account structural breaks.

In fact, the Fourier functions in time series models are based on the work of W. Enders and J. Lee (2012). These methods were subsequently used to finalize the Fourier ADF test. Regarding the subject matter, many unit root tests have been developed in the literature, one of which is the conventional ADF unit root test. Moreover, E. Zivot and D. W. K. Andrews (1992) developed structural breaks, which this test included, and this model only considers one structural break. Later on, J. Lee and M. C. Strazich's (2003) and J. L. Carrion-i-Silvestre's, D. Kim and P. Perron (2009) models were developed, respectively. These are the models that consider two and five structural breaks. In the following years, the Fourier ADF test, which takes into account both sharp and smooth transitional structural breaks, was proposed by W. Enders and J. Lee (2012). They claimed that these methods, in which structural breaks are determined *a priori*, were insufficient. The statistics for the Fourier ADF unit root test are calculated as follows:

$$y_t = y_0 + y_1 \sin\left(\frac{2\pi kt}{T}\right) + y_2 \cos\left(\frac{2\pi kt}{T}\right) + v_t \quad (1)$$

In addition to that, it was used in the cointegration and causality tests of Fourier functions (Tsong, Lee, Tsai & Hu, 2016). The Fourier-based cointegration test and the Fourier-based causality test are among the studies brought to the literature by W. Enders

and P. Jones (2016). In the above calculation, y_t is the dependent variable, y_1 and y_2 are the independent variables, T is the time dimension, \sin is the sine function, \cos is the cosine function, k is the lag length, and v_t is the error term.

In this paper, the version of the volatility spillover test developed by J. Li and W. Enders (2018) was used to account for structural breaks, which was first developed by C. M. Hafner and H. Herwartz (2006). While investigating causality in variance in their paper, J. Li and W. Enders (2018) took into account both smooth and sharp structural breaks with trigonometric functions using sines and cosines. The Lagrange multiplier (LM), which can also be used in larger-size samples, was used to perform the analysis in question. This method is based on the GARCH (1, 1) model, and C. M. Hafner and H. Herwartz (2006) estimate the model as follows:

$$\varepsilon = \xi_{it} \sqrt{\sigma^2(1 + z'_{jt}\pi)}, z_{jt} = (\varepsilon_{jt-1}^2, \sigma_{jt-1}^2) \quad (2)$$

According to this method, structural changes are not taken into account in volatility spillovers. Moreover, σ_{jt-1}^2 indicates conditional variance, ξ_{it} shows the GARCH model's standardized residual values. According to the GARCH (1, 1) model, if there is a long-term structural break between the series which cannot be taken into account by the model, then there is a possibility that the results obtained will be incorrect. In this context, J. Li and W. Enders (2018) added structural breaks to the model in question and established the structural break volatility spillover model as follows:

$$\sigma_{it}^2 = \omega_{0i} + \sum_{k=1}^n \omega_{1i,k} + \sin\left(\frac{2\pi k_i t}{T}\right) + \sum_{k=1}^n \omega_{2i,k} \cos\left(\frac{2\pi k_i t}{T}\right) + \alpha_i \varepsilon_{it-1}^2 + \beta_i \sigma_{it-1}^2 \quad (3)$$

where, T is the time dimension, \sin is the sine function, \cos is the cosine function, k is the lag length, v_t is the error term, π is 3.14, and ω is weight. The findings obtained owing to this model can account for not only severe structural breaks in the series, but also those with smooth transition structural breaks.

On the other hand, the Fourier Granger causality test was developed by W. Enders and P. Jones (2016). The reason for the development of this test is that the traditional Granger causality test performed with the vector autoregressive (VAR) model developed by C. A. Sims (1980) neglects regime changes and is often insufficient. In this test, unobservable regime change movements are determined by including A. R. Gallant's (1981) Fourier functions in the VAR model.

$$\gamma_t = \beta_0 + \gamma_{1k} \sin\left(\frac{2\pi kt}{T}\right) + \gamma_{2k} \cos\left(\frac{2\pi kt}{T}\right) + \vartheta_1 \gamma_{t-1} + \dots + \vartheta_u \gamma_{t-u} \quad (4)$$

The equation created for the test is as above. T is the time dimension, \sin is the sine function, \cos is the cosine function, k is the lag length, v_i is the error term, y_t is the dependent variable, y_1 and y_2 are the independent variables. The basic hypothesis of the Fourier-Granger causality test reads as follows, "There is no causal relationship between the series." ($H_0: \vartheta=0$).

EMPIRICAL FINDINGS

At the first stage of the analysis, the stationarity levels of the series are dealt with using the Fourier-based ADF unit root test developed by W. Enders and J. Lee (2012). All the examined series have unit roots in their level values and have a stationary structure after the first difference.

After establishing a fact that the stationarity levels are at the same level, uni- or bidirectional causality relationships between the sectors were investigated using the conventional Granger causality and Fourier-Granger causality test developed by W. Enders and P. Jones (2016). According to the results presented in Table 3 (the traditional method), no causality was found for any sector. On the other hand, the Fourier-Granger causality test demonstrates that no causality findings were found in the consumer, finance and oil sectors, and one-way causality was detected in the telecom sector from BIST to MOEX. Moreover, there is the two-way causality detected in the electricity

sector between the two indices. This situation is thought to be as is due to the intensity of the strong commercial relationships between Russia and Turkey. In this context, the possible structural breaks caused by the COVID-19 pandemic and the Russia-Ukraine war, which are included in the data subjected to the analysis carried out in the paper, were considered. Especially in the energy sector, there was an increase in energy prices due to dependence on the energy resources coming from the geographies where the conflict started. This situation changed investors' risk perception by affecting the companies operating in the energy sector on global markets. Moreover, there is causality from BIST to MOEX in the communication sector, where there are intense commercial negotiations due to the fact that these are neighboring countries.

Table 2 The Fourier ADF unit root test results

	Level	First Diff.
BIST Consumer	-3.11 (1)	-12.31 (4) ***
BIST Electric	-0.34 (1)	-15.50 (1) ***
BIST Finance	-3.45 (1)	-15.22 (4) ***
BIST Oil	-1.67 (1)	-13.63 (1) ***
BIST Telecom	-0.17 (1)	-11.49 (1) ***
MOEX Consumer	-3.27 (1)	-11.93 (1) ***
MOEX Electric	-2.84 (1)	-12.08 (3) ***
MOEX Finance	-3.14 (1)	-12.24 (1) ***
MOEX Oil	-3.11 (1)	-13.54 (5) ***
MOEX Telecom	-2.71 (4)	-22.41 (3) ***

Note: *** indicates significance with 99% confidence. The values in parentheses indicate the Fourier number.

Source: Authors

Following the causality test, the effect of the volatility spillover was investigated between the Turkish and Russian markets on a sectoral basis. Accordingly, the method that was applied was first developed by C. M. Hafner and H. Herwartz (2006) and does not take into account structural breaks in variance. Following this, the Fourier-based method was used, which can consider smooth transition structural breaks in volatility using the trigonometric functions

Table 3 The conventional Granger causality and Fourier-Granger causality test results

Sector	Conventional Granger Causality		Fourier-Granger Causality	
	BIST → MOEX	MOEX → BIST	BIST → MOEX	MOEX → BIST
Consumer	0.08 (0.76)	0.65 (0.41)	2.374 (0.125)	0.243 (0.637)
Electricity	0.01 (0.97)	0.01 (0.96)	5.199 (0.039)**	5.551 (0.074)*
Financial	0.03 (0.87)	1.22 (0.27)	0.131 (0.695)	0.461 (0.501)
Oil	2.06 (0.15)	0.05 (0.88)	1.291 (0.449)	1.564 (0.445)
Telecom	0.47 (0.49)	1.40 (0.23)	3.425 (0.084)*	0.417 (0.509)

Note: ** and * indicate significance with 95% and 90% confidence, respectively. The values in parentheses indicate significance.

Source: Authors

Table 4 The results of the conventional volatility spillover and Fourier volatility spillover tests

Sector	Conventional Volatility Spillover		Fourier Volatility Spillover	
	BIST → MOEX	MOEX → BIST	BIST → MOEX	MOEX → BIST
Consumer	0.313 (0.85)	1.198 (0.55)	3.77 (0.15)	8.703 (0.012)**
Electricity	0.776 (0.67)	1.247 (0.54)	10.736 (0.00)***	9.699 (0.00)***
Financial	6.995 (0.03)**	1.418 (0.49)	30.812 (0.00)***	11.826 (0.00)***
Oil	0.584 (0.75)	1.971 (0.37)	8.574 (0.013)**	4.683 (0.09)*
Telecom	0.334 (0.84)	1.576 (0.45)	4.356 (0.11)	4.246 (0.11)

Notes: ***, ** and * indicate significance with 99%, 95% and 90% confidence, respectively. The values in parentheses indicate significance.

Source: Authors

developed by J. Li and W. Enders (2018). The obtained findings are given in Table 4; according to the C. M. Hafner and H. Herwartz (2006) method, the volatility spillover from BIST to MOEX was determined only in the financial sector. In the results obtained according to the Fourier volatility spillover method of J. Li and W. Enders (2018), causality was found in bidirectional volatility in the electricity, financial, and oil sectors. The findings show that causality in the variance could not be determined in the conventional C. M. Hafner and H. Herwartz (2006) method, since structural breaks are not taken into account. Thus, performing the analysis by taking into consideration the structural breaks revealed the fact that there were significant differences in the results obtained. In terms of the causality tests, the relationships that are not very strong are seen as in the volatility spillover test. The COVID-19 epidemic and the Russia-Ukraine war can be quoted as the reasons for this situation. The fact that there are causal relationships in the

electricity and financial sectors, and especially in the oil sector, where Russia distributes gas and where there are strong ties between Russia and Turkey, meets the expectations. This volatility spillover between the countries seems likely to harm the Turkish economy in the case of a possible negative development regarding the war.

CONCLUSION

Since the 1980s, liberalization movements in the world and innovations in financial systems have significantly been influencing national economies. The fact that information is accessible more easily and at a lower cost, along with technological progress, has enabled the use of information more effectively, and many financial products have developed with respect to risk and return expectations. The diversity of financial products has broadened risk preferences

on the one hand, whereas, on the other, the number of participants has increased and that has led to market growth. Thus, the financial systems of all countries have become interconnected. This situation has necessitated not being independent from the financial dynamics in other countries' markets while making investment decisions for the country's economy on financial markets. In addition to that, not only economic but also the war and natural disasters that the world is being faced with today affect all global markets. Considering many different sectors of all financial markets, sectoral impact shocks will also be different. In general, this situation can be understood on the examples of raw materials and energy provided from the countries where the war broke out.

The recent conflict between Russia and Ukraine is one of these examples. The events that were effective on the global markets had an impact on both energy prices and the prices of financial assets considered as safe havens. This situation also found a response in the academic literature, and current studies have been carried out in the field. This paper is focused on how the war interacted with different sectors. Accordingly, the effects of the war crisis on the stock market subsectors were analyzed as well.

According to the findings obtained in the paper, bidirectional causality relationships were found between the two countries in the electricity sector and a causality relationship was found from BIST to MOEX in the telecom sector. In addition, there is a mutual volatility spillover between the stock markets of the two countries in the electricity, financial and oil sectors. In the food sector, a volatility spillover from MOEX to BIST was detected. Finally, strong relationships were found between the two countries by both the Fourier-Granger causality and Fourier volatility spillover tests. This situation is thought to be as is due to the intensity of the commercial relationships between Russia and Turkey. However, the use of the Fourier-functional methods enabled the smooth transition structural breaks to be taken into account in the paper. In this context, the possible structural breaks caused by the COVID-19 pandemic and the Russia-Ukraine war, which are included in the data analyzed in the paper, were considered.

Additionally, the Russia-Ukraine war has led to a number of sectoral impacts. Especially so in the energy sector, there has been an increase in energy prices due to dependence on the energy resources coming from the geographies where the conflict started. This situation has changed investors' risk perception by affecting the companies operating in the energy sector on global markets. On the other hand, the financial sector has been exposed to such influences as fluctuating exchange rates and increased demand for safe haven assets due to geopolitical uncertainty. In addition, there have been supply problems and price fluctuations in the food sector and the other basic material sectors in the countries trading with the regions where the war broke out. These sectoral effects have affected global economic balances, causing investors to re-evaluate their portfolio strategies.

The findings of our paper coincide with the findings of a number of the studies (Mahran, 2023; Beraich *et al*, 2023; Vidal-Llana *et al*, 2023) conducted on the basis of the Russia-Ukraine conflict, dealing with different markets and sectors. Similarly, the studies in question revealed the fact that the paper increased the interaction and risk shocks between financial markets and certain sectors (such as energy, electricity).

Finally, the fact that the research study conducted in this paper was carried out taking into consideration the sector indices traded on the stock market is worthy of notice.

The limitations of this paper include the use of only the sector indices on the stock market. However, it is recommended that more comprehensive studies taking into account different sectoral data should be carried out. It is estimated that the other sectors will also be affected in the times of war and that foreign trade balances with the countries closely bordering with the regions where the war broke out will be dynamic. In this regard, it is thought that another paper containing different sectoral data will contribute to evaluating the issue from a broader point of view and will be promising. It will open the door to more comprehensive findings.

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Conference Announcement

CONTEMPORARY ISSUES IN ECONOMICS, BUSINESS AND MANAGEMENT - EBM 2024

December 16-17, 2024, Faculty of Economics, University of Kragujevac,
Kragujevac, the Republic of Serbia

Dejana Zlatanović*

On the days of 16th and 17th December 2024, the Faculty of Economics of the University of Kragujevac will organize the eighth international scientific conference on *Contemporary Issues in Economics, Business and Management* (EBM 2024). Since 2010, the Conference has been held biannually and the same is dedicated to the current issues in the fields of economics, business and management.

The global environment, characterized by extreme dynamics and multidimensionality determines numerous challenges and the context which leads to the redefining of the existing research areas and paradigms, as well as the creation of new ones. Endeavoring to provide valid answers to these contemporary challenges, the Conference encompasses a broad range of the topics that offer a possibility for researchers with different research interests to participate. Pursuant to said, the Conference represents a certain platform for presenting the latest theoretical-methodological and applicative pieces of knowledge and perspectives, as well as a creative and intensive debate participated by researchers from different regions and the identification of possibilities for future joint research.

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Respecting the significance of such identified challenges in economics, business and management, simultaneously endeavoring to provide answers to a broad diversity of the issues and questions, the papers in the following four thematic fields will be presented at the Conference, namely:

- Globalization and regionalization,
- The key issues and challenges in management and marketing,
- Accounting and business finance, and
- Applied informatics and quantitative methods in economics and management.

Within the framework of each thematic field, numerous subtopics have been defined, which offers a possibility of a big variety of the research papers. On the first day, the Conference will comprise a plenary session and four parallel sessions, whereas the second day will be dedicated to summing up the conclusions presented at the Conference and an informal discussion. As eminent researchers in their respective research fields, the keynote speakers at the Conference will be:

- *Alfonso Vargas-Sánchez*, University of Huelva, Spain;

- *Maria Cristina Cinici*, University of Messina, Italy; and
- *Vladimir Dženopoljac*, Zayed University, United Arab Emirates.

All original and unpublished papers of both the theoretical and empirical characters are desirable. The papers will undergo double-blind peer reviews, and all the papers positively reviewed will be published in the Proceedings after the Conference. The Proceedings of the accepted abstracts and the Conference participation certificates will be given to the participants on the very day of the holding of the Conference. The authors of the selected quality papers will have a possibility to publish their papers in the following renowned journals:

Economic Horizons – the journal published by the Faculty of Economics of the University of Kragujevac, indexed in different relevant journal bases, namely in: SCOPUS (Q3) ProQuest/ ABI/INFORM, Cabell's Directories, Index Copernicus Journals Master List, EconLit, EBSCO, Ulrich's Web.

Our Economy – the journal published by the Faculty of Economics and Business of the University of Maribor, indexed in DOAJ, EBSCO, EconBiz, ECONIS, EconLit, ERIH PLUS.

All prospective participants at the Conference should remember the following significant dates:

- 15th September 2024 – the deadline for the submission of the abstracts

- 1st October 2024 – the notification of the acceptance of the paper
- 31st October 2024 – the deadline for the submission of the papers
- 15th 2024 – the notification of the acceptance of the paper.

Information in detail about the Conference can also be found on the official website of the EBM 2024 Conference: <https://ebm.ekf.rs>.

Pursuant to the aforementioned, the Conference will help researchers clarify certain research dilemmas and questions, gain numerous insights into the latest scientific-research results, thus simultaneously deepening the extant and also generate new knowledge. At the same time, the Conference will strengthen the existing cooperation between the participants and provide an opportunity for them to develop new business cooperations and relations as well.

As the President of the Program Board, it is my expectation that a big number of participants from the Republic of Srpska and from abroad will take part and contribute to the identification of the valid solutions to extremely complex problems of the real world through their respective presentations, and creative and constructive discussion. Besides, it is my expectation that the conclusions drawn at the Conference will be a good basis for future research and considerations both in the academic public and in a broader professional public.

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Length of the submissions: Manuscripts should contain between 5,000 and 7,000 words.

Title of the manuscript: The title should not exceed two lines in length.

Abstract and Keywords: The abstract should contain between 100 and 150 words. Authors should list 3 to 6 keywords.

JEL classification: According to Journal of Economic Literature (JEL) Classification System: http://www.aeaweb.org/journal/jel_class_system.php, the author should classify his/her manuscript.

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