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ASSESSMENT OF THE IMPACT OF CIRCULAR ECONOMY COMPETITIVENESS AND INNOVATION ON EUROPEAN ECONOMIC GROWTH

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Abstract:
The world usage of raw materials is 70% higher than what the Earth can safely renew. Circular Economy represents a new model of economic development relying on the 7Rs (redesign, reduce, reuse, repair, renovate, recycle, and recover) to provide operational and strategic benefits on the micro, meso, and macro levels. This research aims to determine the impact that circular economy competitiveness and innovation have on economic growth within European countries by evaluating the impact of four independent variables selected from the European Commission Circular Economy monitoring framework on the GNI per capita. This paper analyses the competitiveness through Values Added at Factor Cost (VAFC), Gross Investment in Tangible Goods (GITG), and Number of Employees (EMP) in Circular Economy, innovation through the Number of Patents in climate change mitigation technologies related to wastewater treatment or waste management (PAT), while the economic growth was estimated based on the GNI per capita annual growth rate (GNIpc). Correlation and regression methods were applied to the sample of 25 European countries using the log-transformed data. The results show that the correlation between VAFC and GNIpc is moderate and significant but negative, while the correlation between GITG and EMP and GNIpc is not statistically significant.

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INTRODUCTION

Throughout the last 150 years of industrial evolution, a linear production and consumption model, in which goods are produced from raw materials, sold, exploited, and then discarded or incinerated, has dominated the global economy. Since the global climate change conference in Paris in 2015 and the Glasgow conference in 2021, 70% more raw materials have been extracted than the Earth's capacity to safely renew them (Circle Economy, 2022). A new economic model has become essential as the world faces increasing volatility in the global economy and signs of resource depletion.

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As an alternative model, the Circular Economy offers operational and strategic benefits at both the micro and macroeconomic levels. Driven by the technological advancements in Industry 4.0, this transformation represents an opportunity with enormous potential for innovation, job creation and economic growth (EMF, 2013; WEF *et al*., 2014; Popović, 2020). The Circular Economy represents a systemic approach to economic development, designed to contribute to all socio-economic subjects. Unlike the linear model, the Circular Economy is meant to be regenerative by design and aims to incrementally decouple growth and development from the consumption of finite resources (EMF, 2022). Circular Economy aims to make the most of the material resources available to us by applying the seven principles ("7Rs"): redesign, reduce, reuse, repair, renovate, recycle, and recover. The idea stems from the imitation of nature, where everything has value, and everything is used, and where waste becomes a new resource. In this way, the product's life cycle is extended, waste is utilised, and, over time, a more efficient and sustainable production model is established. Thus, the balance between progress and sustainability is maintained (REPSOL, 2022).

The European Commission has estimated that the manufacturing sector of the European Union (EU) would gain an additional 600 billion euros annually from the transition to a circular economy (Korhonen *et al.,* 2018). The Circular Economy currently contributes to job creation and economic growth in Europe, and the development of innovative technologies improves product designs for more accessible reuse and promotes innovative industrial processes (EC, 2022). Multiple authors and organisations have tackled the subject of the impact that the Circular Economy has on overall development and growth worldwide or within particular countries, but all have remained theoretical in nature or relied on ad hoc evaluation models (Yuan *et al*., 2006; Mathews & Tan, 2016; Domenech & Bahn-Walkowiak, 2019; Chateau & Mavroeidi, 2020; EMF, 2022). Furthermore, the research focused on the effects of competitiveness and innovation in the Circular Economy in Europe is extremely scarce and intertwined with more complex questions. Thus, it is necessary to evaluate the impact of particular elements of the Circular Economy on many aspects of development, particularly on economic growth.

The notion that Circular Economy will provide strong effects on innovation, job creation and growth is widely accepted even though today, data for confirming these effects is scarce and ununiformed. In Europe, it is especially significant to determine the relations between competitiveness and innovation in the Circular Economy, on the one hand, and economic growth, on the other, to provide investments and funds for the most impactful areas of the economy.

This paper aims to improve understanding of the impact the Circular Economy competitiveness and innovation have on economic growth. Relying on the European Commission Circular Economy monitoring framework indicators, this paper will estimate the correlation between competitiveness and innovation in the Circular Economy and the economic growth within European countries (EC, 2022). Additionally, a linear regression model will be developed to estimate the combined impact of the selected independent variables on the economic growth measured by the GNI per capita growth rate within Europe.

LITERATURE REVIEW

In the 1970s, the ecological economist Boulding and the political economist Thomas Malthus introduced the concept of limitations to growth for the first time (Popović & Milijić, 2021). Some authors and influential international institutions introduced growth's social and environmental dimensions based on their fundamental conclusion that limited resources do not provide an endless supply of fuel for growth under the linear production model (Sverko Grdic *et al.*, 2020; Popović, 2020). While circularity was introduced in the 1970s, multiple authors credit Pearce and Turner (1989) with the concept of the linear economy being substituted by the circular system (Ghisellini *et al.*, 2016; Sverko Grdic *et al.*, 2020; Popović & Milijić, 2021). They examined and explained the role of natural resources on both sides of linear production, making it necessary to evaluate and utilise the economy's circular flow of matter. Today, there are over a hundred definitions of the circular economy (Kirchherr *et al.*, 2017). However, the most widely accepted definition is that of the Ellen MacArthur Foundation, which defines a Circular Economy as "an industrial economy that aims to rely on renewable energy; minimises, tracks, and eliminates the use of toxic chemicals; and eliminates waste through careful design" (EMF, 2013, p.22).

Within the last two decades, both theoretical and empirical research focused on Circular Economy provided frameworks, guidance, and models for faster and more effective implementation of the concept. However, the ad hoc implementation and evaluation of its effects on economic growth and development leave much room for research on both micro and macro levels.

Theoretical discussions about the effects, potential, advantages, limitations, and measurement of the Circular Economy comprise the main body of research within the last two decades (Kirchherr *et al.*, 2017; Geissdoerfer *et al.*, 2017; Berg *et al.*, 2018; Esposito *et al.*, 2018; Korhonen *et al.*, 2018; Martinho & Mourao, 2020; Marković *et al.*, 2020). However, starting with China's experiment with a Circular Economy (Yuan *et al.*, 2006; Geng *et al.*, 2013; Chen *et al.*, 2020), empirical research within the last decade is providing a better understanding of how a Circular Economy can benefit national, regional and world economies (Berg *et al.*, 2018; Bogovitz & Sergi, 2019; Domenech & Bahn-Walkowiak, 2019) as well as individual economic subjects such as corporations and SMEs (Leider & Rashid, 2016; Busu & Nedelcu, 2017; Esposito *et al.*, 2019).

Even though there is no consensus regarding the definition and measurements of the Circular Economy, there were several attempts to assess the impact of the Circular Economy based on the available SDG indicators (UN, 2015), EC indicators (EC, 2022), and other regional or national indicators meant for the assessment of the waste management, energy efficiency, production, and consumption. Some authors focused on indicators from separate datasets, such as eco-innovation (Smol *et al.*, 2017). Others focused on indicators representing particular segments of the Circular Economy, such as waste management and energy efficiency, while a small group of authors tried to provide a comprehensive analysis of the impact of the Circular Economy (Hysa *et al.*, 2020). Most recently, Karman and Pawlowski (2021) created the Circular Economy Competitiveness Index as a comprehensive indicator showing the impact of this new concept on the world economy.

Advances in theoretical and empirical research are creating the necessary basis for the fundamental transformation of the world economy. However, the research is still lacking in assessing the impact of particular segments, such as secondary raw materials, competitiveness, and innovation brought by the Circular Economy, on socio-economic development. This paper aims to narrow the gap by evaluating the available indicators and their adequacy for statistical modelling, as well as developing the model for assessing the impact of competitiveness and innovation on economic growth in Europe.

METHODOLOGY

This paper aims to provide insight into the impact that competitiveness and innovation brought by the Circular Economy have on the economic growth within European countries. For this purpose, the research relies on quantitative and qualitative approaches to analyse the secondary data collected from the EC Circular Economy Monitoring Framework (EC, 2022) and World Bank Database (WB, 2022).

For the purpose of this paper, four indicators related to the Competitiveness and Innovation thematic area will be used treated as independent variables (IV), and Gross National Income growth (Annual %) as an indicator of economic growth will be used as the dependent variable (DV). Keeping in mind the limitations of statistical data for Circular Economy indicators, the paper will use 2016 as the most recent year for which all of the indicators have representative values.

Independent variables (IV) that will be used in the analysis are (EC, 2022):

- Value-added at factor cost - thousand euro - (VAFC)
- Gross investment in tangible goods - thousand euro - (GITG)
- Persons employed – number - (EMP)
- Number of Patents in climate change mitigation technologies related to wastewater treatment or waste management - (PAT)

The dependent variable (DV) that will be used for the purpose of the analysis is (WB, 2022):

- Gross National Income per capita growth (Annual %) (GNIpc)

The dataset used for the purpose of this analysis is presented in Table 1. Seven countries (Czech Republic, Estonia, Ireland, Luxembourg, Malta, Slovenia, Switzerland, the United Kingdom, North Macedonia, and Turkey) were excluded due to the complete lack of statistical data.

Table 1. Used dataset.

Countries	VAFC in 000 €	GITG 000 €	Employees	Patents	GNIpc
Austria	3,705,500.00	291,700.00	64,629.00	3.86	0.023
Belgium	2,926,400.00	631,800.00	51,999.00	14.65	0.010
Bosnia and Herzegovina	153,300.00	14,900.00	14,062.00	0.00	0.039
Bulgaria	539,100.00	86,900.00	60,952.00	0.00	0.037
Croatia	568,400.00	51,300.00	35,094.00	1.66	0.018
Cyprus	162,100.00	10,700.00	7,671.00	0.00	0.023
Denmark	2,319,600.00	250,300.00	39,109.00	5.50	0.014
Finland	2,025,600.00	214,100.00	41,794.00	10.50	0.019
France	19,466,300.00	222,800.00	419,989.00	35.53	0.011
Germany	31,246,300.00	2,809,200.00	641,345.00	66.53	0.022
Greece	616,800.00	66,400.00	67,528.00	1.00	-0.001
Hungary	1,040,200.00	194,600.00	85,943.00	3.50	0.051
Iceland	241,100.00	222,800.00	3,883.00	0.00	0.023

Countries	VAFC in 000 €	GITG 000 €	Employees	Patents	GNIpc
Italy	18,019,700.00	2,201,400.00	510,145.00	14.12	0.033
Latvia	251,400.00	68,000.00	25,614.00	1.00	0.056
Lithuania	406,500.00	53,100.00	36,879.00	0.00	0.051
Netherlands	5,614,400.00	857,700.00	105,763.00	15.69	0.001
Norway	3,720,400.00	390,400.00	52,282.00	0.00	-0.029
Poland	4,830,000.00	716,800.00	355,643.00	45.01	0.029
Portugal	1,413,200.00	222,800.00	84,756.00	0.00	0.033
Romania	1,280,900.00	333,300.00	132,908.00	3.00	0.050
Serbia	267,500.00	117,300.00	26,437.00	0.00	0.029
Slovakia	623,500.00	133,800.00	40,890.00	0.13	0.012
Spain	11,464,300.00	977,500.00	384,753.00	29.09	0.033
Sweden	4,110,300.00	656,100.00	76,485.00	5.01	0.006

Source: *EC (2022) and WB (2022).*

The essential hypotheses tested through this research can be expressed as follows:

H1. There is a statistically significant correlation between competitiveness in a circular economy and economic growth measured by GNIpc.

H2. There is a statistically significant correlation between innovations in Circular Economy and economic growth measured by GNIpc.

H3. Competitiveness and innovation in the Circular Economy have a significant impact on the economic growth in European countries.

Based on the selected indicators, the research in this paper is structured as follows:

1. Normality assumption evaluation, data selection and transformation
2. Correlation analysis between selected indicators
3. Multiple Linear Regression and Model Development

The first step of the research is the evaluation of the normality assumption necessary for correlation analysis and multiple linear regression. Based on the data provided by the Shapiro-Wilk test (Shapiro & Wilk, 1965), the data for further analysis will be selected and log transformation applied to the indicators that do not meet the assumption in their original form. The indicators which do not meet the assumption, even after transformation, will be eliminated from further analysis.

The correlation analysis will provide information about the potential correlation and the intensity of the correlation between Circular Economy competitiveness and innovation indicator, and economic growth. Depending on the results of the correlation analysis, the following regression analysis will be performed to determine the model representing the combined effect of IV on DV. Before model development, a test will be used for the assumptions needed for performing linear regression, including linearity of data, normality of residuals, homoscedasticity, and independence of residuals error terms (Freedman *et al*., 2003). Only if the assumptions are met the quality of the model can be confirmed. For the analysis, the R software (version 4.2.1) and R Studio (version 2022.02.3) were used.

RESULTS

This section will provide an overview of the collected data and statistical analysis and will be divided into three subsections. The first segment introduces the Shapiro-Wilk test for the evaluation of the normality assumption. It will present the results of the test for the original and transformed values. The second segment will show the correlation results between the IV and DV. The third segment will present the linear regression results and evaluate the quality and fitness of the model.

Normality Assumption Evaluation, Data Selection and Transformation

To determine whether the variables used for the correlation analysis meet the normality assumption, the Shapiro-Wilks test was performed. Based on the Shapiro-Wilk test results presented in Table 2, only one indicator meets the requirement without transformation.

Table 2. Shapiro-Wilk Test Result for Original Variables.

Variable	Type of Variable	W	p-value
VAFC	IV	.631	9.685e-07
GITG	IV	.647	1.534e-06
EMP	IV	.684	4.434e-06
PAT	IV	.670	2.970e-06
GNIpc	DV	.957	3.567e-01

Source: *Data analysis performed by the author using R*

Since it was determined that the GNIpc p-value (.3567) is higher than the significance level of alpha (.05), it can be concluded that it meets the assumption of normality, and it will be used in its original form. The original data for four IVs do not meet the assumption of normality, and thus it will be transformed using log transformation (MaCurdy & Pencavel, 1986). The new variables which will be used in the analysis are the following:

- log.VAFC = log(VAFC)
- log.GITG = log(GITG)
- log.EMP = log(EMP)
- log.PAT = log (EMP – (min (EMP) - 1))
- log.GNI = log (GNIpc – (min (GNIpc) - 1))

The transformation of the PAT and GNIpc variables requires the inclusion of the constant to ensure the data adequacy for log transformation.

The Shapiro-Wilk test was applied to the transformed variables to determine whether they meet the assumption of normality in this form. Based on the results of the test, the variables that do not meet the assumption will be eliminated from the model.

Table 3. Shapiro-Wilk Test Result for Log Transformed Variables.

Variable	Type of Variable	W	p-value
log.VAFC	IV	.960	4.136e-01
log.GITG	IV	.978	8.321e-01
log.EMP	IV	.955	3.164e-01
log.PAT	IV	.878	6.210e-03
log.GNI	DV	.957	3.506e-01

Source: *Data analysis performed by the author using R*

Based on the test results provided in Table 3, it can be determined that four out of the five transformed variables meet the requirements of the test – the p-value is higher than the significance level of alpha (.05). The only value that does not meet the requirement is the log.PAT, thus it can be concluded that the number of patents in climate change mitigation technologies related to wastewater treatment or waste management cannot be used for further analysis.

Correlation Analysis

Spearman correlation analysis was performed between transformed Circular Economy competitiveness and innovation indicators and transformed GNIpc growth rate. The following interpretation will be used - the closer *rho* is to ±1 stronger the monotonic relationship.

The correlation analysis shows that there is a negative correlation between all IV and DV. The analysis showed that there was a moderate, negative correlation (rho (23) = -0.40, p = .050) between VAFC and GNIpc. Furthermore, there is a weak, negative correlation (rho (23) = -0.26, p = .212) between GITG and GNIpc, and finally there is very weak, negative correlation (rho = -0.09, p = .683) between EMP and GNIpc. The correlation was examined based on the significance level of alpha (.05), and the results are shown in Table 4.

Table 4. Spearman Correlation Results.

IV	DV	S	Correlation coefficient (rho)	p-value
log.VAFC	log.GNI	3634	- 0.40	.050
log.GITG	log.GNI	3273	- 0.26	.212
log.EMP	log.GNI	2824	- 0.09	.683

Source: *Correlation analysis performed by the author using R*

* Correlation is effect size, and so the strength of the correlation can be verbally described using the following guide for the absolute value of rho (Cohen *et al.*, 2003) (.00-.19) - "very weak",(.20-.39) - "weak", (.40-.59) - "moderate", (.60-.79) - "strong", (.80-1.0) - "very strong"

Based on the correlation results, the analysis could proceed with the regression analysis and include all three IVs since, although weak, there is a correlation between them and the GNIpc.

Regression Analysis

Before the regression analysis was performed, the model needed to meet the assumptions of *linear relationship*, no multicollinearity, *independence, homoscedasticity*, and *multivariate normality* (Freedman *et al.*, 2003). Therefore, the data for these assumptions was tested, and the results are shown in Figure 1.

Figure 1. Assumptions for Multiple Linear Regression

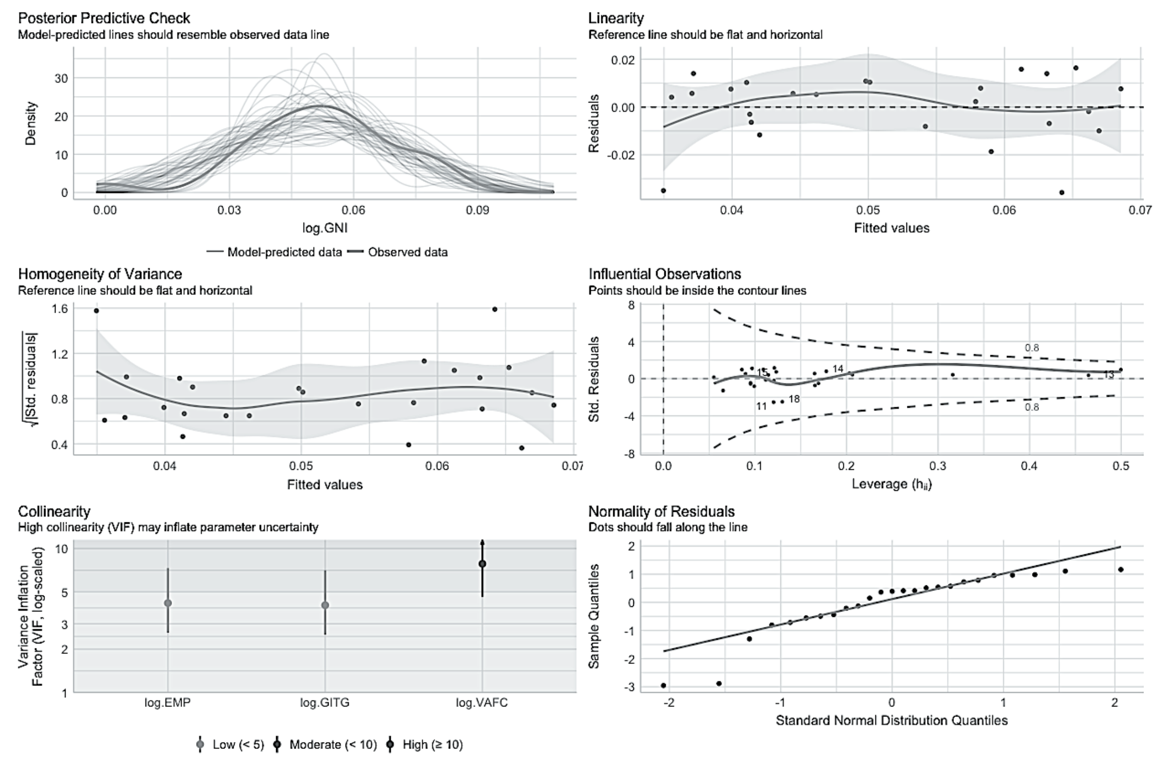

Figure 1 provides the necessary information for testing the assumptions that the model needs to meet.

- The linear relationship is confirmed through the Linearity graph. It is clear that that the data does not show any visible pattern. Therefore, the linear relationship between the variables can be assumed.
- No multicollinearity is confirmed through the Collinearity Graph. It is clear GITG and EMP show low collinearity, while VAFC shows medium collinearity. None of the variables shows high collinearity. Thus, there is no increased uncertainty in the model.
- Independence is confirmed through the Durbin-Watson test (Cohen *et al.*, 2014). Residuals appear to be independent and not autocorrelated ($p = .562$).
- Homoscedasticity is confirmed through the Homogeneity of Variance Graph, and residual points are scattered relatively equally along the line. Thus, homoscedasticity can be assumed.
- Multivariate normality is confirmed through the Influential Observations Graph and Normality of Residuals. It is clear that there are no influential observations (>|.8|) and that data points follow the projected line, thus confirming that the assumption is met.

Since it can be concluded that the assumptions have been met, following the correlation analysis, the multiple linear regression was calculated to estimate the change in economic growth as a function of the change in Value Added at Factor Cost, Gross Investment in Tangible Goods, and Persons Employed. The results of the Regression Analysis are presented in Table 5.

Table 5. Simple Linear Regression (log.GNI ~ log.VAFC + log.GITG + log.EMP).

Variable	β_i	$e^{\log\beta i}$	Std. Error	t-value	P (t-test)
β_0	.0829	.2253	.00297	2.791	.011
log.VAFC	- 0.0182	-0.0495	.0056	-3.274	.004
log.GITG	.0043	.0117	.0045	0.943	.356
log.EMP	0.0159	.0432	.0050	3.176	.005

Source: *Correlation analysis performed by the author using R*

The results of the regression indicated that the model explained 31.36% of the variance and that the model was a significant predictor of economic growth, $F(3,21) = 4.656$, $p = .01$. While VAFC ($B = -0.0182$, $p<.05$) and EMP ($B = .0159$, $P<.05$) contributed significantly to the model, GITG did not ($B = .0043$, $p=.356$). The final predictive model was:

$$\text{log.GNI} = .0829 - (0.0182*\text{log.VAFC}) + (.0043*\text{GITG}) + (.0043*\text{EMP})$$

The log-log model after reverse transformation was:

$$\text{GNIpc} = .2253 - (0.0495*\text{VAFC}) + (.0117*\text{GITG}) + (.0432*\text{EMP})$$

Two out of three analysed variables have a statistically significant impact on economic growth, and it can be interpreted as follows:

- Every 1,000 euros increase in VAFC results in a 4.95e-02 decrease in economic growth rate (GNIpc).
- Every additional person employed in Circular Economy areas is correlated with a 4.32e-02 increase in economic growth rate (GNIpc).

Even though results indicate a positive impact, EMP did not significantly contribute to the model, and thus the following interpretation can be considered only for the sample presented within this paper.

- Every 1,000 euros increase in GITG is correlated with a 1.17e-02 increase in the economic growth rate (GNIpc). However, it is not contributed.

The presented information in this segment provides abundant information for the following discussion of the observed correlation and identified model.

DISCUSSION

Analysing available data sources and the literature regarding the current state of the Circular Economy, its potential, advantages, limitations, and measurement of its effects and implementation on a national, regional, and global scale (EMF, 2022; Circular Economy, 2022, EC, 2022) it is noticed that even though there are advancements in the evaluation of the effects of a Circular Economy (Smol *et al.*, 2017; Hysa *et al.*, 2020), there is a lack of comprehensive systems and models, which can provide reliable and comprehensive estimates for specific areas of impact.

Through this research, an inquiry was made into the correlation between log-transformed independent variables VAFC, GITG, EMP, and PAT, and the log-transformed dependent variable GNIpc.

The observed correlation coefficients show that there is a statistically significant correlation between competitiveness in a circular economy measured by VAFC, GITG, and EMP, and economic growth measured by GNIpc. The analysis proved that:

- There was a moderate, negative correlation between VAFC and GNIpc, which indicates the reverse relationship between Value Added at Factor Cost in Circular Economy and economic growth in Europe.
- There is a weak, negative correlation between GITG and GNIpc, which indicates a direct relationship between Gross Investments in Tangible Goods related to the Circular Economy and the economic growth in European countries.
- There is a very weak, negative correlation between EMP and GNIpc, which indicates the direct, but nearly insignificant, relationship between Employment in the Circular Economy and the economic growth in Europe.

The results of the correlation analysis are consistent with several recent studies (Leider & Rashid, 2016; Busu & Trica, 2019; Karman & Pawlowski, 2021), which developed comprehensive models and frameworks to analyse the economic growth explained by similar variables related to CE for EU member states. Additionally, based on the results of the analysis, it can be concluded that the data support the first hypothesis.

Furthermore, the correlation analysis showed that the observed data regarding innovation in the Circular Economy is not suitable for further analysis and, thus, the effects of innovation on economic growth cannot be evaluated. These results confirm the observations from previously conducted research, which also excluded innovation indicators due to a lack of data (Hysa *et al.*, 2020; Karman & Pawlowski, 2021). Based on these results, it can be concluded that the second hypothesis is not supported.

Finally, a regression analysis was performed to estimate the impact of the transformed independent variables VAFC, GITG, and EMP on the transformed dependent variable GNIpc. The analysis resulted in the regression equation $GNIpc = .2253 - (0.0495*VAFC) + (.0117*GITG) + (.0432*EMP)$, which represents the impact of the Circular Economy competitiveness on the economic growth in European countries. The analysis and constructed model support the third hypothesis. However, the model does not include the innovation segment, thus its predictive capabilities for the whole competitiveness and innovation thematic area are limited. This model, unlike previous research (Leider & Rashid, 2016; Busu & Trica, 2019; Hysa *et al.*, 2020; Karman & Pawlowski, 2021), provides a unique, segmented approach to the evaluation of the competitiveness and innovation in the Circular Economy on economic growth in Europe.

CONCLUSION

This research aims to prove the existing relationship between competitiveness and innovation in the Circular Economy and economic growth in European countries. For this purpose, the data from the Circular Economy Monitoring Framework provided by the European Commissions (2022) and the data provided by the World Bank (2022) in the Development Indicators segment were utilised. Relying on these macroeconomic variables, a linear regression model was developed to assess the effects that competitiveness and innovations brought about by the Circular Economy have on economic growth measured by Gross National Income per capita annual growth rate.

Available data indicate that European countries widely differ in the quality of the systems and treatment of the competitiveness and innovation directed towards Circular Economy. Based on the original data, it was concluded that, for traditionally competitive and innovative economies, Central and Western European countries are leading in terms of utilisation of these specific segments of the Circular Economy Framework. The correlation analysis and regression model show that increased Values Added at Factor Cost have adverse effects on economic growth, while Gross Investments in Tangible Goods, and Employment in Circular Economy have positive effects on economic growth.

Briefly, it can be concluded that:

- Data and scientific framework regarding the implementation and evaluation of the effects of Circular Economy improved daily, but are still lacking.
- There is respectively a moderate, weak, and very weak correlation between Value Added at Factor Cost, Gross Investment in Tangible Goods, and Employment in Circular Economy and economic growth measured by Gross National Income per capita annual growth rate.
- It is expected that, every 1,000 euros increase in VAFC, GITG and increase in employment by one employee will result in a 4.95e-02 decrease, 1.17e-02 increase, and 4.32e/02 increase in the GNIpc annual growth rate, respectively.

The results of this paper are relevant for academic and business communities, as well as for policy-makers. Scientifically, this paper contributes to an attractive and profound research area. The research base so far is primarily focused on the theoretical aspects of the subject, while empirical research is still lacking. This paper aims to narrow the gap between these two aspects of the Circular Economy. Contribution to the business community can be seen through the indication of future development in the European area and the most prolific areas of investment. Thus, business leaders can base their decisions on reliable and scientific data. Finally, perhaps the most significant contribution is to the policymakers. This research is an inquiry into the impact of particular segments of the Circular Economy on economic growth and provides relevant data for directing the development of future policies.

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KORIŠĆEOCENA UTICAJA KONKURENTNOSTI I INOVACIJA U CIRKULARNOJ EKONOMIJI NA PRIVREDNI RAST U EVROPI

Rezime:

Upotreba sirovina u svetu je 70% veća od one koju planeta Zemlja može bezbedno da obnovi. Cirkularna ekonomija predstavlja novi model privrednog razvoja koji se oslanja na „7R“ (redizajniranje, smanjenje, ponovnu upotrebu, popravku, renoviranje, recikliranje i oporavak) kako bi obezbedila operativne i strateške koristi na mikro, mezo i makro nivou. Ovo istraživanje ima za cilj da, kroz procenu uticaja četiri nezavisne varijable iz okvira za praćenje cirkularne ekonomije Evropske Komisije na BND per capita, utvrdi uticaj koji konkurentnost i inovacije u cirkularnoj ekonomiji imaju na privredni rast u evropskim zemljama. U ovom radu analizirana je konkurentnost kroz dodatu vrednost po jediničnoj ceni inputa (VAFC), bruto ulaganje u materijalna dobra (GITG) i broj zaposlenih (EMP) u cirkularnoj ekonomiji, inovacije kroz broj patenata u tehnologijama za ublažavanje klimatskih promena koje se odnose na tretman otpadnih voda ili upravljanje otpadom (PAT), dok je privredni rast procenjen na osnovu godišnje stope rasta BND per capita (GNIpc). Primenjene su metode korelacije i regresije na uzorku od 25 evropskih zemalja koristeći logaritamski prilagođene. Rezultati pokazuju da je korelacija između VAFC i GNIpc umerena i značajna, ali negativna, dok korelacija između GITG i EMP i GNIpc nije statistički značajna.

Ključne reči:
Cirkularna ekonomija,
Konkurentnost,
Privredni razvoj,
Održivi razvoj,
Evropa.

Klasifikacija JEL:
O440, Q01, Q56