THE IMPACT OF ECONOMIC DEVELOPMENT ON ENVIRONMENTAL QUALITY THROUGH TESTING THE ENVIRONMENTAL KUZNETS CURVE HYPOTHESIS IN THE WESTERN BALKAN COUNTRIES

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EXTENDED ABSTRACT

Purpose The foundations of sustainable development theory promote economic growth within the limits of preserving the environmental conditions of countries (Lazăr *et al.*, 2019; Jones., 2022; Hatmanu and Cautisanu, 2023). This paper conducts a preliminary examination of the Environmental Kuznets Curve (EKC) by testing its hypothesized inverted U-shaped trajectory (Kisswani *et al.*, 2019; Ansari, 2022; Magazzino *et al.*, 2023). Specifically, the Kuznets hypothesis suggests that, in the short term, increased economic development leads to higher levels of environmental pollution (Mazur *et al.*, 2015; Shahbaz and Sinha, 2019; Simionescu, 2021). However, over the long run, improvements in environmental standards, the implementation of regulatory measures, and the adoption of cleaner technological and production processes contribute to a reduction in environmental degradation (Zhang *et al.*, 2017; Shuai *et al.*, 2017; Kuznets, 2019; Jóźwik *et al.*, 2021). This analysis includes five Western Balkan countries that have achieved candidate status for European Union membership in the post-2000 period. Empirical tests for co-integration among the variables confirmed the existence of a long-run relationship between economic growth and environmental quality. In a study conducted by Armeanu *et al.* (2018), the relationship between variables measuring environmental pollution and the economic growth rates of the EU-27 countries from 1995 to 2014 was empirically tested. The results of the research confirm the Environmental Kuznets Curve (EKC) hypothesis, indicating the existence of a long-term effect in the case of sulphur dioxide (SO_2) emissions and non-methane volatile organic compounds ($NMVOC_s$). Another significant research in the European context was conducted by Vasylieva *et al.* (2019), examining the relationship between economic growth rate, renewable resource allocation, and greenhouse gas (GHG) emissions during the period 2000-2016. Using FMOLS and DOLS panel estimation techniques, the study confirms the Environmental Kuznets Curve (EKC) hypothesis. Additionally, Dogan and Inglesi-Lotz (2020), conducted a study covering the period from 1980 to 2014, analysing the impact of industrial activity and energy consumption on the increase in carbon dioxide (CO_2) emissions in the EU-27 countries. The findings of this research indicate a long-term decline in (CO_2) emissions as a result of more efficient energy use and the adoption of cleaner technologies. The purpose of this paper is to conduct an empirical analysis of the short- and long-term effects of economic growth in Western Balkan countries on the quality of their natural environment. Based on the available data, the study separately examines the impact of economic growth on carbon dioxide (CO_2) emission levels, in contrast to the effect of economic growth on the increase in total greenhouse gas (GHG) emissions. The Environmental Kuznets Curve hypothesis is tested using data from five Western Balkan countries.

To examine the effect of economic growth on environmental quality and the use of renewable energy in five Western Balkan countries, the following three hypotheses will be tested: H1:

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Increases in economic growth rates and per capita energy consumption have a short-term effect on CO_2 and GHG emission levels, as indicators of environmental quality in Western Balkan countries.
H2: Growth in economic activity and total per capita energy consumption exerts a long-term influence on changes in CO_2 and GHG emissions in Western Balkan countries.
H3: Rising economic growth rates and per capita energy consumption lead to a short-term decline in environmental quality, whereas, in the long term, they contribute to improvements in environmental quality.

Design/methodology/approach The methodological section of this research focuses on examining the existence of both short- and long-run effects of economic growth and per capita energy consumption on the variation in carbon dioxide (CO_2) and greenhouse gas (GHG) emissions. The research covers the period from 2000 to 2023 and includes a sample of five Western Balkan countries-candidates for accession to the European Union (EU-27). The analysis explores links between economic growth, energy use, and environmental degradation using panel data methods. To implement the methodological part and ensure the robustness of the empirical results, the stationarity of the time series is tested using unit root tests. Specifically, the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP). The Johansen co-integration test and Vector Error Correction model are applied to determine the order of co-integration of the variables. Prior to conducting the co-integration tests, the optimal lag length is selected based on the various selection criteria: Akaike Information Criterion (AIC), the Schwarz Information Criterion (SIC), and the Hannan-Quinn Information Criterion (HQIC). The study employs the VAR Lag Order Selection Criteria, and based on the obtained results, the existence of a co-integration relationship among the time series is subsequently assessed.

Findings The research findings confirm the hypothesis regarding the impact of economic growth and per capita energy consumption on carbon dioxide (CO_2) emissions and greenhouse gas (GHG) levels over the long term. The results suggest the existence of a long-run relationship between the examined variables across all five Western Balkan countries, including North Macedonia, where a statistically significant effect of the economic growth rate and per capita energy consumption on (GHG) emissions was confirmed. On the other hand, the hypothesis concerning the short-run relationship among the included variables was validated in three Western Balkan countries - Serbia, North Macedonia, and Bosnia and Herzegovina. Finally, the third hypothesis, which pertains to the Environmental Kuznets Curve (EKC) and its inverted Ushape, was empirically supported in the case of Serbia.

Originality/value Sustainable economic development is a central topic in current economic research and a core part of the European Union's development strategies**:** Europe 2020, European Green Deal (Fetting, 2020; Wolf *et al.*, 2021), Agenda for Sustainable Development (Lee *et al.*, 2016; Delbeke *et al.*, 2019; Kryk and Guzowska, 2021; Burgin, 2023). The originality of this paper lies in assessing the significance of the impact of economic growth on environmental conditions through the application of econometric methods, specifically the Vector Error Correction Model. The value of this research stems from analysing the impact of greenhouse gas emissions on economic growth rates – a dimension that previous studies have primarily examined through the impact of carbon dioxide emissions alone. A key limitation of the study concerns the scope of the dataset, particularly the omission of the pre-2000 period. As a recommendation for future research, a comparative analysis between Balkan countries

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and a group of EU-27 members is suggested to evaluate differences and similarities in the progress of sustainable development policies across different regions of Europe.

Keywords: *Sustainable development, Kuznets (EKC) hypothesis, CO2/GHG emissions, Panel data methods, Western Balkan countries*

JEL classification: *Q01, O44, C50*

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