DOI: https://doi.org/10.37075/EA.2025.3.09 Economic Alternatives, 2025, Issue 3, pp. 797-814

Green Economy and Economic Growth: An Empirical Analysis Using Panel Data

Received: 07.04.2024
Available online: 30.09.2025

Elza Qorraj[*], Atdhetar Gara[**], Besnik Fetai[***]

Abstract

In an era characterized by escalating concerns regarding environmental sustainability, this research assumes a pivotal role in the discourse on economic decision-making, targeting government officials and economists. It employs a methodologically rigorous approach to investigating the impact of adopting a green economic paradigm on a nation's economic growth. The Ordinary Least Squares (OLS) model was applied, followed by advanced panel data models, including the fixed effects model, the random effects model, and the Hausman Taylor model. The Hausman test affirmed the suitability of the Instrumental Variable (IV) Hausman-Taylor model, demonstrating superior consistency and efficiency compared to fixed effects and random effects models. This study was conducted over a long-term horizon, spanning 12 years from 2010 to 2021, with a total of 516 observations involving 43 countries (37 OECD countries and 6 Western Balkan countries). The selection of the Hausman-Taylor model addressed the issue of endogeneity, recognizing the potential influence of economic growth on the variable itself in subsequent years. Consumption emerges as a robust and statistically significant driver of economic growth. This revelation accentuates the potential for policy interventions aimed at stimulating consumption as a means to foster economic expansion. Conversely, the adverse impact of corruption on sustainable development shown in results, as the empirical results expose a statistically significant and negative relationship between corruption levels and economic growth.

Keywords: Green Economy, Economic Growth, Consumption, Corruption,

JEL: C10, C40, E01, E61

1. Introduction

This paper is very important in today's world, where we're facing a lot of environmental problems. It acts as a guide for people who make decisions about the economy, like government officials and economists. The paper uses a careful method to look at data over time to show how having a "green" or environmentally friendly economy affects a country's economic growth. With all the worries about things like climate change and running out of resources, it's really crucial to understand how making the economy greener can help or hurt a country's

[*] Pristina, Kosovo
[**] South East European University Pristina, Kosovo, Albania
[***] Faculty of Business and Economics, South East European University, North Macedonia

wealth. The research highlights not only the advantages of eco-friendly investments but also the critical need to balance environmental care with economic growth. This paper helps decision-makers in government and business make smart choices, so we can have a prosperous and good place to live for people now and in the future.

A significant number of studies (Anser et al., 2021; Zeb et al., 2014; Dogaru, 2021; Kasztelan, 2017; Bogovic and Grdic, 2020; Gato et al., 2019; Kasperowicz, 2015) have found that there is a positive relationship between the green economy and economic growth. These authors conduct research in different dimensions using different techniques and econometric models to generate results, the different approaches used by the authors, including and use of renewable energy, the level of corruption in the respective countries, etc. Their findings consistently indicate that the green economy has a positive impact on economic growth.

There are many empirical findings by different authors (Lee et al., 2022; Aldieri and Vinci, 2018; Wang et al., 2016, Chen et al., 2016) which find negative impact of green economy on economic growth, respectively, the authors focus mainly on the emission of carbon dioxide, which in most cases and countries has a negative impact on sustainable economic growth. The authors suggest that the impact of green economy practices should be considered in economic strategies and policies that aim to influence economic growth and sustainability.

This study analyzes the complex relationship between the green economy and economic growth, using empirical analysis through panel data. The main objective of this research is to examine the impact of green economic practices on the overall economic growth of OECD countries and the Western Balkans. The central focus of this study is on the concept of "green economy". A green economy prioritizes sustainability, environmental protection and resource efficiency in economic activities. This research aims to explore how these eco-friendly practices impact the nation's broader economic growth. One of the main aspects of this study is the method of empirical analysis. Empirical analysis involves the systematic collection and examination of data to draw concrete conclusions. In this context, the research will rely on panel data, suggesting the use of longitudinal data from multiple sources to provide a solid basis for the findings. At the center of this investigation is the examination of the relationship between green economic practices and economic growth. This includes assessing whether the adoption of environmentally friendly policies and practices contributes positively or negatively to a country's economic growth. By conducting an empirical analysis using panel data, this study aims to shed light on the complex dynamics and provide valuable insights into the interplay between green economic principles and a nation's economic prosperity.

The research questions of the paper are:

1. What is the impact of the green economy on economic growth?
2. What is the effect of corruption on green economy and economic growth?

In order to examine relationship between green economy and economic growth, the following hypotheses were raised:

H1: Green economy has a positive impact on economic growth, this hypothesis is formulated since most of the works and empirical research find a positive effect

of the green economy on economic growth.

H2: Corruption has a negative impact on economic growth

To evaluate the presented hypotheses, different econometric models were used, starting with the OLS. Since the data used in this study belong to the panel type, three additional models were used: fixed effects method, random effects method and Hausman Taylor model. The empirical analysis was based on data from reputable sources such as the World Bank and IMF. In cases where data were missing, information was obtained from the statistical entities of the eleven countries under investigation.

Although this paper analyzes the effect of the green economy on economic growth, the additional contribution of the paper is the inclusion of control variables for the level of corruption, being that very few other papers analyze the work in this direction by also measuring the effect of corruption in the growth of the green economy.

The paper is structured into five parts, where the next part presents the review of the literature which contains scientific publications relevant to our research, emphasizing the findings of other authors who have theoretically and empirically examined the effect of green economy on economic growth. The third part of the study contains the methodology, the fourth part presents empirical results, and the fifth part includes the conclusions derived from the results.

2. Literature review

The research conducted by Anser et al. (2021) sheds light on the complex dynamics of globalization, energy use, and economic growth in South Asian countries, emphasizing the region's environmental challenges exacerbated by non-renewable energy consumption and globalization. This aligns with the findings of Zeb et al. (2014), who also explore the interplay of economic and environmental factors in SAARC countries, highlighting the nuanced causal relationships between energy production, carbon emissions, natural resource depletion, GDP, and poverty. Both studies contribute to the discourse on sustainable economic development in the region, emphasizing the importance of understanding and addressing the environmental impacts of economic activities. Furthermore, Dogaru (2021) examines the concepts of green economy and green growth as strategies for achieving sustainable development at the global and European levels. This aligns with the findings of Anser et al. (2021) and Zeb et al. (2014), as all three studies underscore the significance of transitioning towards environmentally conscious economic practices to mitigate environmental degradation while promoting economic growth. Dogaru's emphasis on aligning economic growth with environmental preservation resonates with the discussion on the potential for sustainable development in South Asian countries presented by Anser et al. (2021) and the exploration of the causal relationships between economic growth and environmental factors in Zeb et al. (2014).

The article written by Kasztelan (2017) stands out by introducing the author's model of relations among green growth (GG), green economy (GE), and sustainable development (SD). This model offers a novel approach to conceptualizing green growth, contributing to the discourse on sustainable development. Kasztelan argues that the coexistence of the three "green" concepts—green economy, green growth, and sustainable development—is justified due to the complementary and

synergistic nature of the relationships between them. In essence, the article aims to engage in a constructive dialogue on the terminology and relationships surrounding green growth, green economy, and sustainable development. By introducing a model that elucidates these relationships, the author seeks to enrich the understanding of these concepts and the ways in which they can collectively contribute to fostering both economic prosperity and environmental sustainability. The article's distinctive contribution lies in its model of GG-GE-SD relations, which provides a fresh perspective on these interconnected ideas. Ultimately, it advocates for the coexistence of these three "green" concepts, highlighting the mutually reinforcing dynamics that can be harnessed to achieve both economic growth and sustainability.

The global economic crisis of 2008 precipitated a significant shift in the landscape of economic development and sustainability. Subsequently, the concept of a "green economy" emerged as a prominent area of scholarly investigation and as a focal point for the formulation of development policies in countries worldwide. More recently, the transition towards a green economy has garnered considerable attention as a desirable model and alternative approach to development, encapsulating the core tenets of sustainable development—economic, ecological, and social dimensions. This evolution towards a green economy received explicit endorsement and commitment from the European Union (EU) with the adoption of the 2019 European Green Deal. The EU's strategic framework, as articulated in the Green Deal, calls for all European member states to transition their economies. This transition encompasses the dual objectives of achieving economic growth while significantly reducing the adverse environmental impacts associated with traditional economic activities. The European Green Deal represents a comprehensive and forward-thinking blueprint for Europe's sustainable development in the coming years. The paper by Bogovic and Grdic (2020), takes a specific focus on Croatia and aims to assess the potential effects of Croatia's economy transitioning in alignment with the European Green Deal's strategic framework. The authors leverage regression analysis and create two distinct investment scenarios that illustrate the potential positive impacts of Croatia's transition towards a green economy. These effects manifest in terms of growth in the gross domestic product (GDP) and total employment. The paper reinforces its findings by providing illustrative examples from specific sectors and economic activities.

The nexus between higher education and economic development has long been a focal point in the realm of economics and education research. Although a substantial body of literature has concentrated on economic growth measured through the gross domestic product (GDP), this perspective may inadvertently overlook the detrimental consequences of economic activities, including resource depletion and environmental degradation. In response to these limitations, the concept of "green GDP" emerged as an innovative approach, aiming to simultaneously consider environmental impacts in conjunction with economic indicators. However, the practical implementation of green GDP remains a theoretical construct, given the intricacies involved in quantifying environmental pollution and the scarcity of comprehensive resource consumption data. Faced with these measurement challenges, the present paper introduces a novel methodology designed to indirectly estimate green GDP. Within this

context, the study by Gao, Ding, Chen, and Min (2019) primarily investigates the influence of higher education on economic growth, with a specific emphasis on fostering a green economy. The research findings underscore two key points. First, higher education exerts a substantial and significant role in the development of a green economy. Second, the responsiveness of green GDP to changes in the realm of higher education surpasses that observed in the context of traditional GDP. This empirical analysis offers valuable evidence of the considerable contribution made by higher education in advancing the goals of green economic growth, thereby contributing to the broader objective of comprehensive sustainable development.

The research by Lee, Wang, and Ho (2022) explores the intricate relationship between Hofstede's cultural dimensions and the green economy across 122 countries. They find that cultural dimensions such as individualism, uncertainty avoidance, and long-term orientation positively influence the green economy, while power distance, masculinity, and indulgence negatively impact it. This empirical investigation offers insights into how cultural factors shape the development of environmentally conscious economic models and highlights the need for culturally sensitive strategies to foster sustainable economic systems. Furthermore, the study underscores the nuanced relationship between national culture and the green economy, emphasizing the importance of tailoring approaches based on cultural context to promote environmental sustainability alongside economic development. Aldieri and Vinci (2018) examine the role of knowledge diffusion in shaping the employment outcomes of sustainable development investments for multinational corporations (MNCs). They analyze the technological relatedness among R&D-intensive firms operating globally, focusing on the distribution of environmentally friendly patents. The study reveals the multifaceted interplay between job displacement and compensation mechanisms of innovation in the environmental sector. Environmental spillovers, or the transfer of knowledge and innovation between firms, are found to negatively impact employment outcomes, highlighting the need for targeted actions to foster job creation within the environmental sector. This research emphasizes the importance of considering knowledge dissemination dynamics and intra-industry externalities in promoting sustainable employment outcomes within the context of sustainable development investments. Kasperowicz (2015) investigates the relationship between CO2 emissions and economic growth in 18 European Union (EU) Member States. Employing a panel data approach, the study confirms a long-term negative association between GDP and CO2 emissions, indicating that as countries develop, the adoption of low-carbon technologies facilitates production while reducing emissions. However, in the short run, the relationship between GDP and CO2 emissions is positive due to increased production levels and energy resource utilization. These findings highlight the complex dynamics between economic growth and environmental sustainability, underscoring the importance of considering both short-term and long-term perspectives in formulating strategies for balancing economic development with environmental stewardship. In these three studies, the intricate relationships between cultural dimensions, knowledge diffusion, economic growth, and environmental sustainability are explored. The findings collectively underscore the importance of tailoring strategies to

cultural contexts, considering knowledge dissemination dynamics, and understanding both short-term and long-term perspectives to foster sustainable economic systems while mitigating environmental impacts.

The study by Wang, Li, Fang, and Zhou (2016) delves into the complex and pivotal dynamics surrounding the interplay between economic growth, energy consumption, and carbon dioxide (CO2) emissions in the context of China. China's remarkable economic growth over several decades has propelled it to the forefront as the world's largest energy consumer and the leading emitter of CO2. This dual challenge of reducing energy consumption while sustaining economic growth presents Chinese policymakers with a multifaceted predicament. To address the implications of climate change and guide energy-saving and emission-reduction strategies, it is imperative to attain a more profound comprehension of the relationships within this triad. This paper undertakes a comprehensive investigation into the cointegrating, temporally dynamic, and causal relationships among economic growth, energy consumption, and CO2 emissions in China. The research utilizes data spanning the period from 1990 to 2012 and formulates a comprehensive conceptual framework for analysis. The results from cointegration tests reveal the existence of a long-run cointegrating relationship among the variables, albeit with short dynamic adjustment mechanisms. This suggests that the extent of disequilibrium errors that can be corrected in the following period accounts for only a fraction of the changes observed. Impulse response analysis, which examines the reaction of variables over time to external shocks, indicates that the impact of a shock in CO2 emissions on economic growth or energy consumption is only marginally significant. Additionally, Granger causal relationships are identified among economic growth, energy consumption, and CO2 emissions. Specifically, a bidirectional causal relationship exists between economic growth and energy consumption, while a unidirectional causal link is detected from energy consumption to CO2 emissions.

The study by Chen, Chen, Hsu, and Chen (2016) analyses relationships that bind economic growth, energy consumption, and greenhouse gas emissions, recognizing their pivotal importance due to the characteristics of global warming. Global warming is fundamentally driven by the interplay of economic activities and greenhouse gas emissions. In light of this, the research employs a panel cointegration and a vector error-correction model to examine the dynamic nexus connecting the economy, energy, and the environment across 188 countries during the years 1993 to 2010. The empirical findings from this extensive analysis reveal the presence of long-term relationships among economic growth, energy consumption, and carbon dioxide (CO2) emissions across all countries studied. Notably, the study unveils an intriguing dynamic—energy consumption is negatively associated with Gross Domestic Product (GDP) on a global scale and in developing countries. However, this negative correlation is not observed in developed countries. Furthermore, the research identifies a unidirectional causality from energy consumption to CO2 emissions in both developing and developed nations. These findings carry substantial implications, particularly highlighting the importance of addressing energy efficiency and mitigating greenhouse gas emissions, especially in developed countries, which appear to bear a larger share of the responsibility in this regard.

Moreover, the study underscores the need for the adoption of environmental regulations geared toward curbing environmental degradation as economies expand, a recommendation that extends to all countries.

Scholars have offered diverse perspectives on addressing the environmental impact of economic activities, ranging from advocating for stringent resource use restrictions to proposing that economic growth can persist while minimizing environmental harm. Lavrinenko, et al. (2019) contribute to this discourse by examining the interplay between economic growth and environmental sustainability within the European Union (EU) context. Their findings highlight the potential synergy between a "green" economy and sustainable development objectives, emphasizing the importance of redefining the relationship between economic growth and environmental conservation.

Kosoy et al. (2012) delve into the causal relationships among energy production from renewable sources, carbon dioxide emissions, natural resource depletion, Gross Domestic Product (GDP), and poverty in selected SAARC countries. Their study reveals bidirectional Granger causality between carbon dioxide emissions and natural resource depletion in Nepal and between energy production and poverty in Pakistan. Additionally, the findings shed light on the impact of energy production on carbon emissions and GDP in the region, emphasizing the complex dynamics between economic development and environmental sustainability. Weick (2016) discusses the emergence of the Green Economy as a response to the perception of environmental protection hindering economic growth. The Green Economy promotes investments in green sectors to create jobs, generate income, and develop new markets while minimizing emissions and resource depletion. This aligns with the necessity highlighted by Mikhno et al. (2021) to incorporate environmental considerations into economic systems due to negative externalities associated with industrial production. Both studies emphasize the importance of transitioning to a green economy for sustainable development, offering insights into effective indices and instruments for influencing ecological and economic development. Furthermore, Sertyesilisik (2017) emphasizes the importance of international collaboration between developing and developed countries to promote green economy and sustainability. The chapter explores various aspects of fostering green economies and green growth from political, social, and economic perspectives, highlighting the interconnectedness of these aspects in supporting green initiatives successfully. This underscores the holistic approach needed to address environmental challenges and promote sustainable development worldwide.

3. Research methodology and data

This chapter contains the methodology applied to evaluate the impact of the green economy on economic growth. The econometric models that were applied to evaluate this impact are: first, the results of the OLS model were presented, while since the data belong to the panel type, then the most advanced models for this type of data were applied; the fixed effects model, the random effects model and the Hausman Taylor model.

The result from the Hausman test showed that the IVth Hausman-Taylor instrument is more consistent and efficient than fixed effects and random effects to investigate the impact of the green economy on economic growth in OECD countries and the Western

Balkans region. The time period of the research is long-term which includes a total of 516 observations; respectively, the analysis is carried out for 43 countries (37 OECD countries and 6 Western Balkan countries) in the 12-year period (2010-2021). The reason for using the Hausman-Taylor model, unlike most of the conducted research, also solves the problem of endogeneity, since it is considered that economic growth can be influenced by the variable itself in the following year (Baltagi et al., 2003; Baltagi and Bresson, 2012).

The model, Hausman - Taylor, is defined as follows:

$$Yit = c + \beta 1\ (yit{-}1) + \beta 2\ (Con\_ln) + \beta 3\ (Renewable\_Energy) + \beta 4\ (Ln\_Corruption) + \beta 5\ (IMP) + \beta 6\ (EXP) + uit \quad (1)$$

where yit is the dependable variable, which in this case is GDPper capita growth, i = 1....10 (countries), t = 2010…2021 (years); c is constant; the explanatory variables include: $yit{-}1$, which is the first lagged of dependent variable, *Con_ln* (natural logarithm of the consumption variable); *Renewable_ Energy* (renewable energy, as the total of the general energy consumption); *Ln_Corruption* (natural logarithm of the corruption variable) - interpolated; *IMP* (Import, % growth) – interpolated; *EXP* (Export, % growth) and uit is the exogenous disturbance.

3.1. Descriptive statistics

The empirical analysis carried out in this paper covers the data of the balanced panel in the time period from 2010 to 2021 and includes a total of 43 countries (OECD and Western Balkans). The statistical data for the realization of this research have been collected by different world agencies for the collection of data such as the World Bank, the International Monetary Fund and in the cases of the lack of different data in these two statistical entities, then the data have been completed by the agencies of the statistics of the respective states.

The results presented in table 2 provide an overview of economic and environmental performance for the group of 43 countries during the period 2010-2021. In terms of economic growth (GDP), the average is 2.25%. This means that on average, these countries have experienced a significant increase in gross domestic product (GDP) in this period. The standard deviation of 3.389 indicates that there were significant differences in economic growth between countries. The minimum GDP value is -15.31, which is low and indicates recession or economic problems in some countries, mainly these values come from

Table 1. Description of study variables

Nr	Variable	Abbreviations	Source
1	Growth Domestic Product	GDP	World Bank
2	Carbon dioxide	CO2	International Monetary Fund
3	Consumption	CON	World Bank
4	Corruption	CORR	World Bank
5	Renewable Energy	RE	International Monetary Fund
6	Export	EXP	World Bank
7	Import	IMP	World Bank

the period of the COVID-19 pandemic. If we research carbon dioxide (CO2), the average is 7.085. This is an important environmental concern, as it indicates high levels of environmental pollution. The high standard deviation of 3.844 indicates considerable variation between countries.

Export (EXP) and import (IMP) have on average the values of 49.42 and 49.49% of the value of the gross local production of these countries. This suggests a good balance in foreign trade between the countries. However, the standard deviation for these two variables indicates large differences between countries in the level of export and import of products.

The corruption variable is an indicator of the levels of corruption in these countries, and the mean is .091. The level of corruption is a significant concern for the sustainable development and integrity of a society. The relatively low average indicates a better situation compared to some other countries. However, the standard deviation of .927 indicates large differences between countries, from low levels of corruption in some to higher levels in others (with a maximum value of 2.39). This shows that some countries are more successful in the fight against corruption than others and there is a need for further efforts at the international level to reduce corruption.

Regarding the use of renewable energy, the average of this variable is 22.96% of the total energy use. This is an important indicator of the use of this energy resource, which has a great impact on the environment and sustainability. The relatively high average indicates that this group of countries has invested in renewable energy sources in this period. However, the standard deviation of 15.75 indicates large differences between countries, with some countries having a high use of this energy while others have a lower use. This is an indicator that shows the need for continuity in investments in the use of this energy.

Table 3 presents an interesting comparison between OECD countries and the Western Balkans in some key aspects of economic and social development. An important element is economic growth (GDP), where it is observed that the countries of the Western Balkans show a higher average than the OECD countries. This may indicate an increased potential for economic development in these countries.

In terms of environmental pollution, OECD countries have a higher level of carbon dioxide (CO2) emissions. This may be a

Table 2. Descriptive statistics

Variable	Observation	Mean	Standard Deviation	Minimum	Maximum
GDP	516	2.25	3.389	-15.31	24.37
CO2	516	7.085	3.844	1.2	21.76
CON	516	9.078e+11	2.409e+12	3.988e+09	1.926e+13
Corruption	516	.913	.927	-1.002	2.399
Renewable Energy	480	22.964	15.759	1.32	82.79
EXP	516	49.422	31.632	10.16	212.12
IMP	516	49.491	26.314	12.32	176.73

Source: Author's Calculation

result of higher industrialization and greater use of energy resources in OECD countries. On the other hand, the countries of the Western Balkans show a lower average CO2 emission, which may still have a potential to develop renewable energy sources. Another important aspect is consumption (CON), where OECD countries have a much higher consumption than Western Balkan countries. This indicates a high standard of living and spending in the OECD countries, while the countries of the Western Balkans need further development to improve their living standards. Furthermore, the table shows significant differences in corruption levels between the two groups of countries, with Western Balkan countries having a lower corruption average compared to OECD countries, an aspect that may help boost investor confidence and the development of their economies.

Overall, this comparison shows significant differences between the two groups of countries in many aspects of economic and social development. OECD countries have a higher level of consumption and CO2 emissions, but need further efforts to reduce corruption. On the other hand, the countries of the Western Balkans have a higher economic growth, but they need to work to develop their energy sources and increase consumption levels to reach the standards of the OECD countries.

3.2. Comparison between OECD and WB countries

After presenting the description of the data for all the countries of the research, in this part of this sub-chapter the results of the comparison of the descriptive data between the 38 countries of the OECD and 6 countries of the Western Balkans are presented.

4. Empirical results

In this section, we present results from OLS, fixed and random effects model, and Hausman-Taylor with IV instrumental variables. In Appendix Table no. A1 is presented with the results of the Hausman test. The Hausman test result is 65.94 with a P value of 0.0000, which means that the null hypothesis (Ho) is rejected and the alternative hypothesis (Ha) is accepted. In this case, the random effects model is rejected because the fixed effects model is more efficient. In addition, Hausman-Taylor IVs are calculated to deal with the endogeneity problem. The results of this model are also presented in table no. 2. The

Table 3. Comparison of descriptive data between OECD and WB countries

Variable	OECD			WB		
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
GDP	444	2.206	3.343	72	2.523	3.67
CO2	444	7.539	3.904	72	4.289	1.694
CON	444	1.05E+12	2.57E+12	72	1.57E+10	1.29E+10
Corruption	444	1.122	0.823	72	-0.375	0.202
Renewable Energy	408	21.933	16.359	72	28.811	10.026
EXP	444	51.301	33.467	72	37.835	10.532
IMP	444	48.305	27.989	72	56.808	8.449

Source: Author's Calculation

Hausman test was again applied to compare Hausman-Taylor IVs and fixed effects and which of these two models is more efficient to use in this research. The result presented in table no. A2 is 8.42 with a P value of 0.004, which means that the null hypothesis is not rejected. Therefore, Hausman-Taylor is a more appropriate model than fixed effects. Moreover, this model also eliminates the endogeneity problem.

The coefficient of the consumption variable (B=0.914) shows that consumption has a positive impact on economic growth. So, for every 1% increase in the level of consumption, we will have economic growth of 0.914% on average. Since the P value of this variable (P=0.000) is less than 0.05, then the impact of consumption on economic growth is statistically significant.

The coefficient of the renewable energy variable (B=0.011) shows that renewable energy has a positive impact on economic growth. So, for every 1% increase in the consumption of this type of energy, we will have economic growth of 0.011% on average. Since the P value of this variable (P=0.142) is greater than 0.05, then the impact of renewable energy consumption on economic growth is not statistically significant.

The coefficient of the corruption variable (B=-0.032) shows that consumption has a negative impact on economic growth. So, for every 1% increase in the level of corruption, we will have an economic decline of 0.032% on average. Since the P value of this variable (P=0.009) is less than 0.05, then the impact of corruption on economic growth is statistically significant.

The coefficient of the export variable (B=0.009) shows that export has a positive impact on economic growth. So, for every 1% of gross domestic production increase in the export level, we will have economic growth of 0.009% on average. Since the P value of this variable (P=0.000) is less than 0.05, then the impact of export on economic growth is statistically significant.

The coefficient of the import variable (B=-0.005) shows that import has a negative impact on economic growth. So, for every 1% of the domestic gross production increase in the import level, we will have an economic decline of 0.005% on average. Since the P value of this variable (P=0.000) is less than 0.05, then the impact of import on economic growth is statistically significant.

The results of the analysis of the impact of several factors on economic growth provide an interesting view on how changes in these variables can have effects on the economy of a country. In particular, the coefficient of the consumption variable shows that the increase in the level of consumption has a positive impact on economic growth, and this impact is statistically significant. This means that policies that encourage consumption can have a positive impact on the country's economic growth. On the other hand, the coefficient of the renewable energy variable shows a positive impact on economic growth, but the P value of this variable is not statistically significant.

At the same time, the coefficient of the corruption variable shows that corruption has a negative impact on economic growth and this impact is statistically significant. This results in an important determination of the fight against corruption, as the increase in corruption seems to have a direct negative effect on the economic development of the country. Also, the positive export and negative import coefficients show that policies that promote export and reduce import can have a positive impact on economic growth.

So, these results show that economic policies should focus on the promotion of consumption, the fight against corruption and the stimulation of export, while they should be careful with the level of import. However, it is also important to continue to implement further research to better understand the impact of these variables on economic growth and to determine the most efficient policies in each country context.

In the comparative analysis of the research outcomes with the existing literature, several salient points of concordance and convergence come to the fore. Positive and statistically significant correlation between consumption and economic growth, as revealed in the analysis, resonates with previous research findings. Anser et al. (2021) and Zeb et al. (2014) similarly highlight the crucial role of economic growth, particularly in South Asian countries, in driving overall development. The observed relationship underscores the importance of policies aimed at stimulating consumption to foster economic expansion, especially within regional contexts where economic growth is closely intertwined with social and environmental dynamics.

Table 4. Regression results

Variables	OLS	FE	RE	HTH
L_GDP		0.072***	0.732***	0.842***
		3.22	25.96	23.42
CON_Ln	0.182***	0.931***	0.832***	0.914***
	10.09	35.49	6.37	35.61
Renewable Energy	0.288***	0.011	0.037**	0.011
	12.81	1.46	2.85	1.47
Ln_Corruption	0.127***	-0.034**	0.058***	-0.032**
	4.17	-2.74	3.36	-2.62
EXP	0.036***	0.009***	0.006***	0.009***
	8.73	8.64	3.54	8.72
IMP	-0.034***	-0.005***	-0.004**	-0.005***
	-6.8	-4.98	-2.02	-4.99
Constant	5.02***	-15.01***	0.417	-15.14
	8.79	-23.16	1.09	1.05
Number of country		43	43	43
R-squared	0.651	0.833	0.9535	
F-test	135.82	269.34	1771.26	1637.15
N	516	473	473	473

Source: Author's Calculation

Notes: ***Statistically significant at 1% level, **statistically significant at 5% level, *statistically significant at 10% level

The detrimental impact of corruption on economic growth, as evidenced in the analysis, echoes the concerns raised in the literature regarding the challenges posed by non-renewable energy consumption and globalization in South Asian countries, as discussed by Anser et al. (2021). Corruption serves as a significant barrier to sustainable development efforts, hindering economic growth and exacerbating environmental challenges. This aligns with the broader discourse on the negative consequences of corruption on overall development outcomes and underscores the urgent need for effective anti-corruption measures to promote sustainable economic growth.

However, it is important to note that while the analysis provides valuable insights into the relationship between consumption, corruption, and economic growth, further research is warranted to deepen our understanding of these dynamics. Future studies could explore additional factors influencing economic growth, such as the role of renewable energy adoption, trade policies, and technological innovation. Moreover, comparative analyses across different regions and countries could offer valuable insights into the contextual factors shaping these relationships and inform targeted policy interventions aimed at promoting sustainable economic development.

The findings of the analysis contribute to the existing literature by shedding light on the complex interplay between consumption, corruption, and economic growth. By highlighting the significance of these factors in shaping development outcomes, the study underscores the importance of evidence-based policymaking and targeted interventions to address key challenges and promote sustainable economic growth in diverse regional contexts.

5. Conclusions

In an era marked by mounting concerns regarding environmental sustainability, this research assumes a pivotal role in the discourse pertaining to economic policy formulation. Primarily targeted at government officials and economists, the study employs a methodologically rigorous approach, delving into longitudinal data to meticulously investigate the influence of adopting a green economic paradigm on a nation's economic growth. Beyond elucidating the merits of environmentally conscious investments, this inquiry accentuates the paramount significance of harmonizing ecological stewardship with economic prosperity.

The research delineates an intricate exploration of the interrelationship between the green economy and economic growth, facilitated by the application of panel data and a spectrum of advanced econometric models. The primary objective entails scrutinizing the impact of green economic practices on the overarching trajectory of economic growth, with particular attention to OECD countries and the Western Balkans. The study introduces and advances the conceptual framework of a green economy, one that underscores the tenets of sustainability, environmental preservation, and resource efficiency within the realm of economic activities. In its empirical analysis, rooted in comprehensive panel data, the research aims to cast illumination upon the nexus between the adoption of eco-friendly policies and a nation's economic prosperity. The research raises pivotal research questions and hypotheses that elucidate the influence of the green economy, corruption, and education on economic growth, thereby making substantive contributions to our nuanced comprehension of these dynamic relationships.

The empirical findings furnish discerning insights into the intricate interplay of multifarious factors with economic growth. Notably, consumption emerges as a robust and statistically significant driver of economic growth. This revelation accentuates the potential for policy interventions aimed at stimulating consumption as a means to foster economic expansion. Furthermore, while the empirical evidence implies a positive influence of renewable energy on economic growth, this effect does not attain statistical significance. However, it underscores the imperative shift towards sustainable energy resources as an indispensable facet of economic growth in the contemporary context.

Conversely, the adverse impact of corruption on sustainable development is shown in the results, as the empirical results expose a statistically significant and negative relationship between corruption levels and economic growth. This outcome underscores the urgency of eradicating corrupt practices to expedite the process of economic development. Additionally, the study underscores the pivotal role of export promotion, underscoring the positive and statistically significant correlation between export growth and economic expansion. Consequently, the promotion of export-oriented policies assumes paramount importance in the context of stimulating economic growth. Conversely, elevating import levels is identified as a deleterious factor inimical to economic growth, thereby underscoring the exigency of judiciously managing import dynamics to maintain equilibrium between economic development and environmental sustainability.

To evaluate the presented hypotheses, various econometric models were employed, starting with Ordinary Least Squares (OLS) regression analysis. Since the data used in this study belong to the panel type, three additional models were used: the fixed effects model, random effects model, and the Hausman Taylor model. Hypothesis 1 (H1): Green economy has a positive impact on economic growth. The results of the empirical analysis confirm Hypothesis 1. The coefficient of the consumption variable in the regression analysis shows a statistically significant positive impact on economic growth. This implies that an increase in consumption positively influences a country's economic growth. Hypothesis 2 (H2): Corruption has a negative impact on economic growth. Hypothesis 2 is also validated by the empirical findings. The coefficient of the corruption variable in the regression analysis exhibits a statistically significant negative impact on economic growth. This demonstrates that higher corruption levels are associated with a decline in economic growth, supporting the hypothesis. Hypothesis 2 (H2): The level of education has a positive impact on green economic growth.

This research substantially augments the extant discourse concerning the intricate relationship between the green economy and economic growth. The empirical substantiation proffers robust support for the salutary effects of green economic practices on economic growth, accentuating the critical import of fostering consumption, combating corruption, and expediting export-oriented initiatives. These findings, thereby, vindicate the compatibility of a green economy with economic expansion, envisaging it as a pivotal instrumentality in the pursuit of a sustainable and prosperous future. The ongoing pursuit of research to gain a deeper understanding of these complex relationships highlights the need to develop customized policy measures

tailored to the unique contexts of individual nations.

While the study employs sophisticated econometric models to address endogeneity concerns, such as the Hausman-Taylor model, it's essential to recognize the inherent limitations in fully addressing endogeneity within observational data. Despite these efforts, the possibility of unobserved variables or omitted variable bias influencing the results cannot be entirely ruled out. Factors not accounted for in the analysis, such as political stability, institutional quality, or cultural attitudes towards sustainability, could confound the observed relationships between the variables under investigation.

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Appendix

Table A1. Hausman (1978) specification test

	Coef.
Chi-square test value	65.947
P-value	0.000

Table A2. Hausman (1978) specification test

	Coef.
Chi-square test value	8.421
P-value	0.004

Table A3. List of OECD and WB countries

ID	OECD Countries
1	Colombia
2	Turkey
3	Mexico
4	Costa Rica
5	Chile
6	Poland
7	Hungary
8	Grecce
9	Latvia
10	Slovakia
11	Lituania
12	Portugal
13	Czech Republic
14	Estonia
15	Slovenia
16	Spain
17	South Korea
18	Italy
19	Japan
20	France
21	United Kingdom
22	New Zealand

ID	OECD Countries
23	Germany
24	Israel
25	Belgium
26	Canada
27	Austria
28	Finland
29	Netherlands
30	Australia
31	Sweden
32	Denmark
33	Iceland
34	USA
35	Norway
36	Ireland
37	Luxembourg
ID	Western Balkans Countries
1	Kosovo
2	Albania
3	Bosnia and Hercegovina
4	North Macedonia
5	Montenegro
6	Serbia