sustainability

MDPI

Article

A Panel Analysis Regarding the Influence of Sustainable Development Indicators on Green Taxes

Claudia Diana Sabău-Popa *, Alexandra Maria Bele, Mirela Bucurean, Sorina Ioana Mociar-Coroiu and Naiana Nicoleta Tarcă

Faculty of Economic Sciences, University of Oradea, 410001 Oradea, Romania; lacatusalex@yahoo.com (A.M.B.); mbucurean@gmail.com (M.B.); sorina_coroiu@yahoo.com (S.I.M.-C.); naianatarca@gmail.com (N.N.T.)
* Correspondence: dianasabaupopa@yahoo.ro; Tel.: +40-741-206-643

Abstract: Green taxes are taxes collected to protect the environment by controlling the negative effects of certain activities and products on the environment. They are also an instrument of environmental policy and can therefore contribute to several sustainable development goals. According to the studies carried out, the green economy aims to ensure sustainable development. The main objective of this paper is to identify the existing relationships between green taxes and sustainable economic development through a dynamic panel analysis. A dynamic panel analysis was therefore carried out on the existing links between environmental taxes and charges at the European level and the indicators of the circular economy. The results of the two dynamic regressions for the two dependent variables, namely total green taxes and energy taxes, show a positive and significant correlation with the variation of GDP and with primary energy consumption, confirming the hypothesis that environmental taxes and energy taxes are closely linked to these two important indicators of sustainable development. Thus, as GDP changes, the taxes on energy production and the energy products used in both transport and stationary applications increase. As a result of the analysis, we can note that the increase in primary energy consumption and the consumption of raw materials leads to an increase in environmental and energy taxes. Energy taxes are a possible solution to reduce CO_2 emissions in third world countries and may even stimulate climate action. In contrast, we found no significant correlation between green taxes and the following variables: Human Development Index, net greenhouse gas emissions, private investment and gross value added related to circular economy sectors, the consumption of raw materials, waste generated, waste treatment, the supply, transformation, and consumption of renewable energy, public expenditure on environmental protection, and climate-related economic losses.

Keywords: green taxes; sustainable development; environmental protection; dynamic panel data model; energy taxes; GDP; primary energy consumption

check for updates

Citation: Sabău-Popa, C.D.; Bele, A.M.; Bucurean, M.; Mociar-Coroiu, S.I.; Tarcă, N.N. A Panel Analysis Regarding the Influence of Sustainable Development Indicators on Green Taxes. *Sustainability* **2024**, *16*, 4072. https://doi.org/10.3390/su16104072

Academic Editor: Claudio Sassanelli

Received: 28 March 2024
Revised: 5 May 2024
Accepted: 9 May 2024
Published: 13 May 2024

1. Introduction

Recently, due to the increasing pollution, environmental protection, and sustainable development have become priority 0 issues. Governments are under pressure to try to find ways to minimize environmental damage while reducing the negative impact of natural resource exploitation and the use of energy. In response to this immense pressure, countries are applying a variety of economic tools to achieve sustainable economic development and environmental conservation goals. Among these, green taxes have become the most significant and prosperous financial instrument in climate change and the fight for environmental conservation [1–3]. According to several authors, they are also known as environmental taxes, eco-taxes, climate taxes, ecological taxes, and environmental taxes [1,4,5].

The concept of green taxes describes taxes levied to protect the environment. They can control the negative effect of certain activities and products on the environment, being an instrument of environmental policy. These green taxes not only reduce pollution but also do so in efficient and cost-effective ways [6]. Green taxes are effective tools for achieving environmental goals, because they are mandatory, and otherwise economic agents can be punished with additional fines [7].

Environmental taxes are green financial instruments "whose taxable base is a physical unit that has a proven specific negative impact on the environment. Four subsets of environmental taxes are distinguished: energy taxes, transport taxes, pollution taxes, and resource taxes" [8]. Green taxes are guided by four principles that are the results of various discussions on climate change issues as well as environmental protection: the polluter pays principle, the prevention principle, the precautionary principle, and the responsibilities principle [9,10]. The polluter pays principle means that the person or company that causes environmental pollution must pay for the damage that they have caused.

Kumar et al. [11], who explore in their study the field of green finance and the circular economy through the analysis of specialized literature, find that green finance supports sustainable development, and prevents and limits the effect of climate change, through investments in the circular economy. Kumar et al. [12] show in their study that for the comprehensive approach to global problems such as global warming or the depletion of natural resources, which demand the transition to sustainable development, the large-scale use of green finance is mandatory.

Green taxes can help boost the support for sustainable economic growth and generate more tax revenue for the economy. While economic incentives are relatively favorable for playing a vital role in the business cycle, green taxes have been introduced as a key instrumental factor in limiting CO_2 emissions and mitigating climate change [13].

Taking into account the results of previous studies, the main objective of this paper is to analyze the impact of GDP, energy consumption, CO_2 emissions, and raw material consumption on green taxes in European countries, highlighting the fact that the level of sustainable development of the country directly influences the level of green taxes. Thus, a dynamic panel analysis was carried out regarding the existing links between green taxes at the European level and the indicators of sustainable development.

The innovative elements of our study are given via the realization of two dynamic regressions, with unique variables, and by highlighting the significant correlation between green taxes and GDP variation, respectively, and primary energy consumption. Also, the originality is given by the unique approach and the combination of variables used.

The research paper is structured as follows: Section 2 presents a brief specialized literature review on the existing correlation between green taxes and sustainable development. Section 3 presents the data, the research methodology, and the empirical results obtained. Section 4 discusses the results and Section 5 presents the conclusions based on the analysis conducted, its limitations, and future research.

The analysis carried out led to the finding that green taxes have a close connection with two important indicators of sustainable development: GDP and primary energy consumption.

2. Literature Review

In the analysis of the specialists' interest in investigating the existing correlation be-tween green taxes and sustainable development, we used the Web of Science Core Collection (WOS) data collection, for the selection of articles to be included in the analysis, on the topic of green taxes and sustainable development.

Figure 1 shows the quantitative evolution of the number of papers written on the topic: of green taxes and sustainable development, the interest of researchers doubled in the last 3 years. The countries with the most papers published on the topic of green taxes and sustainable development are China (175 documents), the USA (41 documents), Pakistan (27 documents), England (24 documents), India (23 documents), Italy (19 documents), and Ukraine (17 documents). There is little research on the correlation between green taxes and sustainable development in Europe, which is why we conducted this empirical study.

Figure 1. Evolution over time of interest in the concepts of green taxes and sustainable development. Source: processed by the authors based on Web of Science Core Collection data.

A visual depiction of the network of keywords frequently found in studies on green taxes and sustainable development can be found in Figure 2. Each keyword in this network is represented by a node, and the size of the node reflects how frequently that keyword appears across several research studies. When two keywords occur together in a research study, a line is drawn between them; the thickness of the line shows how many times the keywords occur together. Additionally, the network's nodes are color-coded to indicate which groups they are a part of. The main findings that can be deduced from the visualization map of the correlation network between the keywords indicate that 18 items were recorded and grouped into three clusters, which generated 617 connections, with powerful total links of 2165.

The keywords grouped in the three resulting clusters are as follows:

- Cluster 1—red, with eight items, centered around the key concept of energy, connected with the keywords as follows: management, impact, performance, sustainability, China, emissions, and carbon tax.
- Cluster 2—green with six items, centered around the concept of sustainable development, which includes the following keywords: policy, model, technology, growth, innovation, etc.
- Cluster 3—blue with four items, centered around the concept of CO_2 emissions, connected with the following keywords: economic growth, consumption, renewable energy.

The specialized literature of recent years has highlighted that taxes related to the environment or energy can be considered as a double dividend for the government. First, the state can use such taxes to achieve energy efficiency and environmental goals [14,15]. Second, governments can recycle environmental taxes and use them for various economic activities: tourism, health, education, development projects, etc. [16,17]. For example, energy taxes include those levied on products used in the transportation sector and electricity generation, such as natural gas and fossil fuels, among others. A part of policy initiatives, i.e., green taxes, aims to achieve certain environmental objectives, such as encouraging the adoption of cleaner and cost-effective energy sources, promoting sustainable industry and greener initiatives and behaviors, as well as discouraging the use of certain energy sources [1,18,19].

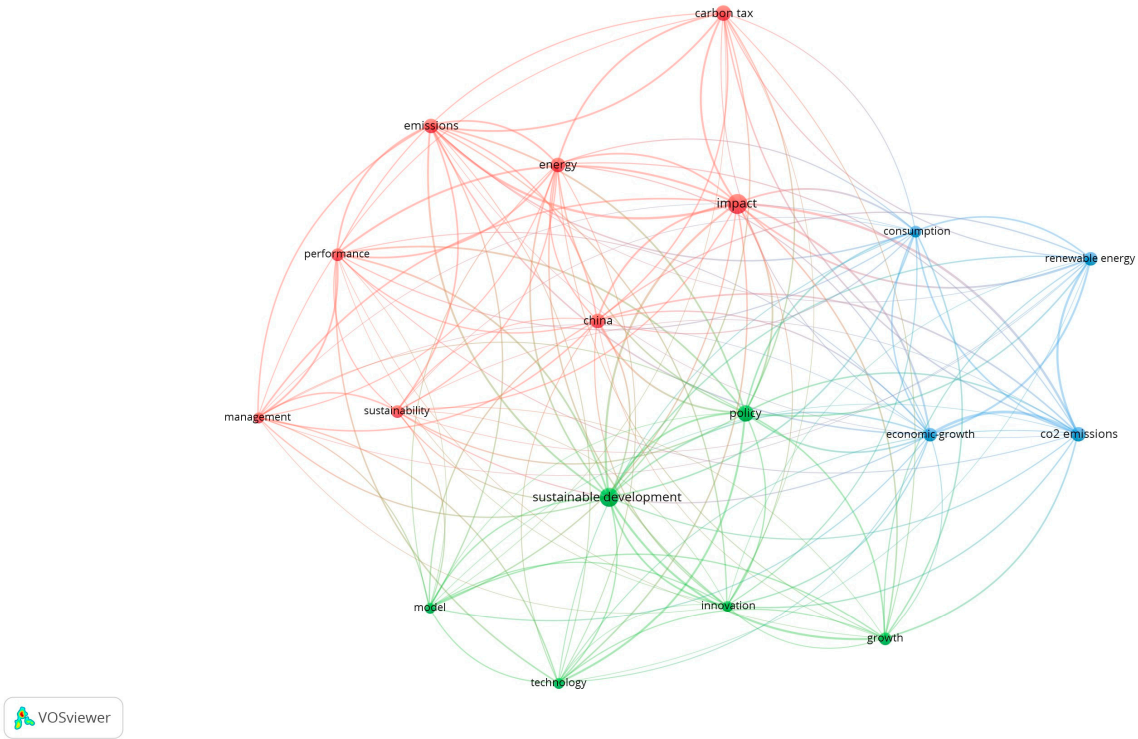

Figure 2. Co-occurrence of keywords. Source: processed by VOS viewer authors, version 1.6.19.

With the implementation of environmental taxes, firms and the corporate sector are left with two options: to use non-renewable sources for commercial activities and pay taxes related to CO_2 emissions, as well as to transform technology to renewable sources to avoid taxation [13,20,21].

Specialists emphasize the significance of green taxes in strengthening the serious consequences of environmental pollution, arguing that government authorities should impose high taxes on carbon-containing products and abandon private organizations for established businesses that use non-renewable energies. Thus, an organized fiscal framework will require the minimization of fossil fuel consumption and the promotion of low-emission vehicles [22]. Environmental taxes, according to the World Bank [23], create a triple win for fiscal policy: the additional tax revenues generated, the improvement of the efficiency of the tax system, and the reduction of the need to raise conventional taxes to finance public spending to address the same social costs. The European Green Deal pledged to create the context for broad fiscal reforms at the national level, remove fossil fuel subsidies, including in the maritime and aviation sectors of the ETS, and shift the tax burden from labor to pollution while taking social considerations into account [24,25].

A lot of research has already shown that environmental taxation contributes to several Sustainable Development Goals (SDGs). Environmental tax reforms can have multiple collateral benefits, in addition to reducing gas emissions [26–33]. For example, reductions in fossil fuel consumption due to fuel or carbon excise decrease local air pollution, contributing to SDG3 (health and well-being) and SDG15 (on life and land). Similarly, there is evidence of the impact of petrol/diesel taxes in controlling the growth of petrol/diesel motor vehicles, thereby reducing road congestion and road accidents, thus supporting the achievement of SDG11 (Sustainable Cities and Communities). There is also growing evidence that environmental taxes can raise revenue at a lower cost to the economy than some conventional taxes. For example, using carbon and fuel taxes instead of wage taxes can reduce the underground economy and support formal employment, influencing SDG8 (decent work and economic growth) [32–34].

Green taxes and fiscal and environmental policy measures are seen as key factors in mitigating climate change. In their study, the authors [35] analyzed the dynamics between environmental taxes and ecological sustainability for the period from 1995/Q1 to 2018/Q4 using data from the top seven green economies by using Quantile-on-Quantile regression. The results of the study indicate the mixed and asymmetric impact of green taxes on eco-logical sustainability.

The study led by the authors, Wang, Tang, and Boamah [36], identifies the correlations between environmental governance and happiness and highlights the influence of environmental governance on happiness, using Levinson's econometric model. The results of the study show us that as follows: environmental governance can significantly improve happiness and indirectly affect happiness through green taxes, which leads us to the conclusion that environmental governance and the construction of ecological civilization should be strongly promoted; green taxes can significantly increase happiness, so green taxes should be promoted and reformed; and income, regional, and educational heterogeneity exists in the direct and mediating effects of environmental governance on happiness.

It has already been proven that green taxes can help developing countries achieve a low-carbon transformation while supporting an inclusive and equitable growth path. The environmental tax reforms can improve social equality, especially in lower-income countries (SDG1 and SDG 10). First, this is because wealthier urban households consume more energy [37], and second, because the structural change generated by green taxes can in-crease the intensity of the force of production labor [38] and increase the relative profitability of labor [39].

3. Correlations between Green Taxes and Sustainable Development—Empirical Evidence from European Countries

This paper aims to contribute, through empirical analysis, how green financial instruments, namely environmental taxes and fees, influence sustainable economic de-velopment at the level of the European Union. It is essential to understand this relation-ship because it sheds light on whether the use of taxes as a tool for environmental policy affects economic growth positively or negatively. The importance of environmental taxes and strict environmental policies as means of addressing environmental degradation is increasingly recognized. The study conducted in this paper examines the relationship be-tween environmental tax revenues and sustainable development indicators.

Green taxes have the potential to alleviate the burden of other tax heads including corporation, employment, profit, and value-added taxes by promoting sustainable growth and increasing the tax revenue for the economy. Because of lower economic activity, business closures and layoffs, and lockdown measures during the COVID-19 epidemic, the revenue from other taxes fell. As a result, green taxes can encourage revenue mobilization to support government spending, economic growth, and the achievement of the SDGs.

We sought to highlight the close link between green taxes, represented by total environmental taxes, and sustainable development. The data set analyzed in this doctoral re-search contained 310 observations (31 countries—EU member states plus Switzerland, Ice-land, and Norway, for 10 years), and the analysis period was 2012–2021, wih the database being collected from Eurostat [40].

The analysis was carried out in relation to the following research hypotheses:

H1: *The variation in GDP and its main components significantly and positively influences total green taxes, as well as energy taxes.*

H2: *Waste generation significantly and positively influences total environmental taxes, while waste treatment significantly and negatively influences environmental taxes, as well as energy taxes.*

H3: *Public spending on environmental protection, private investment, and the Human Development Index negatively and significantly influences green taxes and energy taxes.*

H4: *The energy transformation and consumption of renewable sources, as well as of raw materials, significantly and positively influence the level of green taxes and energy taxes.*

H5: *An increase in net greenhouse gas emissions causes a decrease in total environmental taxes and energy taxes.*

H6: *The increase in primary energy consumption generates an increase in total environmental taxes and energy taxes.*

These hypotheses were formulated to test the link between green taxes and sustainable development indicators represented by the explanatory variables as follows: GDP, waste generation, public spending on environmental protection, private investment, energy transformation, greenhouse gas emissions, primary energy consumption, the consumption of raw materials, and the Human Development Index.

3.1. Variables, Data, and Methodology

The dependent variable, total green (environmental) taxes, includes fiscal revenues from green taxes, which include energy taxes, transport taxes, and polluting resource taxes [40].

Figure 3 captures the evolution of green taxes for the European countries in the period 2012–2021. The trend is linear, with a constant increase throughout the period, but less so in 2020 when a sudden drop from EUR 316,054.17 million to EUR 342,368.14 million Euros can be noted. The minimum value was recorded in Malta in 2012 of EUR 205.49 million, and the maximum value was reached in 2021 in Germany of EUR 64,714 million.

In Figure 3, our major concern was to identify the reason behind the big fluctuation from 2019 to 2021. The COVID-19 pandemic affected the amount of revenue from some environmental taxes during 2020 and 2021, such as the air travel tax which fell due to the reduced air travel. Another explanation for the decrease in total environmental taxes is mainly the lower revenues from agriculture, forestry, fishing, the service sector, and the transport industry. In the agriculture, forestry, and fishing industries, revenues fell mainly as a result of the carbon tax, which coincided with larger tax cuts for the use of certain fuels in this industry.

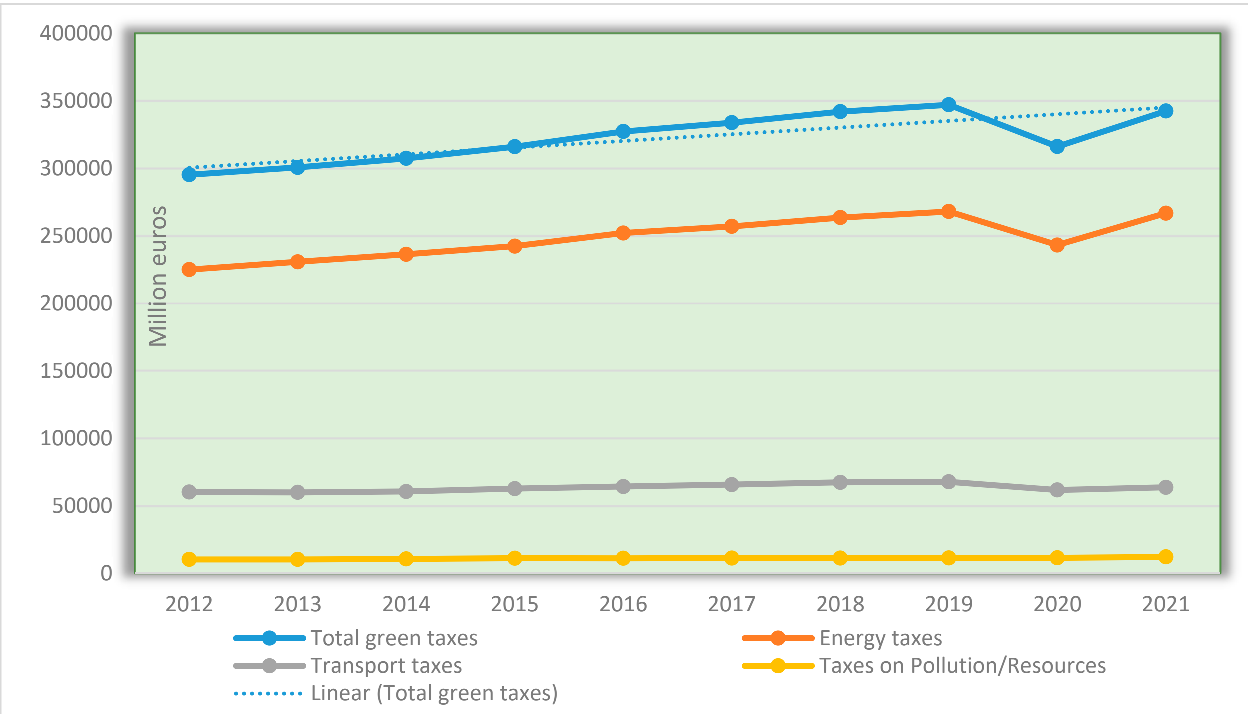

Figure 3. The evolution of total green taxes in European countries between 2012 and 2021 (million euros). Sursa: own editing.

Regarding the other dependent variable, namely energy taxes, the countries in the data set had energy taxes on average of EUR 8280.51 million, for the period 2012–2021. The minimum value of this variable was recorded in Malta in 2013 of EUR 107.56 million, and the maximum value was reached in 2021 in Germany of EUR 54,619 million. As we can see in Figure 3, energy taxes have the largest share of total environmental taxes, followed by transport taxes and pollution/resource taxes. This fact is largely explained by the value of the domestic consumption tax on energy products.

The GDP underwent a continuous upward trend with a slight drop in 2020, in the context of the COVID-19 pandemic, as we can see in Figure 4. The minimum value of the independent variable—GDP and its main components—was recorded in Malta in 2013 of EUR 7944.3 million, and the maximum value was reached in 2021 in Germany of EUR 3,601,750 million.

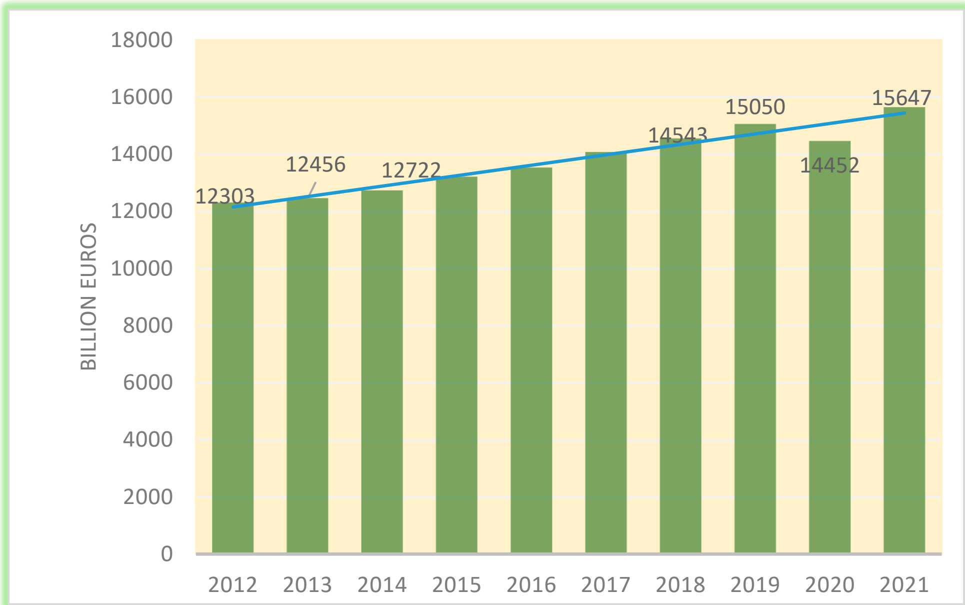

Figure 4. The evolution of GDP in the European countries, period 2012–2021 (billion euros). Source: own editing.

Figure 5 shows, in parallel, the municipal waste generated through waste management operations and the waste treated in the European countries from 2012 to 2021.

The differences between the two variables are not very large, and as we can see in Figure 5, the generated waste followed a constant trajectory without notable changes compared to the treated waste, which showed fluctuations between 2017 and 2020. The minimum value of the variable *waste generated* was recorded in Iceland in 2012 of 164 thousand tons, and the maximum value was reached in 2021 in Germany of 53,748 thousand tons.

Figure 6 captures the dynamics of the consumption of raw materials from 2012 to 2020 for the European countries, with an increasing trend highlighted by the dotted line. In the analyzed period, a constant trend can be noted from 2013 to 2016, followed by a gradual increase until 2019. The increase in the use of materials in developing regions is primarily driven by industrialization, which involves the transfer of the intensive production of materials from developed regions. However, the use of natural resources and the resulting benefits, as well as environmental consequences, are not evenly distributed across countries and regions. To achieve sustainable consumption and production, it is essential to adopt circular economy strategies that aim to minimize or eradicate waste and pollution, promoting the continuous use of products and materials. The minimum value of the raw material consumption variable was recorded in Malta in 2014 of 4772 thousand tons, and the maximum value was reached in 2017 in Germany of 1,332,439 thousand tons.

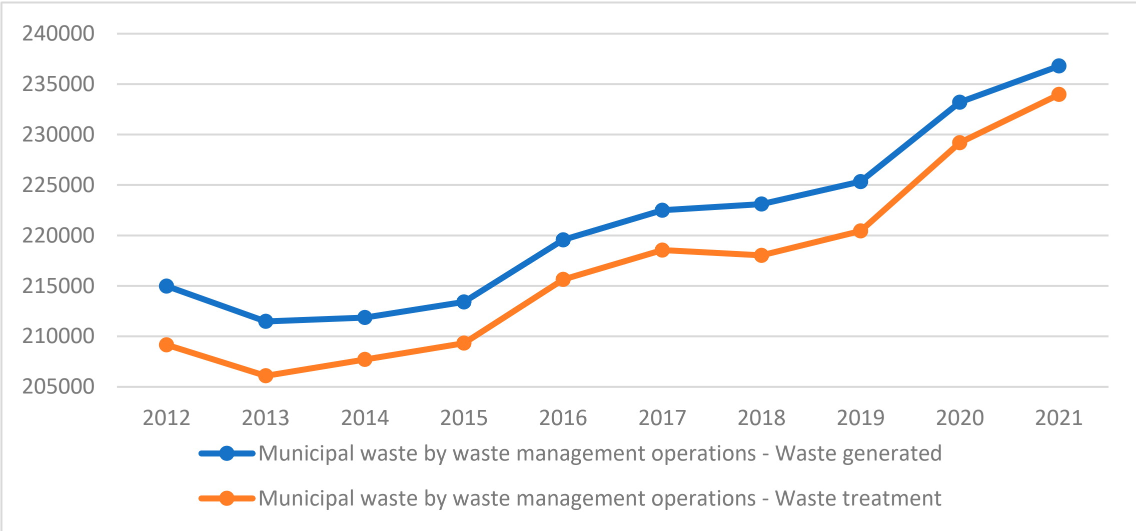

Figure 5. Municipal waste generated by waste management operations vs. waste treated in the European countries between 2012 and 2021 (thousands of tons). Source: own editing.

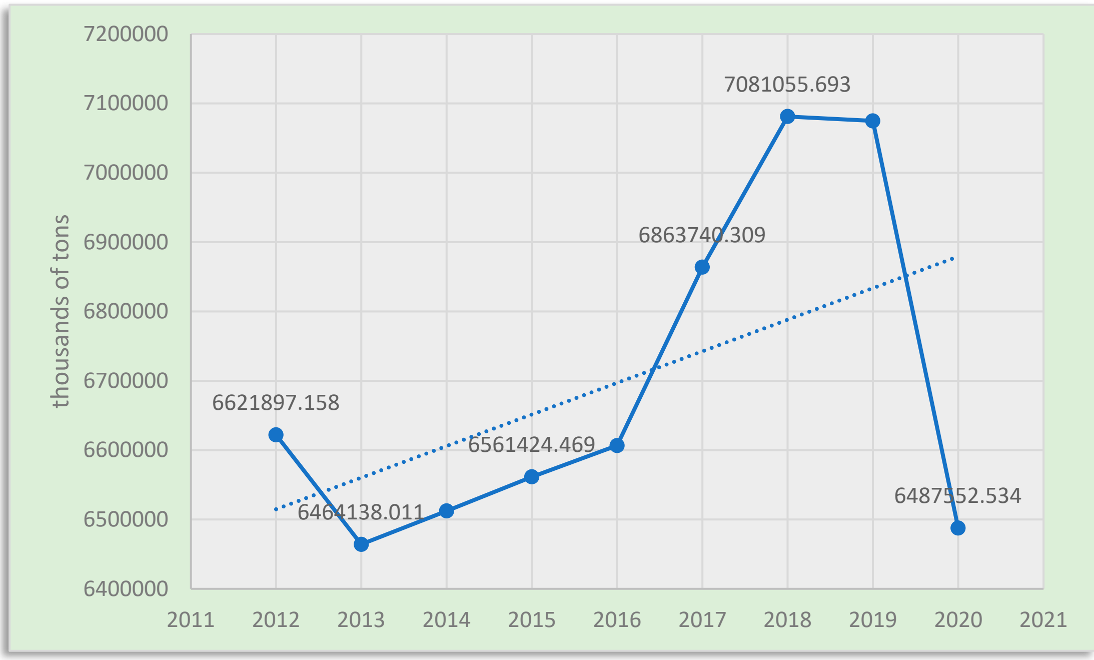

Figure 6. Dynamics of consumption of raw materials in the European countries between 2012 and 2020. Source: own editing.

Figure 7 captures the net greenhouse gas emissions in the European countries from 2012 until 2021 showing a steady trend without major fluctuations, with a decrease starting from 2020. The lowest gas emissions were recorded in Sweden in the year 2020 of 0.6 tons/per capita, and the maximum value was reached in 2012 in Iceland of 45.8 tons/per capita.

According to the EEA [41], greenhouse gas emissions are estimated to have decreased by 1/3 since 1990 in the EU27. Emissions fell in almost all sectors, especially in energy supply, industry, and the residential sector, but not enough despite the environmental protection measures taken in all European countries. Climate and environmental policies implemented in European countries that contributed to the reduction in gas emissions consisted of increased use of renewable sources, the switch from coal to gas for power generation, improved energy efficiency, and structural changes in EU economies.

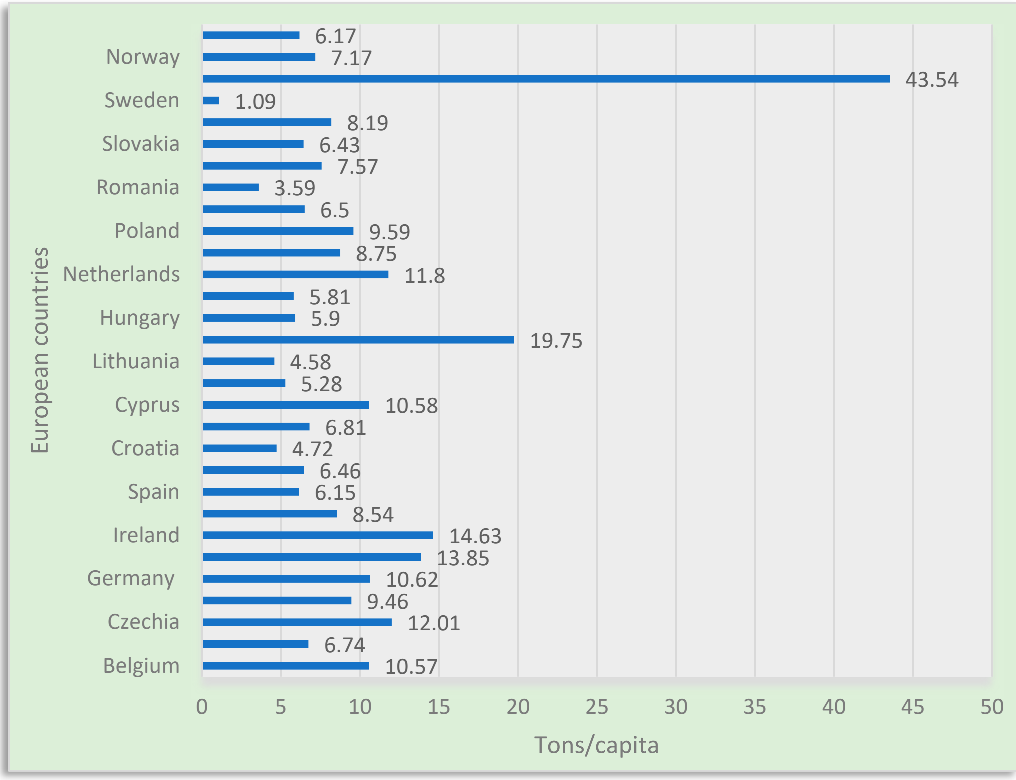

Figure 7. Net greenhouse gas emissions in the European countries (average value for the period 2012–2021). Source: own editing.

The variable representing the mean of the difference in energy supply, transformation, and consumption of renewable sources is 482.74, while the median of the difference in energy supply, transformation, and consumption is 0.01. It can be seen from Figure 8 that in the analyzed period we have a continuous upward trend in the supply, transformation, and consumption of renewable sources with a slight decline in 2018. France, Germany and Netherlands have the largest supply, transformation, and consumption of renewable sources.

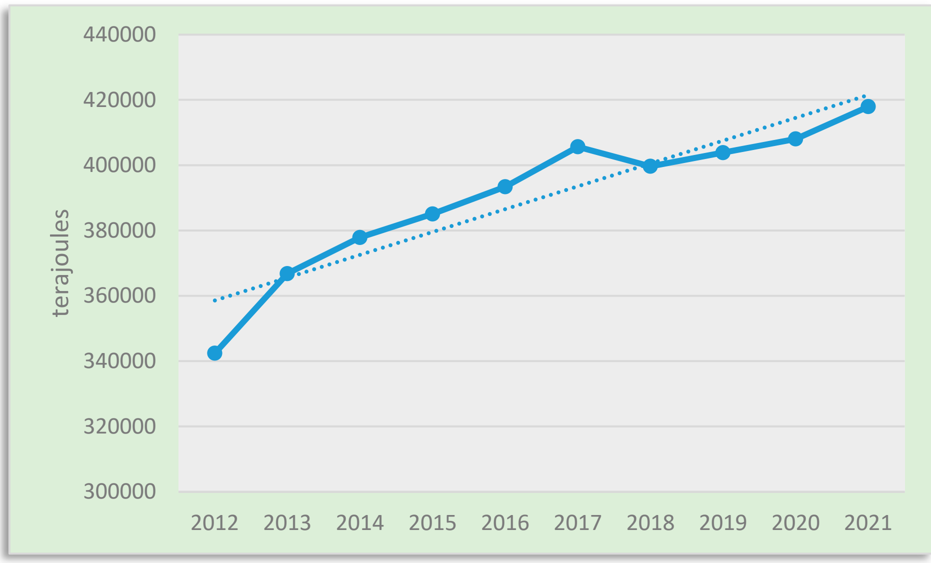

Figure 8. Supply, transformation, and consumption of renewable sources in European countries between 2012 and 2021. Source: own editing.

Regarding the variable *public expenditure on environmental protection*, Figure 9 shows how much money that each government spends on environmental protection measures in European countries. The minimum value of the variable of public expenditure on environmental protection was recorded in Cyprus in the year 2013 in the sum of EUR 44 million, and the maximum value was reached in 2021 in France of EUR 26,013 million.

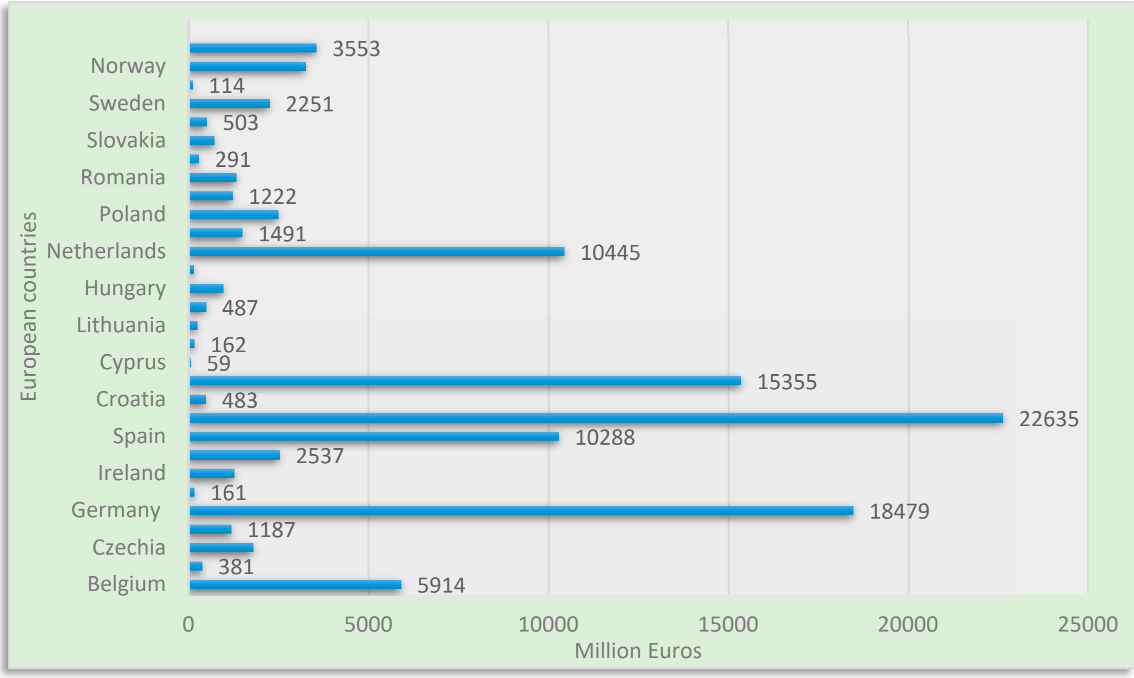

Figure 9. Evolution of public expenditures for environmental protection in European countries. (average value for the period 2012–2021). Source: own editing.

Figure 10 shows the private investments and gross added value related to the sectors of the circular economy at the EU 27 level from 2012 until 2021. The trend is a constant one and a progressive increase can be noted, these investment efforts having to be economically profitable in the long term. In the case of the variable *private investments and gross added value related to the sectors of the circular economy*, the minimum value was recorded in Cyprus in 2014 of EUR 33 million, and the maximum value was reached in 2018 in Germany of EUR 34,489 million.

The effective utilization of natural resources is also a crucial responsibility, and as we can see in Figure 10, the trend is increasing. Oil, gas, precious metals, and numerous other minerals contribute significantly to the budget's revenue. Companies usually pay governments environmental payments to reduce or neutralize the possible environmental effects of mining, oil, and gas operations. Environmental licensing fees, special charges or fees related to emissions, pollution, water and energy consumption, waste disposal fees, environmental restoration fees, and contributions to environmental organizations and funds are examples of the kinds of payments that may be required by laws, regulations, or contractual terms. Although local communities and citizens frequently find these payments interesting, they are not always recognized as being noteworthy.

Figure 11 captures the evolution of climate-related economic losses in European countries from 2012 to 2021. These were highly fluctuating with constant ups and downs. The minimum value was recorded in Croatia in 2012 of EUR 2 million, and the maximum value was reached in 2013 in Germany of EUR 14,214 million. The biggest losses were reached in 2021 of EUR 59,928 million. The reasons for this are multiple, including the development of climate-vulnerable areas and the worldwide weather and climate extremes that have become more severe and frequent because of climate change. The future costs associated with climate-related hazards are influenced not only by the frequency and severity of these events but also by various other factors, such as the value of assets at risk and expected climate adaptation measures.

The governments of Europe "face climate risks" for which they are unprepared yet. She also said that to "ensure sustainable development," European authorities need to move swiftly to cut emissions. Climate change's economic effects are now a reality for society; these are issues that need to be addressed. Proactive action, sustainable practices, and international cooperation are the compass that leads to resilient and flourishing economies in the face of a constantly changing climate as we weather the storm of climate-related economic repercussions.

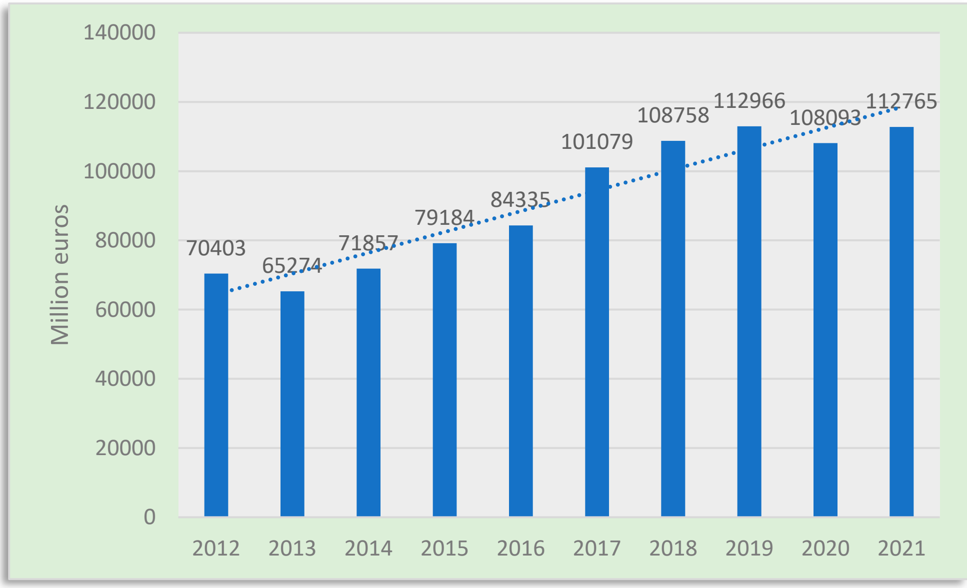

Figure 10. Private investments and gross added value related to circular economy sectors in European countries for the period 2012–2021. Source: own editing.

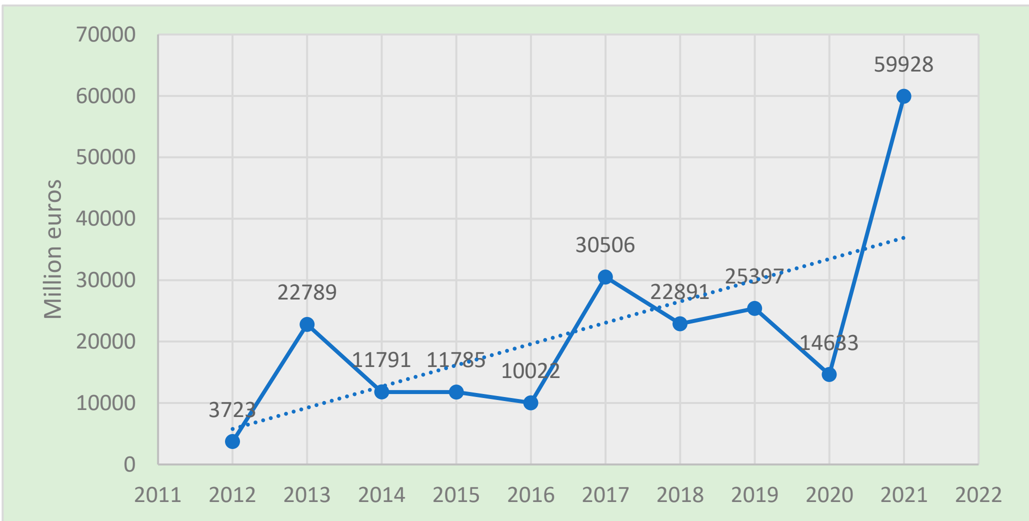

Figure 11. Climate economic losses in European countries between 2012 and 2021. Source: own editing.

The threats from climate change must be addressed using means that can ensure the desired environmental and economic effects for Europe today. The development and implementation of operational and long-term adaptation measures, mitigating the anthropogenic impact on the climate, including the creation of regulatory and economic mechanisms to prevent greenhouse gas emissions, and the development of mutually beneficial multilateral cooperation are the main goals of climate policy, even though the COVID-19 pandemic has slowed down the process of climate losses.

Figure 12 regarding primary energy consumption at the European countries level from 2012 to 2021 shows a decreasing trend, without major fluctuations. However, a decrease can be noted between 2013 and 2016 from 1384.2 million tons to 1330.5 million tons. However, the most notable fluctuation is between the years 2019 and 2020 from 1353.8 million tons to 1235.6 million tons due to the COVID-19 pandemic that influenced primary energy consumption.

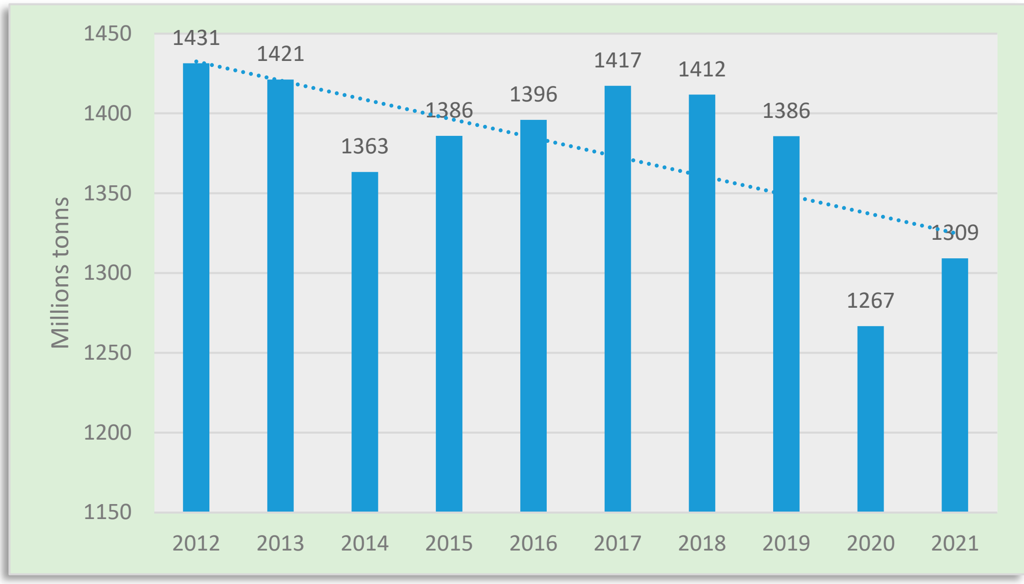

Figure 12. Primary energy consumption in European countries between 2012 and 2021. Source: own editing.

In the case of the Human Development Index, the minimum value was recorded in Bulgaria in 2021 of 0.795, and the maximum value was reached in 2018 in Norway of 0.962.

In this study, we performed a dynamic panel analysis to identify the correlations between the indicators of sustainable development and green taxes.

The first step consisted of testing the stationarity of the variables used in the analysis using the Harris–Tsavalis (HT) test, an improved unit root test for panel data, based on the traditional Dickey–Fuller (ADF) test. This test takes into account individual heterogeneity and cross-sectional dependence, thus allowing more accurate inferences to be drawn within the panel data settings. The test provides a detailed explanation of the testing methodology, including the estimation of individual specific fixed effects and trends, the calculation of residuals, and the calculation of the cross-sectional mean of the individual ADF test statistics. By using the Harris–Tsavalis test methodology, we sought to identify the presence of unit roots in the panel data, considering both individual heterogeneity and cross-sectional dependence.

Statistical stationarity refers to the fact that the statistical properties of a time series, or the process that generates it, do not change over time. These features include mean, variance, autocorrelation, and others, which remain constant over time. If a time series is stationary, these statistics can be used as descriptors to predict its future behavior. Unit root tests are used to determine whether a trending time series requires differentiation or regression based on deterministic functions of time to become stationary. These tests are useful in identifying the existence of long-run equilibrium relationships between non-stationary variables in time series by applying economic and financial theory. Thus, by using these tests, we can determine which approach is required to achieve the stationarity of trend data.

To remove trends from a time series and achieve stationarity, the process of differentiation can be used. The trend of a time series is characterized by a constant increase or decrease in its level, which makes the series non-stationary. Differentiation involves calculating the difference between consecutive values in the series. Applying the difference () function to an artificial data set with a linearly increasing trend yields a new time series where the trend has been removed.

Table 1 below shows the results of the stationarity tests applied to the panel data. For the non-stationary variables, we used differentiation, working afterwards with the variables thus obtained.

Table 1. Stationarity test results.

Variables	Rho	*p*-Value	Result
Total green taxes	0.5963	0.0041	Stationary
Energy taxes	0.5781	0.0013	Stationary
GDP and its main components	0.9843	1.0000	Nonstationary
Human Development Index	0.7540	0.7051	Nonstationary
Waste generated	1.1249	1.0000	Nonstationary
Waste treatment	1.1287	1.0000	Nonstationary
Net greenhouse gas emissions	0.6694	0.1213	Nonstationary
Supply, transformation, and consumption of resources	0.6660	0.1213	Nonstationary
Primary energy consumption	0.4044	0.0000	Stationary
Public expenditure for environmental protection	1.1136	1.0000	Nonstationary
Private investment and gross value added	0.3958	0.0000	Stationary
Climate-related economic losses	−0.0310	0.0000	Stationary
Consumption of raw materials	0.2372	0.0000	Stationary

Source: own editing.

Next, we tested the autocorrelation for the panel data using the Wooldridge serial correlation test, which is based on the Durbin–Watson statistic. This test assesses whether the residuals exhibit a significant positive or negative serial correlation, indicating a violation of the assumption of independent errors. The xtserial command estimates the test statistic and provides the associated *p*-value indicating whether there is evidence of serial correlation in the residuals. If the *p*-value is below some chosen significance level, it suggests the presence of serial correlation.

The xtserial command in Stata 16 software uses the approach developed by Baltagi and Li [42] to test for cross-sectional dependence in panel data. This command provides several serial correlation tests, including the Lagrange Multiplier (LM) test, the Robust LM test, and the Breusch–Pagan test. Typically, the xtserial command is used after estimating a panel data model using fixed effects or random effects methods. This allows us to test for serial correlation in the residuals of the panel data model and to assess the presence of cross-sectional dependence.

The Hausman test was developed by Jerry A. Hausman in 1978 [43] and is a statistical tool used in the field of econometrics to assess the presence of endogeneity in a regression model. Its purpose is to determine which estimation method, either fixed effects or random effects, is more appropriate for panel data models. The main idea of the Hausman test is to compare the efficiency of the two estimation methods by analyzing the difference between the coefficients obtained from the fixed effects models and the random effects models. If the difference is statistically significant, this suggests the presence of endogeneity and indicates the preference for the fixed effects model because it provides consistent estimates. If the null hypothesis is valid, there should be no systematic difference between the two estimators.

The Arellano–Bond test [44] for AR (1)/AR (2) serial correlation in first differences is a statistical test used to check for the autocorrelation in the first difference residuals of a dynamic panel data model. The purpose of this test is to diagnose the presence of serial correlation in the differenced data. The test is based on the premise that if the residuals of the first difference exhibit serial correlation AR (1)/AR (2), this indicates that the baseline levels of the variables in the model may also exhibit serial correlation.

Therefore, two-panel regressions were obtained according to the formulas below, thus obtaining two equations (one for total green taxes as the dependent variable and one for energy taxes as the dependent variable), sustainable development indicators being explanatory variables in both models. We reproduce the particularized form of the regression models as follows:

$$\begin{aligned}\textbf{total\_environmental\_taxes} &= \text{const.} + \alpha \times \text{L.total\_environmental\_taxes}_i + \beta_1 \times \text{D.gdp\_and\_main\_components}_i \\ &+ \beta_2 \times \text{D.human\_development\_index}_i + \beta_3 \times \text{D.waste\_generated}_i + \beta_4 \times \text{D.waste\_treatment}_i \\ &+ \beta_5 \times \text{D.net\_greenhouse\_gas\_emission}_i + \beta_6 \times \text{D. supply\_transformation\_and\_c}_i \\ &+ \beta_7 \times \text{primary\_energy\_consumption}_i + \beta_8 \times \text{D.government\_expenditure\_for\_environmental protection}_i \\ &+ \beta_9 \times \text{private\_investment\_and\_gross\_add}_i + \beta_{10} \times \text{climate\_related\_economic\_losses}_i \\ &+ \beta_{11} \times \text{raw\_material\_consumption}_i + \varepsilon_{it},\end{aligned} \tag{1}$$

$$\begin{aligned}\textbf{energy\_taxes} &= \text{const.} + \alpha \times \text{L.total\_environmental\_taxes}_i + \beta_1 \times \text{D.gdp\_and\_main\_components}_i \\ &+ \beta_2 \times \text{D.human\_development\_index}_i + \beta_3 \times \text{D.waste\_generated}_i + \beta_4 \times \text{D.waste\_treatment}_i \\ &+ \beta_5 \times \text{D.net\_greenhouse\_gas\_emission}_i + \beta_6 \times \text{D. supply\_transformation\_and\_c}_i \\ &+ \beta_7 \times \text{primary\_energy\_consumption}_i + \beta_8 \times \text{D. government\_expenditure\_for\_environmental protectioni}_i \\ &+ \beta_9 \times \text{private\_investment\_and\_gross\_add}_i + \beta_{10} \times \text{climate\_related\_economic\_losses}_i \\ &+ \beta_{11} \times \text{raw\_material\_consumption}_i + \varepsilon_{it},\end{aligned} \tag{2}$$

Parameter estimation of the two regression equations was performed by using the feasible generalized least squares (FGLS) method, being appropriate because heteroscedasticity and/or serial correlation in error terms was identified. Then, the estimates obtained via the dynamic panel method were then subjected to robustness analyses to assess the stability of the results. The Pesaran CD test [45] is a statistical test used to assess cross-sectional dependence in panel data models.

The Wald test, used by us in this study, is a statistical test used to determine whether a parameter in a statistical model differs significantly from a hypothesized value. The main idea of the Wald test is to compare the estimated value of a parameter with its hypothetical value under the null hypothesis. The general formula for the Wald test statistic is W = (estimated value—hypothesized value)/standard error. When the sample size is large enough and the data follow approximately a normal distribution, the test statistic W follows approximately a standard normal distribution under the null hypothesis. If the obtained *p*-value is less than a predefined significance level (e.g., 0.05), the null hypothesis is rejected, and it is concluded that there is enough evidence to support the conclusion that the parameter is significantly different from the hypothesized value.

When estimating cross-sectional linear time series models, panel-corrected standard error (PCSE) is a technique used by us to address the potential problems of heteroscedasticity and serial correlation in the data. PCSE estimates the attempt to correct these problems by adjusting the standard errors of the model coefficients. These methods of estimating the regression equations were the most suitable considering the data used in the analysis and the fact that we performed a dynamic panel analysis, and not a static analysis, where other methods such as OLS estimation would have been applicable [46,47].

3.2. Empirical Results

Following the analysis, the following results were reached from a statistical point of view. Table 2 shows the results of the regressions as follows.

Based on the coefficients and *p*-values generated in the panel analysis and presented in Table 2, we can interpret the following for the dependent variable—*Total green taxes*:

- The variable is explained by its previous values, from $t-1$. The coefficient of 0.93 is statistically significant, having $p = 0.00$. This result suggests that the current values of total green taxes are strongly positively correlated with past values, indicating the existence of a history effect on this variable.
- For the variable *GDP and its main components* (diff_gdp_and_main_components) the coefficient is 0.03 and is statistically significant, having $p = 0.00$. This result indicates a

significant positive correlation between the variation of GDP and total green taxes. An increase in GDP is linked with an increase in green taxes.

- Other significant independent variables: Waste generated, waste treatment, the supply, transformation, and consumption of renewable sources and waste—renewable municipal waste, primary energy consumption (primary_energy_consumption), public expenditure for environmental protection, and climate-related economic losses have *p*-values of less than 0.05, indicating a significant correlation with total green taxes. These results suggest that the differences in waste generation, transformation of renewable sources, and primary energy consumption significantly and positively influence total green taxes, and waste treatment, general government spending, and climate-related economic losses significantly and negatively influence the total green taxes.
- Non-significant independent variables: Human Development Index, net greenhouse gas emissions, private investment and gross value added related to circular economy sectors, and raw material consumption are not statistically significant at a level of 0.05. This means that these variables do not have a significant influence on the dependent variable within this model.

Table 2. Regression results (var. dep. total_environmental_taxes and energy_taxes).

Y	Total_Green_Taxes			Energy_Taxes		
	Coef.	t	*p* > t	Coef.	t	*p* > t
L1.	0.93	25.01	0.00	0.92	20.81	0.00
diff_gdp_and_main_components	0.03	24.02	0.00	0.02	22.26	0.00
diff_human_development_index	−3734.30	−0.23	0.82	−7279.35	−0.49	0.63
diff_waste_generated	0.55	2.00	0.05	0.51	2.25	0.03
diff_waste_treatment	−1.00	−3.26	0.00	−0.89	−3.68	0.00
diff_net_greenhouse_gas_emission	24.04	0.62	0.54	22.99	0.61	0.55
diff_supply_transformation_and_c	0.10	3.53	0.00	0.13	3.11	0.00
primary_energy_consumption	32.41	2.94	0.01	28.35	2.75	0.01
diff _government_expendit_environment	−0.51	−4.49	0.00	−0.40	−2.72	0.01
private_investment_and_gross_add	0.0001	0.01	0.99	0.03	0.99	0.33
climate_related_economic_losses	−0.20	−4.31	0.00	−0.20	−4.66	0.00
raw_material_consumption	−0.003	−1.48	0.15	−0.003	−1.85	0.08
_cons	72.35	0.84	0.41	87.49	1.07	0.29

Source: own editing.

Based on the coefficients and *p*-values generated in the panel analysis, we can interpret the following for the dependent variable—*energy taxes*:

- The variable is explained by its previous values, from $t - 1$. The coefficient is 0.92 and is statistically significant at the 0.05 level. This result suggests that the current values of energy taxes are strongly positively correlated with past values, indicating the existence of a historical effect on this variable.
- The variable, GDP, with the coefficient of 0.02 statistically significant at a level of 0.05, indicates a significant positive correlation between the variation of GDP and the energy taxes. An increase in GDP is associated with an increase in energy taxes.
- Other significant independent variables: Waste generated, waste treated, the supply, transformation, and consumption of renewable sources, primary energy consumption, public expenditure for environmental protection, and climate-related economic losses have significant coefficients and *p*-values lower than 0.05, which indicates a significant correlation with the dependent variable—energy taxes. These results suggest that differences in waste generation, waste treatment, energy transformation and consumption, general government expenditure, and climate-related economic losses significantly influence, some positively (such as waste generated and primary energy consumption) and others negatively (waste treated, public spending for environmental protection and climate-related economic losses), green taxes.

- Insignificant independent variables: Human Development Index, net greenhouse gas emissions, private investments related to circular economy sectors, and the consumption of raw materials are not correlated, statistically significantly, with the energy taxes variable within this model.

Next, using the Wald test and panel-corrected standard error (PCSE), we tested the stability of the correlations from the developed regressions. Again, obtaining similar results in regard to significance confirms the robustness, stability, and partial validity of the main results reported earlier.

Based on the provided coefficients and their associated statistical tests (*t*-tests) presented synthetically in Table 3, we can interpret the results of an estimated panel-corrected standard error (PCSE) regression model for the variable *total green taxes* (dependent variable) in relation to the independent variables, which are actually indicators of sustainable economic development as follows:

- GDP and its main components: for a one-unit increase in the variation in GDP, there is a 0.01-unit increase in total green taxes, which is statistically significant at the 5% level (p-value < 0.05).
- Human Development Index, net greenhouse gas emissions, climate-related economic losses: the coefficients and p-values > 0.05 suggest that there is no significant relationship between the respective variables and total green taxes.
- Primary energy consumption: An increase in primary energy consumption generates an increase in total green taxes. The coefficient is statistically significant at the 1% level (p value = 0.00).
- Waste generated, waste treated, the supply, transformation, and consumption of renewable sources, general public expenditure for environmental protection, private investment and gross value added related to circular economy sectors: the coefficient of this variable and the p-values suggest that the relationships are not statistically significant at conventional levels, and the robustness testing of the regression did not validate the correlation of these variables with green taxes.

Table 3. Robustness results (var. dep. total_environmental_taxes and energy_taxes).

Y	Total_Green_Taxes			Energy_Taxes		
	Coef.	**t**	***p* > t**	**Coef.**	**t**	***p* > t**
diff_gdp_and_main_components	0.01	2.38	0.02	0.01	2.67	0.01
diff_human_development_index	−3131.83	−0.14	0.89	−7629.78	−0.33	0.74
diff_waste_generated	0.50	0.35	0.73	0.52	0.36	0.72
diff_waste_treatment	0.18	0.12	0.90	0.22	0.14	0.89
diff_net_greenhouse_gas_emission	−108.99	−1.74	0.08	−102.90	−1.74	0.08
diff_supply_transformation_and_c	0.04	0.22	0.83	0.01	0.06	0.95
primary_energy_consumption	154.87	5.96	0.00	119.59	6.16	0.00
diff_general_government_expendit	0.22	0.34	0.73	0.21	0.33	0.74
private_investment_and_gross_add	0.23	1.58	0.11	0.21	1.79	0.07
climate_related_economic_losses	0.13	0.50	0.62	0.22	0.86	0.39
raw_material_consumption	0.01	1.98	0.05	0.01	1.99	0.05
_cons	424.52	2.50	0.01	167.56	1.28	0.20
Rho	0.76			0.64		

Source: own editing.

Also, based on the provided coefficients and their associated statistical tests (*t*-tests), we can interpret the results of an estimated panel-corrected standard error (PCSE) regression model for the variable *energy taxes* (dependent variable) in relation to the independent variables, which are indicators of sustainable economic development:

- GDP and its main components: For a one-unit increase in the difference between variations in GDP, there is a 0.01-unit increase in energy taxes. The coefficient is statistically significant at the 1% level (p value = 0.01).

- Human Development Index, net greenhouse gas emissions, climate-related economic losses: the coefficients of the respective variables suggest that there is no significant relationship between them and energy taxes.
- Primary energy consumption: For a one-unit increase in primary energy consumption, there is an increase of 119.59 units in energy taxes. The coefficient is statistically significant at the 1% level (p value = 0.00).
- Waste generated, waste treated, the supply, transformation, and consumption of renewable sources, general public expenditure for environmental protection, private investment, and gross value added related to circular economy sectors: the coefficient of this variable and the p-values suggest that the relationships are not statistically significant at conventional levels, and the robustness testing of the regression did not validate the correlation of these variables with green taxes.

4. Discussion

Based on the results obtained from the robustness estimation and validation of the two dynamic regressions, the research hypothesis H1 is confirmed; thus, the change in the GDP level and its main components significantly and positively influences the total green taxes and energy taxes, respectively.

Research hypotheses H2–H5 are not confirmed when testing the robustness of the dynamic panel. Even though the results of the regressions show a significant correlation between the following independent variables, namely aste generated, waste treatment, the supply, transformation, and consumption of renewable sources, public expenditure for environmental protection, and economic losses related to climate, on the one hand, and green taxes on the other, by testing the robustness of the dynamic panel model, the respective correlations are not validated and not statistically significant at conventional levels (p value > 0.05).

Research hypothesis H6 is thus confirmed, as the primary energy consumption variable has significant coefficients and p-values of lower than 0.05, which indicates a significant and positive correlation between total green taxes, respectively, with energy taxes.

Consequently, the implementation of an environmental tax in the analyzed countries could impact economic growth by increasing the production costs in these sectors, as they rely heavily on physical capital and raw materials such as machinery, fuel, and electricity. Conversely, in countries with a high initial GDP per capita, agriculture and industry contribute less to GDP compared to the service sector. This shift means that production relies more on human capital than on physical capital and raw materials, leading to lower levels of pollutant emissions. Moreover, wealthier nations have better resources to increase their energy efficiency and physical capital productivity in the agricultural and industrial sectors, thereby reducing pollutant emissions and the tax base for environmental taxes. Therefore, a country's initial level of development, as indicated by its GDP per capita, can have an impact on the relationship between environmental taxes and economic growth.

The increase in GDP and its main components generates an increase in environmental taxes, namely energy taxes, transport taxes, and taxes on polluting resources. Thus, together with the change in GDP, the taxes on energy production and energy products used both for transport and for stationary applications will increase. At the same time, there will be increases in the taxes on gasoline, diesel, and other transport fuels, respectively, and the taxes related to the extraction or use of natural resources.

The generation and treatment of waste significantly and positively affect environmental taxes, energy taxes, transport taxes, and the level of taxes on polluting resources. Thus, the higher the amount of municipal waste generated, which consists of collected household and similar waste, the higher that the taxes on the environment, energy, and transport will increase.

Changes in green taxes, energy taxes, transportation taxes, and the amount of taxes on polluting resources can result from public spending on environmental protection and private investment. Because environmental protection includes all activities and actions with the primary goal of preventing, minimizing, and eliminating pollution and other forms of environmental degradation, we thought that these two variables were crucial to the research that was performed. In addition, they are seen as a crucial component of the shift to a circular economy in terms of private investment in industrial symbiosis, recycling procedures, and innovation. On the other hand, the lower the environmental fees and the less the load on the carrier, the greater they are.

The transformation and consumption of energy significantly and positively influence the level of total environmental taxes and energy taxes. Regardless of the trend that this indicator will follow, it covers all the major sectors of the economy that are involved in production, trade, energy transformation, and energy consumption.

Energy taxes are a possible solution to reducing CO_2 emissions in third world countries and may even spur climate action. There is also an ongoing debate about using the EU's trade influence to promote environmental practices in other nations. To summarize, several important aspects of the European Green Deal require further definition and implementation. These include the definition of sustainability and associated trade-offs, the formalization of the "not harming the environment" principle, and the establishment of EU leadership on green issues.

The level of economic losses related to the climate significantly and negatively influences a decrease in taxes on polluting resources. The indicator measures the economic losses due to changes in weather and climate-related events, and the higher they are, the higher the tax level will be. Net greenhouse gas emissions influence the dynamics of total environmental taxes, as well as energy and transport taxes. The increase in primary energy consumption and the consumption of raw materials causes an increase in green taxes, and energy and transport taxes. Moreover, the increase in private investment and gross additions generates a decrease in transportation charges. At the same time, the increase in the Human Development Index leads to a decrease in taxes on polluting re-sources.

The analysis carried out confirmed the hypothesis that green taxes have a close connection with the indicators of sustainable development objectives.

5. Conclusions

To incentivize business owners to implement low-waste technologies, manage the collection and processing of generated waste, which is secondary raw material, and decrease waste generation and the amount of waste that is stored in landfills, environmental taxes and payments have been implemented in foreign developed nations. The current state of the nation's economy is taken into consideration by legislators when they determine the kind and level of tax to be imposed. They start by establishing the most advantageous framework for the application of the "polluter pays" principle.

Environmental taxes may only be imposed to alter actions that are detrimental to the environment and not to increase the loss of money. The cost of environmental harm and the price signal needed to meet environmental objectives may be considered while determining the stimulus-level tax. Through grants or tax breaks, the ensuing tax resources are frequently utilized to promote change even further. There is no reciprocal exclusion between these categories of environmental revenues. There may be incentives in the fees for covering costs and impacts, and the money raised by fiscal environmental taxes may be utilized in part to support the related environmental objectives.

By introducing low-waste technologies and organizing the collection and processing of generated waste, which is secondary raw material, environmental taxes and payments, which are applied in foreign developed countries, aim to encourage entrepreneurs to reduce their waste generation and the volume of waste that is stored in landfills. Legislators begin by establishing the most advantageous conditions for the application of the "polluter pays" principle, taking into consideration the nation's existing economic circumstances, before deciding on the type and amount of tax to be established.

The results of the dynamic regressions, validated by the applied robustness tests, show that an increase in GDP generates an increase in environmental taxes, namely energy taxes, transport taxes, and taxes on polluting resources. Thus, together with the change in GDP, the taxes on energy production and energy products used both for transport and for stationary applications will increase. At the same time, there will be increases in the taxes on gasoline, diesel, and other transport fuels.

Green taxes are strongly positively correlated with primary energy consumption. For a one-unit increase in primary energy consumption, there is an increase of 32.41 units in total green taxes and an increase of 28.35 units in energy taxes. Energy taxes are a possible solution to reducing CO_2 emissions in third world countries and may even spur climate action. The increase in primary energy consumption and the consumption of raw materials are causing an increase in environmental taxes, specifically energy taxes.

The analysis carried out confirmed the hypothesis that green (environmental) taxes have a close connection with two important indicators of sustainable development: GDP and primary energy consumption. In contrast, we did not identify a significant correlation between green taxes and the following variables: Human Development Index, net greenhouse gas emissions, private investment, gross value added related to circular economy sectors, raw material consumption, waste generated, waste treatment, the supply, transformation, and consumption of renewable sources, public expenditure for environmental protection, and economic losses related to climate. This finding is useful for both academic research and governments for the realistic substantiation of the level of green tax revenues and for establishing appropriate measures on energy and fiscal policy.

Many Sustainable Development Goals (SDGs) are supported in its achievement by environmental taxes. In our study, we demonstrate the various secondary benefits that environmental tax reforms can provide. Though testing of hypotheses like H1 revealed that variation in GDP and its main components significantly and positively influences total green taxes, specifically energy taxes that strengthen domestic resource mobilization, including through international support to developing countries to improve domestic capacity for tax and other revenue collection, the article supports SDG 17: Partnerships to achieve the SDG and SDG 8: Decent Work and Economic Growth [48].

The validation of the research hypotheses H6 indicates that energy taxes could be an effective way to cut CO_2 emissions and for the transition to renewable energy. As a result, local air pollution is reduced when fossil fuel consumption is reduced because of fuel or carbon excise taxes, which supports SDG3 (health and well-being) and SDG15 (life and land) [49].

This study was limited to the influences on green taxes in 31 European countries. Therefore, this research could be improved by examining more countries and continents, and perhaps by extending the analysis to over a longer period of time or including other variables in our analysis, such us budget deficit. More investigations into the efficiency of using green instruments can extend the potential of this study in the future.

Author Contributions: Conceptualization, C.D.S.-P., A.M.B. and N.N.T.; Methodology C.D.S.-P., A.M.B., S.I.M.-C. and M.B.; Software A.M.B. and N.N.T.; Formal Analysis C.D.S.-P., S.I.M.-C. and M.B.; Data curation A.M.B., M.B. and N.N.T.; Writing—Original Draft Preparation, C.D.S.-P., A.M.B. and S.I.M.-C.; Validation, C.D.S.-P., S.I.M.-C. and N.N.T.; Visualization, N.N.T. and M.B.; Investigation, A.M.B., S.I.M.-C. and M.B.; writing—review and editing, C.D.S.-P., M.B. and N.N.T. All authors have read and agreed to the published version of the manuscript.

Funding: The publication fee for this article is supported by the scientific research budget of the University of Oradea.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Mpofu, F. Green Taxes in Africa: Opportunities and Challenges for Environmental Protection, Sustainability, and the Attainment of Sustainable Development Goals. *Sustainability* **2022**, *14*, 10239. [CrossRef]
2. Bovenberg, A.L.; Goulder, L.H. Environmental Taxation and Regulation. In *Handbook of Public Economics*; Elsevier: Amsterdam, The Netherlands, 2002; Volume 3, pp. 1471–1545. [CrossRef]
3. Morley, B. Empirical evidence on the effectiveness of environmental taxes. *Appl. Econ. Lett.* **2012**, *19*, 1817–1820. [CrossRef]
4. Braathen, N.A. New information in the OECD database on instruments used for environmental policy. In *Green Taxation and Environmental Sustainability*; Edward Elgar: Cheltenham, UK, 2012. [CrossRef]
5. Pitrone, F. Defining 'Environmental Taxes': Input from the Court of Justice of the European Union. *Bull. Int. Tax.* **2015**, 58–64. [CrossRef]
6. OECD. Environmental Fiscal Reform Progress, Prospects and Pitfalls. 2017; pp. 1–47. Available online: www.oecd.org/tax/tax-policy/tax-and-environment.htm (accessed on 17 November 2023).
7. Rodríguez, M.; Robaina, M.; Teotónio, C. Sectoral effects of a Green Tax Reform in Portugal. *Renew. Sustain. Energy Rev.* **2019**, *104*, 408–418. [CrossRef]
8. OECD. Environmentally Related Taxes, 2005—OECD Glossary of Statistical Terms. Available online: https://stats.oecd.org/glossary/detail.asp?ID=6437 (accessed on 17 November 2023).
9. Nobanee, H.; Saif, U. Mapping green tax: A bibliometric analysis and visualization of relevant research. *Sustain. Futures* **2023**, *6*, 100129. [CrossRef]
10. OECD. Green Growth and Taxation. 2023. Available online: https://www.oecd.org/greengrowth/greengrowthandtaxation.htm (accessed on 17 November 2023).
11. Kumar, B.; Kumar, L.; Kumar, A.; Kumari, R.; Tagar, U. Green finance in circular economy: A literature review. *Environ. Dev. Sustain.* **2023**. [CrossRef] [PubMed]
12. Kumar, L.; Nadeem, F.; Sloan, M.; Restle-Steinert, J.; Deitch, M.J.; Ali Naqvi, S.; Kumar, A.; Sassanelli, C. Fostering Green Finance for Sustainable Development: A Focus on Textile and Leather Small Medium Enterprises in Pakistan. *Sustainability* **2022**, *14*, 11908. [CrossRef]
13. Shahzad, U. Environmental taxes, energy consumption, and environmental quality: Theoretical survey with policy implications. *Environ. Sci. Pollut. Res. Int.* **2020**, *27*, 24848–24862. [CrossRef] [PubMed]
14. Li, Y.; Zhou, M.; Sun, H.; Liu, J. Assessment of environmental tax and green bonds impacts on energy efficiency in the European Union. *Econ. Change Restruct.* **2022**, *56*, 1063–1081. [CrossRef]
15. Angele, K.; Klyviene, V. The Relationships between Economic growth, Energy Efficiency and CO_2 Emissions Results for the Euro Area. *Ekonomika* **2020**, *99*, 6–25. [CrossRef]
16. Zhang, J.; Zhang, Y. Carbon tax, tourism CO_2 emissions and economic welfare. *Ann. Tour. Res.* **2018**, *69*, 18–30. [CrossRef]
17. Kwilinski, A.; Ruzhytskyi, I.; Patlachuk, V.; Patlachuk, O.; Kaminska, B. Environmental Taxes as A Condition of Business Responsibility in The Conditions Of Sustainable Development. *J. Leg. Ethical Regul. Issues* **2019**, 1–6. Available online: http://izmail.maup.com.ua/assets/files/maup-2.4.-12.pdf (accessed on 1 March 2024).
18. Zioło, M.; Kluza, K.; Kozuba, J.; Kelemen, M.; Niedzielski, P.; Zinczak, P. Patterns of Interdependence between Financial Development, Fiscal Instruments, and Environmental Degradation in Developed and Converging EU Countries. *Int. J. Environ. Res. Public. Health* **2020**, *17*, 4425. [CrossRef] [PubMed]
19. Doran, M.D.; Poenaru, M.M.; Zaharia, A.L.; Vătavu, S.; Lobonț, O.R. Fiscal Policy, Growth, Financial Development and Renewable Energy in Romania: An Autoregressive Distributed Lag Model with Evidence for Growth Hypothesis. *Energies* **2023**, *16*, 70. [CrossRef]
20. Naidoo, M.; Gasparatos, A. Corporate environmental sustainability in the retail sector: Drivers, strategies and performance measurement. *J. Clean. Prod.* **2018**, *203*, 125–142. [CrossRef]
21. Jiang, C.; Fu, Q. A Win-Win Outcome between Corporate Environmental Performance and Corporate Value: From the Perspective of Stakeholders. *Sustainability* **2019**, *11*, 921. [CrossRef]
22. Sharif, A.; Kartal, M.; Bekun, F.; Pata, U.; Foon, C.; Depren, S. Role of green technology, environmental taxes, and green energy towards sustainable environment: Insights from sovereign Nordic countries by CS-ARDL approach. *Gondwana Res.* **2023**, *117*, 194–206. [CrossRef]
23. Available online: https://www.worldbank.org/en/programs/the-global-tax-program/environmental-taxes#1 (accessed on 1 March 2024).
24. CSB. EU's Green Taxation: Tackling Climate Change through Tax. 2022. Available online: https://www.mondaq.com/climate-change/1250524/eus-green-taxation-tackling-climate-change-through-tax (accessed on 17 November 2023).
25. Sabău-Popa, C.D.; Bele, A.M.; Dodescu, A.O.; Boloș, M.I. How Does the Circular Economy Applied in the European Union Support Sustainable Economic Development? *Sustainability* **2022**, *14*, 9932. [CrossRef]
26. Heine, D.; Black, S. Benefits beyond Climate: Environmental Tax Reform. In *Fiscal Policies for Development and Climate Action*; World Bank: New York, NY, USA, 2018. [CrossRef]
27. Hassan, M.; Oueslati, W.; Rousselière, D. Environmental taxes, reforms and economic growth: An empirical analysis of panel data. *Econ. Syst.* **2020**, *44*, 100806. [CrossRef]
28. Drummond, I.; Marsden, T.K. Regulating Sustainable Development. *Glob. Environ. Change* **1995**, *5*, 51–63. [CrossRef]

29. Gao, X.; Zheng, H.; Zhang, Y.; Golsanami, N. Tax Policy, Environmental Concern and Level of Emission Reduction. *Sustainability* **2019**, *11*, 1047. [CrossRef]
30. Ahmed, N.; Sheikh, A.A.; Hamid, Z.; Senkus, P.; Borda, R.C.; Wysokińska-Senkus, A.; Glabiszewski, W. Exploring the Causal Relationship among Green Taxes, Energy Intensity, and Energy Consumption in Nordic Countries: Dumitrescu and Hurlin Causality Approach. *Energies* **2022**, *15*, 5199. [CrossRef]
31. Abbas, S.; Ahmed, Z.; Sinha, A.; Mariev, O.; Mahmood, F. Toward fostering environmental innovation in OECD countries: Do fiscal decentralization, carbon pricing, and renewable energy investments matter? *Gondwana Res.* **2024**, *127*, 88–99. [CrossRef]
32. Saqib, N.; Usman, M.; Radulescu, M.; Șerbu, R.S.; Kamal, M.; Belascu, L.A. Synergizing green energy, natural resources, global integration, and environmental taxation: Pioneering a sustainable development goal framework for carbon neutrality targets. *Energy Environ.* **2023**. [CrossRef]
33. Ajeigbe, K.B.; Ganda, F.; Enowkenwa, R.O. Impact of sustainable tax revenue and expenditure on the achievement of sustainable development goals in some selected African countries. *Environ. Dev. Sustain.* **2023**. [CrossRef]
34. World Bank. World Development Report 2003: Sustainable Development in a Dynamic World: Transforming Institutions, Growth, and Quality of Life. Available online: https://documents.worldbank.org/en/publication/documents-reports/documentlist?qterm=P073946 (accessed on 17 November 2023).
35. Ullah, S.; Luo, R.D.; Adebayo, T.S.; Kartal, M.T. Dynamics between environmental taxes and ecological sustainability: Evidence from top-seven green economies by novel quantile approaches. *Sustain. Dev.* **2022**, *31*, 825–839. [CrossRef]
36. Wang, J.; Tang, D.; Boamah, V. Environmental Governance, Green Tax and Happiness—An Empirical Study Based on CSS (2019) Data. *Sustainability* **2022**, *14*, 8947. [CrossRef]
37. Dorband, I.; Jakob, M.; Steckel, J.; Ward, H. Double progressivity of infrastructure financing through carbon pricing—Insights from Nigeria. *World Dev. Sustain.* **2022**, *1*, 100011. [CrossRef]
38. Malerba, D.; Wiebe, K.S. Analysing the effect of climate policies on poverty through employment channels. *Environ. Res. Lett.* **2021**, *16*, 035013. [CrossRef]
39. Govinda, T.; Yazid, D.; Toman, M.; Heine, D. Carbon Tax in an Economy with Informality: A Computable General Equilibrium Analysis for Cote d'Ivoire. In *Policy Research Working Paper No. 9710*; World Bank: Washington, DC, USA, 2021. Available online: http://hdl.handle.net/10986/35830 (accessed on 1 March 2024).
40. Eurostat. 2023. Available online: https://ec.europa.eu/eurostat/web/sdi/database (accessed on 1 March 2024).
41. EEA Is Europe Reducing Its Greenhouse Gas Emissions? 2023. Available online: https://www.eea.europa.eu/themes/climate/eu-greenhouse-gas-inventory/is-europe-reducing-its-greenhouse (accessed on 17 November 2023).
42. Baltagi, B.H.; Li, Q. A note on the estimation of dynamic fixed effects panel data models. *Econom. Theory* **1992**, *8*, 113–119. [CrossRef]
43. Hausman, J.A. Specification tests in econometrics. *Econom. J. Econom. Soc.* **1978**, *46*, 1251–1271. [CrossRef]
44. Arellano, M.; Bond, S. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Rev. Econ. Stud.* **1991**, *58*, 277–297. [CrossRef]
45. Pesaran, M.H. General diagnostic tests for cross section dependence in panels. In *CESifo Working Paper Series*; IZA P.O.: Bonn, Germany, 2004.
46. Oster, E. Unobservable Selection and Coefficient Stability: Theory and Evidence. *J. Bus. Econ. Stat.* **2019**, *37*, 187–204. [CrossRef]
47. Silva, F.B.G. Fiscal Deficits, Bank Credit Risk, and Loan-Loss Provisions. *J. Financ. Quant. Anal.* **2021**, *56*, 1537–1589. [CrossRef]
48. Ali, S.M.; Appolloni, A.; Cavallaro, F.; D'Adamo, I.; Di Vaio, A.; Ferella, F.; Gastaldi, M.; Ikram, M.; Kumar, N.M.; Martin, M.A.; et al. Development Goals towards Sustainability. *Sustainability* **2023**, *15*, 9443. [CrossRef]
49. Pedersen, C.S. The UN Sustainable Development Goals (SDGs) are a Great Gift to Business. *Procedia CIRP* **2018**, *69*, 21–24. [CrossRef]