THE ROLE OF ENVIRONMENTAL TAXES IN GENERATING TAX REVENUES AND REDUCING GREENHOUSE GAS EMISSIONS IN THE EUROPEAN UNION

Valentin Marian Antohi[1*], Costinela Fortea[2], Monica Laura Zlati[3], Ioana Lazarescu[4]

[1) ,2), 3),4)] *Dunărea de Jos University, Galati, Romania*

Abstract

The aim of this study is to examine the role of environmental taxes in generating tax revenues and reducing greenhouse gas emissions in the European Union. The study investigates how these taxes, particularly those on energy and transport, contribute to the EU's climate objectives, such as climate neutrality by 2050. It also assesses differences in their implementation between Member States. In the context of the European Green Pact, the research aims to provide a comprehensive analysis of the effectiveness of these taxes in supporting climate policies and sustainable development. The study uses an econometric analysis applied to a dataset comprising relevant economic and environmental indicators, including taxes on energy, transportation, net greenhouse gas emissions and GDP per capita. This approach makes it possible to assess the relationships between the variables and to measure the impact of each type of tax-on-tax revenues and emission reductions. The analysis also includes descriptive statistics to highlight differences between Member States. The results indicate that energy taxes have a significant and positive impact on revenues from environmental taxes, contributing substantially to the budgets of Member States that implement them in an ambitious way. At the same time, fuel and transport taxes have been found to be under-used in some Member States, thus limiting their potential to generate revenue and reduce transport emissions. The economic differences and uneven application of environmental taxes between Member States suggest the need for harmonization and coordination at EU level to achieve common climate objectives. From a policy point of view, the findings highlight the importance of developing well-coordinated environmental tax policies to maximize their effectiveness in reducing emissions and generating revenues. Strengthening environmental fiscal frameworks, reinvesting revenues in sustainable initiatives and ensuring equitable implementation across Member States are key measures that policy makers should consider enhancing the role of environmental taxation in climate governance. However, the study also has some limitations that should be considered when interpreting the results. The analysis is based on aggregate macroeconomic data, which may not fully capture sectoral and regional

[*] Corresponding author, **Valentin Marian Antohi** – valentin_antohi@yahoo.com

differences in the effectiveness of environmental taxes. In addition, although the econometric model isolates the effects of taxation, other factors such as technological advances, regulatory frameworks and behavioural changes also play an important role in reducing emissions and could not be fully accounted for in this study. Future research should explore more detailed sectoral analysis and assess long-term trends to provide a more comprehensive understanding of the effectiveness of environmental taxation in the European Union.

Keywords
environmental taxes, public policy, tax revenues, economic growth, econometric analysis
JEL Classification
H2, H3, H6

Introduction

The European Union, in its efforts to achieve climate neutrality by 2050, is promoting environmental fiscal policies essential for the transition to a green economy. The European Green Deal (European Commission, 2023) and the Paris Agreement (United Nations, 2023) commitments put the EU at the forefront of global sustainability initiatives. Energy and transport taxes play an important role, helping both to reduce greenhouse gas emissions and to generate revenues for green infrastructure and energy efficiency. However, the implementation of these taxes varies between Member States, creating challenges in ensuring a just transition. This paper analyses the impact of these taxes on tax revenues and climate policies, offering solutions for their optimization to support less developed countries and strengthen cohesion in the EU. The aim of this study is to analyse the role of environmental taxes in generating tax revenues and reducing greenhouse gas emissions in the European Union and on the implementation of climate policies in the context of the transition to a green economy and international commitments to reduce greenhouse gas emissions.

The adoption of green taxes reflects a broader EU effort to align tax structures with sustainable development goals, helping to internalize the external costs of pollution and promoting a more sustainable economic model (Saqib, Usman, et al., 2023). Taxes on energy, transport and carbon emissions are the main mechanisms used to influence economic behaviour and reduce greenhouse gas (GHG) emissions (Ahmad et al., 2024; Pan et al., 2024). However, the effectiveness of these taxes depends on their level of enforcement and the coherence of tax policies at EU level. Some Member States, such as Sweden and Germany, have implemented high green taxes, using the revenues raised to support technological innovation and renewable energy (Degirmenci & Aydin, 2024; Degirmenci & Yavuz, 2024). In contrast, other countries, particularly in Eastern Europe, apply lower levels of taxation, which reduces their effectiveness and creates economic disparities in the green transition (Dorjnyambuu, 2024; Obobisa & Ahakwa, 2024). These differences raise competitiveness and social justice issues, requiring better coordination of tax policies at EU level (Love, 2024; Müller et al., 2024).

The social acceptability of green taxes remains an important challenge, as these taxes can have a regressive impact on the population, disproportionately affecting low-income households, requiring appropriate compensatory measures such as green energy subsidies or tax rebates for vulnerable groups (Muth, 2023).

Beyond the economic and social implications, another major obstacle to the effective implementation of green taxes is the lack of a coherent strategy on the use of the revenues raised from these taxes. While in theory, the money collected through environmental taxes should be reinvested in green infrastructure projects and measures to support the energy transition, in reality, their allocation varies considerably across Member States, which reduces their long-term impact and can create uncertainty among taxpayers (European Enviromental Agency, 2023). For example, in some countries, revenues from energy taxes are used to balance national budgets without being explicitly directed towards sustainable investments, which undermines the original purpose of these tax policies and may affect public perception of their legitimacy (World Bank, 2022).

In this context, this research proposes a comprehensive analysis of the impact of environmental taxes on tax revenues and greenhouse gas emission reductions in the European Union, through an econometric approach linking data on energy and transportation taxation levels, gross domestic product per capita and net greenhouse gas emissions. Unlike other studies that have focused on either the fiscal impact of environmental taxes or their environmental dimension, this paper integrates both perspectives to provide an overview of how environmental taxes simultaneously contribute to the EU's budgetary and climate objectives (Sackitey, 2023).

The novelty of this paper lies in its comprehensive approach to the impact of environmental taxes on tax revenues and climate policies in the European Union, through an econometric analysis linking economic and environmental variables in the current context of the ecological transition. Unlike other previous studies that have analysed the fiscal or climate effects of environmental taxes individually, this paper integrates both dimensions to assess the extent to which environmental taxes contribute both to the generation of budgetary revenues and to the reduction of greenhouse gas emissions. The study thus contributes to the discussion on green fiscal policies and the transition to a climate neutral economy in the European Union.

The research objectives are:

O1: Literature review on the impact of environmental taxes on tax revenues

O2: Modelling the impact of different economic and environmental indicators on environmental tax revenues at EU level

O3: Disseminating results and formulating public policy

By achieving these objectives, the paper aims to contribute to the discussion on green fiscal policies and to provide solutions for strengthening fiscal and environmental policies in the European Union.

2. Literature review

In recent years, a growing literature has explored the role of environmental taxes in achieving fiscal sustainability and reducing greenhouse gas emissions. Research on international taxation and environmental policies has developed significantly in recent

decades, highlighting the need for coordinated and integrated tax policies to address global economic and environmental challenges (Chelly et al., 2022; He et al., 2023; Tan et al., 2022). Some recent studies (Saqib, Radulescu, et al., 2023; Song & Hua, 2024; Xu et al., 2023) have explored the impact of environmental taxes on national economies and carbon reduction targets, emphasizing that effective tax policies can support both economic growth and environmental protection. A central issue discussed in the recent literature is the effect of environmental taxes on fiscal sustainability. According to the authors Al Shammre et al. (Al Shammre et al., 2023), Aziz et al. (Aziz et al., 2024), (Hartono et al. (Hartono et al., 2023), The correct application of carbon and energy taxes can have beneficial effects on both government revenues and the reduction of greenhouse gas emissions. Research by Khan et al. (Khan et al., 2023), Javed et al. (Javed et al., 2023) support this theory, demonstrating that environmental taxes have a significant impact on technological innovation and the transition to a green economy. In addition, a body of research underlines the importance of harmonizing tax policies at the international level, especially within the European Union. Mérand (Mérand, 2024) și Jaakkola (Jaakkola, 2023) stresses that without a coordinated tax approach, Member States risk creating an environment of unfair tax competition. According to the Nerudova et al. (Nerudova et al., 2023), Close tax cooperation is essential to maximize the efficiency of tax systems and to avoid the erosion of the tax base as well as the artificial transfer of profits between jurisdictions. The issues raised by the Base Erosion and Profit Shifting (BEPS) initiative have attracted considerable attention in the recent literature. Some studies (Alm et al., 2022; Noonan & Plekhanova, 2023) argue that the implementation of BEPS measures has improved tax transparency and limited abusive tax avoidance practices. However, many countries still face difficulties in effectively applying these measures, especially in emerging economies. In the context of the rapidly developing digital economy, some studies (Catubig et al., 2024; Hines, 2023; Mpofu, 2022) examined the difficulties that countries face in taxing digital companies. These studies reveal that the digital economy requires a new tax approach, reflecting the complexity of globally generated revenues. In this respect, recent proposals to implement a global minimum tax are seen as a promising solution to ensure fair taxation and combat tax avoidance in the digital sector. Therefore, this paper aims to extend the existing literature by investigating the integrated impact of taxation on economic and environmental sustainability. The contributions of the current research will provide a better understanding of how tax policies can facilitate the transition to a green and digital economy in line with the European Union's sustainability and climate neutrality goals by 2050.

3. Methodology and data

We aim to analyse the impact of different economic and environmental indicators on environmental tax revenues at the EU level, using a multivariate econometric model. The main goal is to identify significant relationships between environmental taxes, greenhouse gas emissions, GDP per capita and other relevant variables to assess the effectiveness of environmental fiscal policies in the context of efforts to transition to a

green economy. We used data from the Eurostat platform for the period 2010-2022, the indicators are presented in Table 1.

Table no. 1. Presentation of indicators

Symbol	Indicators	Type	Unit of measure	Data source
ENVTAXR	Environmental tax revenues	dependent	Million euro	Eurostat (Eurostat, 2024b)
TAXEN	Environmental taxes - Taxes on energy	independent	% of GDP	Eurostat (European Commission, 2024)
TAXENT	Environmental taxes - Taxes on energy, of which transport fuel taxes	independent	% of GDP	Eurostat (European Commission, 2024)
TAXTRANS	Environmental taxes - Transport taxes (excluding fuel taxes)	independent	% of GDP	Eurostat (European Commission, 2024)
NGRNHE	Net greenhouse gas emissions	independent	Index, 1990=100	Eurostat (Eurostat, 2024c)
GDPCAP	Real GDP per capita	independent	euro per capita	Eurostat (Eurostat, 2024d)
ENFL	Energy flow - Sankey diagram data Final consumption - energy use	independent	Million euro	(Eurostat, 2024a)

Source: Elaborated by the authors

The analysis period 2010-2022 has been chosen given the significant developments in EU policies on green taxation and energy transition, as well as the availability of relevant data for all 27 EU Member States. Since 2010, the EU has stepped up efforts to implement fiscal mechanisms in support of climate objectives with the adoption of the Europe 2020 strategy, which introduced the first firm commitments to a low-carbon economy. In the following years, these measures have been reinforced by initiatives such as the 2030 Energy-Climate Package, which set more ambitious targets for

emission reductions, energy efficiency and the use of renewable energy, and the launch of the European Green Deal in 2019, which redefined the regulatory framework for green taxation in Member States. The choice of the period 2010-2022 thus allows capturing these legislative changes and assessing their impact on the level of green taxation and the associated fiscal and climate effects. As regards the selection of the variables included in the econometric model, the main criteria were their relevance to the objectives of the study and the availability of consistent datasets at Member State level. The dependent variable, environmental tax revenues (ENVTAXR), was chosen because it directly reflects the impact of fiscal policies on public finances and the environmental transition. Among the independent variables, taxes on energy (TAXEN) and transportation (TAXTRANS) were included because they are the main components of green taxation and are used as regulatory instruments to reduce emissions. GDP per capita (GDPCAP) was introduced to capture the relationship between economic development and the ability of states to implement green taxes, while net greenhouse gas emissions (NGRNHE) allow an assessment of the fiscal efficiency of environmental taxes in achieving climate goals. Some variables, such as the level of investment in green technologies or government expenditure on energy transition, have not been included in the model due to limited data availability or methodological differences in reporting between Member States. In addition, variables relating to the structure of energy consumption or the level of excise taxes specific to each country have been excluded to avoid collinearity problems and to maintain the robustness of the estimates. The model used thus aims to balance the accuracy of the estimates with data availability and comparability between Member States, providing a robust analytical framework for assessing the impact of green taxation on tax revenues and emission reductions. These variables are selected based on their relevance to EU environmental and fiscal policy and reflect the objectives of reducing carbon emissions and promoting the transition to the green economy. The methodology aims to assess the statistical significance of each variable and their relative impact on environmental tax revenues, using least squares (OLS) estimators. This approach aims to obtain a clear picture of how environmental tax policies contribute to the achievement of the European Union's economic and environmental objectives, with a particular focus on the interaction between taxes and macroeconomic and environmental variables.

We formulate the following working hypotheses:

Hypothesis 1 (H1): An increase in energy taxes (TAXEN) has a positive and significant impact on environmental tax revenues, suggesting that energy tax policies are effective in generating additional tax revenues.
Hypothesis 2 (H2): Transportation taxes (TAXTRANS), excluding fuels, have a positive and significant impact on environmental tax revenues, suggesting that transportation tax policies are effective in raising additional tax revenues.
Hypothesis 3 (H3): An increase in GDP per capita (GDPCAP) has a positive and significant impact on environmental tax revenues, indicating that states with higher GDP generate more environmental tax revenues.

Hypothesis 4 (H4): An increase in final energy consumption (ENFL) has a significant positive impact on environmental tax revenues, indicating that states with higher energy consumption have higher environmental tax revenues.

The linear regression model equation is expressed as:

$$ENVTAXR = \beta 0 + \beta 1 \cdot TAXEN + \beta 2 \cdot NGRNHE + \beta 3 \cdot TAXENT + \beta 4 \cdot TAXTRANS + \beta 5 \cdot GDPCAP + \beta 6 \cdot ENFL + \epsilon$$

Where,
ENVTAXR - Environmental tax revenues (in million euro), dependent variable.
TAXEN - Energy taxes (% of GDP), independent variable;
NGRNHE - Net greenhouse gas emissions (Index, 1990=100), independent variable;
TAXENT - Transportation energy taxes (% of GDP), independent variable;
TAXTRANS - Transportation taxes excluding fuels (% of GDP), independent variable;
GDPCAP - Real GDP per capita (euro per capita), independent variable;
ENFL - Final energy consumption (in million euro), independent variable
β0 - Constant term (intercept).
β1,β2,β3,β4,β5,β6 - The coefficients associated with each explanatory variable, representing the expected change in environmental tax revenues for each unit of change of the respective variables.
ϵ - The regression error or residual, capturing the unspecified variable in the model.

This equation describes how each of the independent variables influences environmental tax revenues. The coefficients β provide quantitative estimates of the impact of each variable, allowing us to assess whether these variables are statistically significant and to what extent they contribute to environmental tax revenues at the EU level.

4. Results and discussions

In the context of the transition to a green economy, the European Union has adopted a series of fiscal measures to discourage polluting economic activities and stimulate investment in sustainable technologies. Environmental taxes play an important role in this effort, helping to generate additional tax revenues, but also contributing to climate objectives by changing economic behaviour.

VIF (Variance Inflation Factor) values are used to assess the collinearity problem between independent variables in a regression model. The results of the VIF values for the model are presented in Table 2.

Table no. 2. VIF (Variance Inflation Factor) values

	VIF	1/VIF
TAXENT	3.124	0.32
TAXEN	2.189	0.457
TAXTRAS	1.75	0.571
GDPCAP	1.48	0.676
NGRNHE	1.383	0.723
ENFL	1.221	0.819

Mean VIF	1.858	.

Source: Elaborated by the authors

According to Table 2, the VIF values for all variables are below the critical threshold of 5, which indicates that there is no collinearity problem between the explanatory variables. The highest VIF values are for TAXENT and TAXEN, but these are also within an acceptable range, suggesting that the variables can be included in the model without affecting the stability and reliability of the estimates. The variables ENFL and NGRNHE have the lowest VIF values, suggesting that they are the least correlated with the other variables in the model, meaning that they can provide independent and valuable information about their impact on environmental tax revenues. Thus, the model does not suffer from collinearity and the independent variables can be properly interpreted in the regression analysis.

Table 3 presents the descriptive statistics of the indicators.

Table no. 3. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ENVTAXR	351	11189.143	16339.201	190.62	65179
TAXEN	351	1.993	0.571	0.5	4.8
NGRNHE	351	80.016	28.092	22.1	162.6
TAXENT	351	1.443	0.44	0.4	2.7
TAXTRANS	351	.501	0.343	0	1.5
GDPCAP	351	26015.071	17064.992	5080	85850
ENFL	351	3564.293	4212.506	4.9	19111.3

Source: Elaborated by the authors

The evolution of indicators for 2022 is presented in Figure 1.

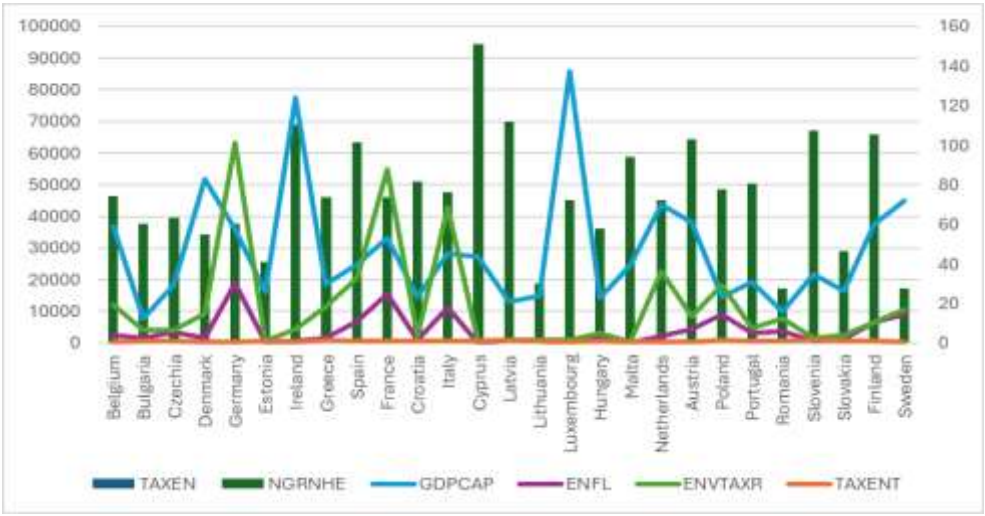

Figure no. 1. Evolution of the analysed indicators in 2022 at the level of the European Union countries

Energy taxes in the EU vary significantly between Member States, with an average of 1.99% of GDP. The standard deviation of 0.57 suggests a moderate variation, reflecting differences between countries in the application of energy tax policies. The minimum level of 0.5% and the maximum of 4.8% suggest that some countries apply more aggressive energy tax policies while others levy lower taxes. Member states with high energy taxes, such as Denmark and Sweden, use the revenues to finance the transition to renewables and discourage fossil fuel consumption. Increasing energy taxes in Member States is key to achieving the EU's climate goals, including climate neutrality by 2050. These taxes contribute directly to reducing fossil fuel consumption and generating revenues to support the green transition. This disparity reflects differences in economic and policy priorities between Member States, but also points to an opportunity for harmonization of environmental tax policies at EU level. Taxes on transport fuels average 1.44% of GDP, varying between 0.4% and 2.7%, and are higher in countries such as Germany and the Netherlands. In contrast, transport taxes (excluding fuels) average 0.50%, indicating a more limited application. GDP per capita in the EU ranges from €5,080 to €85,850, reflecting major economic differences between Member States. States with higher GDP are better prepared for the green transition, while those with lower GDP require additional support. Final energy consumption and revenues from environmental taxes vary significantly between countries, reflecting economic and fiscal differences, with large countries such as Germany and France collecting significant amounts.

The results of the regression model estimation for the impact of economic and environmental variables on environmental tax revenues in the European Union are presented in Table 4.

Table no. 4. Regression model estimation results for the impact of economic and environmental variables on environmental tax revenues in the European Union

ENVTAXR	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
TAXEN	4125.602	1049.041	3.93	0	2062.26	6188.943	***
NGRNHE	22.653	16.965	1.34	0.183	-10.715	56.021	
TAXENT	-2085.232	1626.627	-1.28	0.201	-5284.619	1114.156	
TAXTRANS	4456.896	1564.595	2.85	0.005	1379.52	7534.272	***
GDPCAP	.094	.029	3.24	0.001	.037	.15	***
ENFL	3.425	.106	32.22	0	3.216	3.634	***
Constant	-12711.56	2650.433	-4.80	0	-17924.65	-7498.47	***

Mean dependent var	11189.143	SD dependent var	16339.201
R-squared	0.788	Number of obs	351
F-test	213.651	Prob > F	0.000
Akaike crit. (AIC)	7274.256	Bayesian crit. (BIC)	7301.282

**** p<.01, ** p<.05, * p<.1*

Source: Elaborated by the authors

According to Table 4, the R-squared value (R-squared = 0.7884) shows that the model explains about 78.84% of the variation in environmental tax revenue. This is a fairly high value, indicating considerable explanatory power of the model. The adjusted R-squared value (Adj R-squared = 0.7847) confirms this, correcting for the number of variables included in the model. The F value (213.65) and the associated probability (Prob > F = 0.0000) indicate that the regression model as a whole is highly statistically significant, suggesting that the explanatory variables taken together have a significant effect on the dependent variable (ENVTAXR). The model suggests that an increase in energy taxes (TAXEN) has a positive and significant impact on environmental tax revenues, with a coefficient of 4125.602 and a p-value = 0.000. This result confirms hypothesis H1 that energy taxes contribute substantially to the increase in environmental tax revenues. At the EU level, this has major implications, given that energy taxes are a key tool in the energy transition strategy. Taxes on fossil fuels and other forms of polluting energy discourage their use and stimulate investment in renewable energy sources. Countries such as Germany and Denmark have adopted strong tax policies in this regard, helping to increase tax revenues that can be reinvested in green initiatives and sustainable infrastructure projects. As the EU steps, up its efforts to become climate neutral by 2050, increasing energy taxes is seen as an important tool to achieve these goals. The positive coefficient of 4456.896 associated with transportation taxes (TAXTRANS) and its statistical significance (p = 0.005) confirms hypothesis H2 that these taxes contribute significantly to environmental tax revenues. At the European level, transportation taxes, such as registration taxes and vehicle taxes,

play an important role in discouraging the ownership of polluting vehicles and promoting environmentally friendly vehicles. Countries such as France and the Netherlands have successfully implemented such policies, which not only boost tax revenues, but also contribute to a shift in consumption behaviour towards low or zero emission vehicles. These taxes are essential to support green transport infrastructure and reduce emissions in the transport sector, one of the most difficult to decarbonize. The model result indicates a positive coefficient of 0.0935686 for GDP per capita (GDPCAP) and a p-value = 0.001, which supports hypothesis H3 that countries with higher GDP per capita generate more revenues from environmental taxes. This implies that richer countries in the European Union, such as Sweden, Germany or the Netherlands, can implement higher environmental taxes and invest more in environmental policies. These countries not only impose higher environmental taxes but also have a greater financial capacity to reinvest these revenues in sustainable technologies and green infrastructure projects, strengthening the transition to a low-carbon economy. The coefficient of 3.425345 associated with final energy consumption (ENFL) and its statistical significance (p = 0.000) confirm hypothesis H4 that higher final energy consumption is associated with higher environmental tax revenues. This result reflects the importance of energy consumption in generating tax revenues in EU Member States. Countries with high energy consumption, such as Germany and Italy, collect substantial revenues from taxes on energy consumption, and these revenues can be used to finance the energy transition. Increasing energy efficiency and switching to renewable energy sources will gradually reduce fossil energy consumption, but energy consumption taxes are currently a major source of revenue for Member States. However, there is a need for optimization and coordination between different types of taxes and other complementary policies to support the transition to a sustainable economy and to achieve the ambitious climate goals of the European Union.

In terms of practical implications, the results suggest that EU tax policies should encourage the harmonization of environmental tax levels between Member States to avoid economic distortions and unfair tax competition. At present, discrepancies between countries with high environmental taxes, such as Sweden and Germany, and those with lower levels of taxation, particularly in Eastern Europe, limit the effectiveness of EU-wide measures. Setting minimum tax thresholds for energy and transport taxes could therefore reduce these differences and ensure a fairer contribution to the green transition. The results also emphasize the importance of reinvesting revenues from environmental taxes in sustainable infrastructure, renewable energy and social protection measures for vulnerable groups to prevent the regressive impact of these taxes on low-income consumers. Compared to other studies in the literature, this research provides a more comprehensive perspective on the interaction between environmental taxes and economic and environmental indicators. For example, previous studies by Ahmad et al. (Ahmad et al., 2024) and Saqib et al. (Saqib, Usman, et al., 2023) demonstrated the positive effects of carbon taxes on emission reductions, but without linking these to the tax revenues raised and the disparities across EU Member States. In contrast, our research integrates both dimensions, highlighting not only the fiscal impact of environmental taxation, but also its role in the development of a

sustainable economic framework. Also, the studies by Javed et al. (Javed et al., 2023) emphasized the importance of an efficient distribution of green tax revenues, a conclusion that is also supported by the results obtained in this analysis. The distinct contribution of this study lies in its integrated approach to fiscal and environmental impacts, thus providing a sound analytical framework for the formulation of more coherent and effective public policies at the European level. The results indicate the need for more effective coordination of green taxation policies at EU level to ensure a balanced economic impact and a sustainable transition towards climate neutrality. By harmonizing green taxation and effectively reinvesting revenues from environmental taxes, Member States can maximize the economic and environmental benefits of this fiscal instrument.

5. Conclusion

In the context of the European Union's objective to become climate neutral by 2050, environmental fiscal policies play an important role in the transition to a green economy. They not only generate revenues for sustainable infrastructure and renewable energy projects but also influence economic behaviours and contribute to reducing greenhouse gas emissions. Based on the results we are formulating a set of public policies that reflect the potential of environmental taxes on EU Member States' economies as well as on long-term climate goals. To ensure a uniform application of environmental taxes and to maximize their impact on tax revenues and emission reductions, the European Union should promote the harmonization of tax policies between Member States. This could entail setting minimum levels for energy and transport taxes so that all countries contribute fairly to achieving climate objectives. Given the limited impact of fuel taxes in some Member States, a review of tax policies in the transport sector is needed. Public policies should encourage higher fuel taxes and promote electric vehicles as well as other forms of low-emission transport. This could involve setting minimum levels for energy and transport taxes so that all countries contribute equitably to climate goals. Given the limited impact of fuel taxes in some Member States, a review of fiscal policies in the transport sector is needed. Public policies should encourage higher fuel taxes and promote electric vehicles as well as other forms of low-emission transport. Schemes to tax infrastructure use and transport emissions should also be introduced. To facilitate the green transition in Member States with lower GDP per capita, the European Union should develop financial support mechanisms including cohesion funds and other financing programs dedicated to climate policies. This support would allow these states to implement ambitious environmental fiscal measures without negatively affecting economic growth. The funds raised from environmental taxes should be reinvested in a strategic way, in particular in modernizing energy infrastructure and energy efficiency incentives. These public policies support the green transition through financial support mechanisms, investment in sustainable infrastructure and tax reforms, contributing to a more sustainable and resilient European Union in the long term.

However, the study has certain limitations that need to be considered when interpreting the results. The use of aggregated national level data may omit regional or sectoral particularities that could influence the effectiveness of environmental taxes. Also, the econometric model used, although robust, cannot capture all contextual variables that may influence the relationship between environmental taxes and economic and climate outcomes, such as changes in consumer behaviour or indirect effects of other environmental regulations. Another limitation is that the analysis did not include variables related to the impact of pandemics on green tax policies, an issue that could have significant implications for recent trends in green taxation. Building on these limitations, future research could explore the specific impacts of green taxes on different economic sectors, looking in detail at how green tax policies affect emission-intensive industries such as transportation and industrial manufacturing. Also, an important line of investigation would be to assess how the COVID-19 pandemic has influenced green taxation, either through changes in consumer behaviour and decreases in fossil fuel consumption, or through new economic support measures that have affected the implementation and effectiveness of green taxes. In addition, future research could analyse the impact of the implementation of the Border Carbon Adjustment Mechanism on emerging economies and international trade relations, given the new EU regulations adopted in this respect.

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