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Dr. Diellza Bilalli

International Balkan University, Skopje, North Macedonia

https://orcid.org/0009-0007-5459-4595

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Correspondence concerning this article should be addressed to Dr. Diellza Bilalli.

Email: Diellza.ibu@ibu.edu.mk

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Evaluating the Economic and Environmental Effects of Environmental Taxation in OECD Countries

Dr. Diellza Bilalli

Abstract

As concerns about global environmental issues are recognized as a significant factor that must be addressed and mitigated, policymakers are turning to taxation to internalize externalities and motivate sustainable practices. This paper investigates the effectiveness of environmental taxation in achieving economic and environmental objectives by analyzing data from OECD countries. Examining the relationship between taxation, economic behavior, and environmental goals provides essential insights into the implementation and outcomes of environmental taxation policies. If appropriately designed, environmental taxation can be an important tool that aligns economic incentives and environmental objectives. In order to test for the effect that environmental taxes would have on the economy and the environment, data were analyzed for the OECD countries for the period 1994-2023 by using several techniques, including the Ordinary Least Squares, Fixed Effects, and Random Effects models. The findings suggest that in OECD countries, by implementing environmental taxation, the desired economic and environmental goals are not being met yet, since environmental taxation is not contributing to positive economic growth and not contributing to lowering emissions, such as a one percentage point increase in environmental related tax revenue, leads to a decrease in the real GDP of $4633per capita, and 1.22 metric ton increase in emissions per capita, indicating that the environmental tax as a tool is not being used effectively in OECD countries.

Keywords: Environment, taxes, carbon, emissions, sustainable

Introduction

As global warming concerns have increased in recent years, countries have recognized the importance and urgency of addressing environmental issues. Initiatives have been taken on the global level. Countries around the world are implementing strategies to mitigate climate change risk, reduce pollution, and protect natural resources by enforcing environmental regulations, promoting sustainable practices, developing green technologies to improve energy efficiency and reduce pollution, investing in sustainable infrastructure, and promoting public awareness and education about the importance of preserving our planet.

Since natural resources are scarce, they need to be protected and carefully and efficiently managed so that future generations are able to meet their needs. As a result of this, a new field of economics called 'environmental economics' has emerged, which analyses and investigates the ways that economic incentives and policies can be used in such a way to effectively address environmental issues that come as a result of economic activities such as pollution, resource depletion, waste, and climate change, while at the same time considering the costs and economic impacts. The roots are traced back to the late 1950s and early 1960s. Kolstad (2011) defines this field as: "Environmental economics is concerned with the impact of the economy on the environment, the significance of the environment to the economy, and the appropriate way of regulating economic activity so that balance is achieved among environmental, economic, and other social goals".

Among imposing and enforcing environmental standards for industries, standards for vehicle fuel efficiency, and proper disposal of waste, countries have started to impose environmental taxes to internalize the negative externality resulting from unregulated economic activity. As is known, a negative externality occurs whenever an economic agent generates a cost that influences other parties but does not account for or pay for it. When these costs are not reflected in the prices, it will result in overproduction and overconsumption of goods or other activities that might have social costs. So, the introduction of such taxes aims to internalize the negative externality. These types of taxes are called 'Pigouvian Taxes'. They are named after the famous economist Cecil Pigou, who argued and stressed the importance of government intervention in using taxes and subsidies to internalize the effects of such externalities.

According to the OECD, environmentally related taxes are categorized into four categories: taxes on energy products such as fossil fuels and electricity, including the fuels used in transportation; taxes on transport including the import/export

taxes of transport vehicles; Pollution taxes and Resources taxes including taxes on water extraction, forest products, and cover the following environmental domains: climate change, biodiversity, ocean, air pollution, water and soil pollution, ozone, noise, radiation, fossil fuels, minerals, chemical management, energy efficiency etc.

All these taxes imposed on environmental-related goods tend to regulate and internalize the externality, ensuring that the actual costs are charged to those responsible and incentivizing more sustainable practices while at the same time protecting the environment and society from harmful activities. Imposing such taxes encourages cleaner production processes, reduces emissions, and supports environmental sustainability.

Literature Review

Imposing environmental-related taxes in different sectors influences economic behavior since it impacts the prices of goods and services, discouraging unsustainable practices while at the same time incentivizing environmentally friendly practices such as green technologies and eco-friendly energy use to reduce emission levels.

Authors have analyzed the different impacts that environmental taxes and environmental regulations can have on various economic and environmental aspects, such as improved environmental quality related to a low-emission economy (Karydas & Zhang, 2019), promoting renewable technology by recycling the taxes and subsidizing renewable energy or energy-efficient technologies (Baranzini et al., 2000; Mardones & Carbello, 2019), reduce carbon emissions and fossil fuel energy consumption (Borozan, 2019). On the other hand, since imposing environmental taxes can lead to higher production costs, it can weaken the international competitiveness of firms, or the polluters might shift this increased cost to customers by charging higher prices on their products (Lin & Li, 2011).

When analyzing the relationship between environmental taxes and pollution, Morley (2012) found a significant negative relationship between environmental taxes and pollution. Further, Miller and Vela (2013) found that carbon taxes effectively reduce carbon emissions. Other authors, Nakata and Lamont (2001), and Berkhout et al. (2004), have also obtained similar results that state that environmental taxes are effective in reducing carbon emissions. Similarly, Wolde-Rufael and Mulat-Weldemeskel (2023), when analyzing 20 European countries for the period 1995-2012, found a negative and statistically significant relationship between environmental taxes and carbon emissions.

On the other hand, some authors have found that environmental taxes alone are ineffective in reducing CO2 emissions. Instead, there is a need to implement other environmental policies to reach the desired objectives. Agostini et al. (1992) examined the effects of a carbon tax on CO2 emissions in OECD-European countries. They found out that even with the introduction of such a tax, the emissions keep growing. Similarly, Lin and Li (2011) found that environmental taxes are ineffective and do not significantly reduce emissions. This view is also supported by Liobikienė et al. (2019), who analyzed the European Union countries, and their results showed that the environmental taxes, more specifically the energy taxes, did not influence emissions.

Imposing environmental taxes also affects economic activity, so authors have investigated the relationship between these two indicators and have found that higher pollution taxes boost economic growth (Hettich, 1998). Similarly, Dökmen (2012) analyzed 26 European countries from 1996 to 2009 and found that introducing and increasing environmental taxes leads to a statistically significant increase in gross domestic product.

Sadiku and Madzova (2024) estimate the relationship between industrial activity and green growth for OECD countries where the production-based CO2 emissions index was used as a proxy variable of green growth. Their results suggest that environmental taxes and investments in environmental technology can mitigate CO2 emissions.

Environmental policy instruments in general can affect the broader economic activities. Environmental taxes are only a part of a broader set of environmental policy instruments that can have wider impact effects beyond emission reduction. Environmental policy stringency can influence economic activity through changes in trade patterns and innovation. Evidence from OECD countries suggests that stricter environmental policies can reshape trade patterns by increasing the trade of environmental-related goods, as countries adjust production and consumption towards more sustainable practices in order to comply with regulations (Bilalli, 2024). This suggests that environmental policies and environmental taxes can contribute not only to environmental outcomes but also to the economy.

Research Methodology

This paper's main objective is to investigate the relationship between environmental taxes and economic growth, and the relationship between environmental taxes

and emissions for the period 1994-2023 in OECD countries. The empirical analysis consists of several techniques, covering panel data for the OECD countries.

The analysis aimed to investigate the separate impact that environmental taxes would have on economic growth and the environment. Therefore, two separate analyses were conducted to determine the effects.

The following Hypotheses were tested:

H0a: Environmental Taxes do not affect economic growth

H1a: Environmental Taxes influence economic growth

H0b: Environmental taxes do not affect the quality of the environment

H1b: Environmental taxes influence the quality of the environment

The analysis begins with investigating the impact of environmental taxes on economic growth. The indicator for environmental taxation was taken as the Environmental Related Tax Revenue as a percentage of GDP in OECD countries, obtained from the OECD database, and serves as an independent variable, while the indicator to measure economic growth is taken as Real GDP per Capita, which serves as a dependent variable and was also obtained from the OECD database. Firstly, an OLS regression analysis was made, and then a fixed and random model was applied. Finally, a Hausman test was performed to assess which model was more appropriate for the analysis. The models are also tested for heteroskedasticity.

Then, the second part of the analysis investigates the effect of environmental taxes on the environment. Again, the indicator for environmental taxes was taken as the Environmental Related Tax Revenue as % of GDP, while the indicator for measuring environmental progress was taken as the Air emissions- greenhouse gas emissions expressed in kilograms of CO2 equivalent per person, also obtained from the OECD database. The three models mentioned above were also applied in this case.

The Environmentally Related Tax Revenue is expressed as environmental tax revenue as % of GDP, which includes all tax payments to the general government that are deemed to have environmental relevance, including tax on water quantity, water pollution tax, tax on waste collection, tax on emissions to air, plastic bag levy, and energy taxes (Organisation for Economic Co-operation and Development, 2006). The indicator used for measuring economic growth, the Real GDP per capita, was expressed in US$ in 2020ppp, while the indicator for measuring environmental progress was greenhouse gas emissions, measured in CO2 equivalent metric tons per capita.

Table 1

Variables and Explanation

variable	Acronym	Expressed in	Source
Environmentally related tax revenue	ERTR	Tax revenue, % of GDP	OECD
Real GDP per capita	RGDPPC	US Dollar, 2020ppp	OECD
Greenhouse gas emissions per capita	GHGPC	KG of CO2 equivalent per person, thousands	OECD

Source: Organisation for Economic Co-operation and Development (2023, 2025a, 2025b)

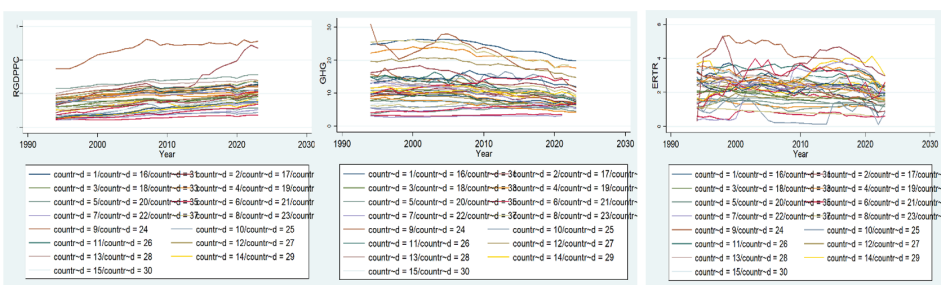
The basic equation model is considered

E1: $RGDPPC=\beta_1+\beta_2\ ERTR$ (1)

E2: $GHGPC=\beta_1+\beta_2\ ERTR$ (2)

Graph 1

GHG per capita, Real GDP per Capita, and Environmental- related Tax Revenue in OECD countries 1994-2023



Source: Compiled by the author based on data from the Organisation for Economic Co-operation and Development (2023, 2025a, 2025b)

The following table represents the descriptive data statistics included in the empirical analysis. The number of observations for the environmental-related tax revenue is 1122; for Real GDP per capita, the number of observations is 1140, while for greenhouse gas emissions per capita, there are 1125 for the OECD countries from 1994 to 2023. The average value of environmental-related tax revenue is 2.25% of the GDP; for the Real GDP per Capita, the value is 42897, while for GHG, the average value is 10.9 metric tons per capita. The standard deviations of ERTR, RG-

DPPC, and CO2PC are 0.865, 20096, and 5.47, respectively. The minimum value for ERTR is 0.11, while the maximum is 5.36; for Real GDP per capita, the minimum value is 10497, while the maximum is 131141; and for greenhouse gas emissions per capita, the minimum value is 2.72, while the maximum is 30.96.

Table 2

Descriptive Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
ERTR	1,122	2.255597	.8652792	.11	5.36
RGDPPC	1,140	42897.92	20096.09	10497.71	131141.3
GHG	1,125	10.9154	5.479709	2.72	30.96

Source: Authors calculations

Empirical Results

Considering that the main aim of this research is to investigate the impact of environmental-related taxes on the economy and the environment, two separate analyses were conducted. This section reveals the empirical analysis by conducting OLS, fixed, and random effect models, and the Hausman-Taylor test was employed to determine which model is more appropriate for this analysis.

First, the results of the analysis on whether environmental taxes impact economic growth will be presented. The indicator taken as an independent variable is the Environmental Related Tax Revenue as a % of GDP, the data taken from the OECD database, while the dependent variable is Real GDP per Capita. As we can see from the following results obtained from the OLS analysis, a positive relationship exists between the variables, meaning that a 1 unit increase in ERTR will increase the Real GDP per capita by 2081$. The results are statistically significant since the p-value = 0.003, which is lower than the critical value of p=0.05, and the t-value is 3. Even though the results are significant, the environmental-related taxes, as a single factor, only explain 0.8% of the Real GDP per capita variations, which is expected, since there are many other factors that affect the Real GDP, that are not included and considered in the model.

Table 3

Results of the OLS model testing the impact of environmental taxes on economic growth

Dependent variable ***RGDPPC***	***β***	***Standard dev.***	***t***	***P>|t|***
ERTR	2081.538	693.1843	3.00	0.003
_cons	38146.47	1674.547	22.78	0.000
Obs	1122			
Prob > F	0.0027			
R-squared	0.0080			
Adj R-squared	0.0071			
Root MSE	20082			

Source: Author's calculations

In addition to the OLS, the data were analyzed using the fixed and random effects models, and the Hausman test was used to determine which of these two models was more appropriate for this analysis.

Table 4

The results of the Fixed and Random effects model on the impact of environmental taxes on economic growth

	FIXED EFFECTS model	**RANDOM EFFECTS** model	**FIXED EFFECTS (robust)**	**RANDOM Effects (robust)**
RGDPPC– dependent variable				
ERTR	-4633.902*	-4514.056*	-4633.902***	-4514.056***
constant	53293.8*	52889.01*	53293.8*	52889.01*
Observation **Nr. of groups**	1,122 38	1,122 38	1,122 38	1,122 38
F / Wald χ^2	93.39*	89.52*	3.68***	3.60***
Hausman test **chi2(1)** **Prob>chi2**	6.25 0.0124			
Note: (*) statistically significant at the 1% level, (**) statistically significant at the 5% level, (***) statistically significant at the 10% level.				

Source: Authors calculations

The number of observations in this analysis is 1122, while the number of groups is 38. Based on the results obtained from the Hausman test, having a value of p=0.0124, the fixed model is more suitable for this analysis at a 5% significance level. Based on this model, there is a significant negative relationship between environmental taxation and economic growth in OECD countries; a 1 unit increase in environmental-related tax revenue as a percentage of GDP would decrease the real GDP per capita by 4633$, the results being highly significant at 10% significance level. According to the analysis, the results show that higher levels of environmental taxation may impede economic growth. According to the results, H0a is rejected, and H1a is accepted, showing that higher environmental taxes can affect the economy; however, that effect is negative.

The next part of the analysis will investigate the effectiveness of environmental taxes in reducing greenhouse gas emissions. A dependent variable is greenhouse gas emissions per Capita, while an independent variable, again, is the Environmental Related Tax Revenue as a % of GDP.

Table 5

The results of the OLS model testing the impact of environmental taxes on the environment

	OLS			
Dependent variable ***EM***	***β***	***Standard dev.***	***t***	***P>|t|***
ERTR	-.0260801	.1901745	-0.14	0.891
Obs	1,109			
Prob > F	0.8909			
R-squared	0.0000			
Adj R-squared	-0.0009			
Root MSE	5.48			

Source: Authors' calculations

The pooled regression analysis shows that none of the variations in greenhouse gas emissions are explained by environmental taxes. However, the model is not statistically significant, with a P-value of 0.89. This model does not reveal a significant relationship between the emissions and the environment in the OECD countries, likely due to heterogeneity across countries, and the model fails to control for unobserved country-specific effects.

Therefore, in order to account for the effects of each group in the panel, the fixed and random effects models were applied, and according to the Hausman test, the random effect proved to be appropriate for this analysis. The model shows that a 1-unit increase in environmental-related tax revenue will increase greenhouse gas emissions by 1.22 metric tons per capita, the results being statistically significant at 5% significance level. Even though the results are statistically significant, the environmental taxes account only for 10.9% of the variations in the emission levels within OECD countries over time.

Table 6

The results of the Fixed and Random effects model on the impact of environmental taxes on the environment

	FIXED EFFECTS model	**RANDOM EFFECTS** model	**FIXED EFFECTS (robust)**	**Random Effects (robust)**
GHG Emissions- dependent variable				
ERTR	1.242848*	1.227925*	1.242848**	1.227925**
constant	8.061936*	8.135569*	8.061936*	8.135569*
Observation **Nr. of groups**	1109 38	1109 38	1109 38	1109 38
F / Wald χ^2	130*	128.59*	6.45**	6.43**
Hausman test **chi2(1)** **Prob>chi2**	2.57 0.1090			
Note: (*) statistically significant at the 1% level, (**) statistically significant at the 5% level, (***) statistically significant at the 10% level.				

Source: Authors calculations

Conclusion

Raised concerns about the viability of natural resources and the climate change risks, which might come because of economic activity, have led countries worldwide to act on a global level, and try to mitigate the negative effects of climate change, committing to reduce pollution, promoting sustainable practices, improving energy efficiency, and reducing waste. One of the measures that the countries

are taking to address these issues is implementing an 'Environmental tax' on goods and activities deemed harmful to the environment as a means to internalize the negative externality resulting from uncontrolled economic activity. This study aimed to analyze whether, by implementing environmental taxation, the countries reached their environmental and economic goals by analyzing the data for selected OECD countries from 1994 to 2023. As the goals of the countries are to increase economic growth and improve the environment by imposing environmental taxes, the result of this analysis shows that environmental taxation is not proving to achieve the intended effect. Firstly, the analysis shows that in OECD countries, as they increase their environmental tax revenue by one percentage point, it leads to a decrease of 4633$ per capita, indicating that higher environmental taxes can impede economic growth. On the other hand, environmental taxes are ineffective in reducing emissions since a one percentage point increase in environmental tax as a percentage of GDP leads to a 1.22 metric ton increase in emissions per capita. The analysis shows that OECD countries are not using environmental taxes effectively since the desired environmental and economic objectives are not being met.

References

Agostini, P., Botteon, M., & Carraro, C. (1992). A carbon tax to reduce CO_2 emissions in Europe. *Energy Policy, 20*(4), 279–290.

Baranzini, A., Goldemberg, J., & Speck, S. (2000). A future for carbon taxes. *Ecological Economics, 32*, 395–412. https://doi.org/10.1016/S0921-8009(99)00110-5

Berkhout, P. H. G., Ferrer-i-Carbonell, A., & Muskens, J. C. (2004). The ex-post impact of an energy tax on household energy demand. *Energy Policy, 26*, 297–317.

Bilalli, D. (2024). Evaluating the influence of environmental regulations on sustainable trade practices (in selected OECD countries). *Knowledge – International Journal, 64*(1), 173–178. https://ojs.ikm.mk/index.php/kij/article/view/6798

Borozan, D. (2019). Unveiling the heterogeneous effect of energy taxes and income on residential energy consumption. *Energy Policy, 129*, 13–22. https://doi.org/10.1016/j.enpol.2019.04.017

Dökmen, G. (2012). Environmental tax and economic growth: A panel VAR analysis. *Erciyes Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 40*, 43–65.

Hettich, F. (1998). Growth effects of a revenue-neutral environmental tax reform. *Journal of Economics, 67*(3), 287–316. https://econpapers.repec.org/article/kapjeczfn/v:67:y:1998:i:3:p:287-316.htm

Karydas, C., & Zhang, L. (2019). Green tax reform, endogenous innovation and the growth dividend. *Journal of Environmental Economics and Management, 97*, 158–181. https://doi.org/10.1016/j.jeem.2017.09.005

Kolstad, C. D. (2011). *Environmental economics* (2nd ed.). Oxford University Press.

Lin, B., & Li, X. (2011). The effect of carbon tax on per capita CO2 emissions. *Energy Policy, 39*(9), 5137–5146. https://doi.org/10.1016/j.enpol.2011.05.050

Liobikienė, G., Butkus, M., & Matuzevičiūtė, K. (2019). The contribution of energy taxes to climate change policy in the European Union. *Resources, 8*(2), 63. https://doi.org/10.3390/resources8020063

Mardones, C., & Cabello, M. (2019). Effectiveness of local air pollution and GHG taxes: The case of Chilean industrial sources. *Energy Economics, 83*, 491–500. https://doi.org/10.1016/j.eneco.2019.05.012

Miller, S. J., & Vela, M. A. (2013). *Are environmentally related taxes effective?* (IDB Working Paper No. IDB-WP-467). Inter-American Development Bank. https://publications.iadb.org/en/are-environmentally-related-taxes-effective

Morley, B. (2012). Empirical evidence on the effectiveness of environmental taxes. *Applied Economics Letters, 19*, 1817–1820.

Nakata, T., & Lamont, L. (2001). Analysis of the impacts of carbon taxes on energy systems in Japan. *Energy Policy, 29*(2), 159–166.

Organisation for Economic Co-operation and Development. (2023). *Environmentally related tax revenue*. OECD Data. https://stats.oecd.org/Index.aspx?DataSetCode=ERTR

Organisation for Economic Co-operation and Development (2025a). *Air Emissions- Greenhouse gas emissions inventories*. OECD Data. https://www.oecd.org/

Organisation for Economic Co-operation and *Development*. (2025b). *Real GDP per capita (green growth indicators)*. OECD Data. https://www.oecd.org/

Organisation for Economic Co-operation and Development. (2006). *The political economy of environmentally related taxes*. OECD Publishing. https://read.oecd-ilibrary.org/environment/the-political-economy-of-environmentally-related-taxes_9789264025530-en

Sadiku, L., & Madzova, V. (2024). The relationship between industrial production and green growth of OECD countries. *Economics and Management, 21*(1), 7–22.

Wolde-Rufael, Y., & Mulat-Weldemeskel, E. (2023). Effectiveness of environmental taxes and environmental stringent policies on CO2 emissions: The European experience. *Environment, Development and Sustainability, 25*(6), 5211–5239. https://doi.org/10.1007/s10668-022-02262-1