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THE IMPACT OF ENVIRONMENTAL TAXES ON TRANSPORTATION AND STORAGE ENTERPRISES' DEVELOPMENT – THE CASE OF BALKAN COUNTRIES

Adam SADOWSKI[1*], Anna MISZTAL[2], Magdalena KOWALSKA[2], Ryszard JĘDRZEJCZAK[1], Per ENGELSETH[3], Andrzej BUJAK[4], Beata SKOWRON-GRABOWSKA[5]

[1]*Department of Strategy and Value-Based Management, University of Lodz, Lodz, Poland*
[2]*Faculty of Economics and Sociology, University of Lodz, Lodz, Poland*
[3]*Tromsø School of Business and Economics, UiT The Arctic University of Norway, Narvik, Norway*
[4]*Department of Finance and Management, WSB University in Wroclaw, Wroclaw, Poland*
[5]*Faculty of Management, Czestochowa University of Technology, Czestochowa, Poland*

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Abstract. Sustainable development counteracts climate change and strives for a good quality of life. It is a development based on economic, social and environmental goals which should be evaluated. Environmental taxes have to ensure enterprises' development follows sustainability principles. The basis of environmental taxes is a physical unit of harmful substance emissions with a proven negative impact on the environment. The article's main objective is to assess the impact of environmental taxes (Env_{tax}) on the sustainable development of the transportation and storage enterprises (Sus_d) (NACE Rev. 2: H) from 2008 to 2018. We created integrated indicators of sustainable development and its components, single-equation and multi-equation models (the OLS estimation) and Model Autoregressive Moving Average with eXogenous (ARMAX) to verify the research hypothesis. The research results indicate that energy (En_{taxI}), transport (Tr_{tax}) and pollution taxes (Pol_{tax}) from current and previous period significantly affect the development of transportation and storage enterprises within sustainability principles (economic: E_d, social: S_d, and environmental: Env_d). There is a strong variation in the strength and direction of the impact of environmental taxes on the development of the transportation and storage enterprises following sustainability principles in Bulgaria, Croatia, Romania, and Slovenia from 2008 to 2018. The results indicate that taxes are not effectively used and that implementing reforms in the European Union in this area is the right direction.

Keywords: sustainable development, environmental taxes, transport sector.

JEL Classification: H25, H71, Q01, Q56.

*Corresponding author. E-mail: *adam.sadowski@uni.lodz.pl*

Introduction

Sustainable development at the enterprise level means maximizing profit, supporting employees and local communities and implementing environmentally friendly solutions, including eco-innovation (Mikušová, 2017; Misztal, 2021; Lassala et al., 2021). Therefore, sustainable development requires instruments and tools to support its goals (Štrukelj & Zabukovšek, 2019). Next to environmental fees, subsidies, loan guarantees, insurance or the EU Emissions Trading System (EU ETS), environmental taxes are economic policy instruments whose task is to stimulate actions for sustainable development (Cremer et al., 2004; Jaworski & Czerwonka, 2019; Shahzad, 2020).

Previous research shows the relationship between environmental regulation, economic growth and sustainable development (Misztal, 2020; Shen et al., 2021; Murshed et al., 2021). Researchers emphasize that enterprises have different environmental tax policies within their multi-tier supply chains (Yu et al., 2019). They point to the economic arguments for increasing environmental taxes and they also emphasize the constraints and risks associated with their growth, including concerns about competitiveness and distribution (Rosenstock, 2014; Leal et al., 2018). Some studies indicate that environmental taxes positively impact emission reduction,., On the other hand, however, they also reduce social welfare (Xu & Lee, 2018). At the same time, research indicates that socially and environmentally responsible enterprises are more likely to pay environmental taxes (Fallan & Fallan, 2019). Research results for the EU member states demonstrate that environmental taxes are one of the determinants of the development of enterprises that occurs within sustainability principles (Misztal, 2020).

The research gap covers the discussions of both the geographical region (Balkan countries) and the industry covered by the study (transport and storage companies).

The paper's novelty is the assessment of the impact of direct environmental taxes on sustainable development and its economic, social and environmental components in Bulgaria, Croatia, Romania and Slovenia from 2008 to 2018. In addition, the analyses concern the transportation and storage sector whose negative environmental impact is indisputable (Fukuda & Ouchida, 2020; Xu et al., 2020). Estimating the correct models of the effect of environmental taxes is essential in terms of actions and legal initiatives undertaken for sustainable development.

We focused on developing countries within the Balkans that joined the European Union during a similar period. These countries share common experiences concerning the transformation from centrally planned to free-market economies. They implemented reforms aimed at liberalizing economies and catching up with the countries of Western Europe. Slovenia has already entered the Eurozone, while Bulgaria, Romania and Croatia are implementing economic programs allowing them to enter the Eurozone in the coming years. The transport and storage sector is not highly developed there, which may be due to the relatively poorly developed transport infrastructure and mountainous areas. Despite progress in expanding the transport network over the past decade, achieving the development goal should focus on the investment, development of intermodal transport and cross-border connections. Analyzed countries can be an alternative to Western Europe's "tight" market (a market with high trading volume and narrow bid and ask margins).

The main hypothesis of the research paper (H_0) is as follows: "The impact of environmental taxes on the sustainable development of transport and storage enterprises in the Balkan countries is diverse in terms of strength and direction". We also formulated the following sub-hypotheses:

- H1: The environmental development of enterprises has higher dynamics compared to the economic and social development of enterprises from the transport and storage section;
- H2: Energy taxes are critical environmental taxes for the sustainable development of companies from the transport and storage section in the analyzed countries;
- H3: Individual environmental taxes often harm the economic, social and environmental development of the transport business sector in the Balkans.

In addition, we want to verify whether there are differences in the impact of individual environmental taxes on the pillars of sustainable development (economic, social and environmental). To validate the purpose of the study, we have created single-, multi-equation and ARMAX models. Calculations are based on the Eurostat database.

The paper's structure was systematized to verify the research hypothesis and it consists of six parts: introduction, literature review, methodology, results, discussion and conclusions.

1. Literature review

Environmental protection and climate change are essential topics in public debate (Damtoft et al., 2008; Cramer et al., 2018; Cohen et al., 2021; Sušnik & van der Zaag, 2017; Bebbington & Unerman, 2018). Sustainable development is the basis for the wellbeing of present and future generations, as well as counteracting climate change. Its implementation requires the involvement of enterprises which, thanks to their activities supporting social and environmental development, can determine their competitiveness level (Gangone & Gănescu, 2014; Comporek et al., 2021; Pimonenko et al., 2020).

The development of enterprises within sustainability principles can be defined in various ways, including:

- "meeting the needs of a firm's direct and indirect stakeholders (…) without compromising its ability to meet the needs of future stakeholders as well" (Dyllick & Hockerts, 2002);
- "keep the business going", "future-proofing" (Colbert & Kurucz, 2007);
- "take decisions considering the common value" (Porter & Kramer, 2007);
- "sustainable enterprise development is the procedure to develop shareholders' worth by economic, social, and environmental perfection" (Bansal et al., 2019);
- "sustainable development is the basis for the development of future generations and constitutes opportunities and challenges for managers in terms of building socio-economic value" (Stawicka, 2021).

It consists of three pillars (Taşkirmaz & Bal, 2017; Księżak & Fischbach, 2018; Dhahri & Omri, 2018):

- economic, based on profit maximization, increase in the value of the enterprise, increase in the level of assets, cost reduction (improvements and reduced energy and raw material inputs), opening and creation of a new market;
- social, which means employee development, training and salary increase, improvement of working conditions;
- environmental, based on reducing the negative impact of economic activity on the natural environment, reducing waste and emissions into the environment, eliminating toxic substances and using renewable raw materials.

Enterprises' sustainable development requires adaptation to the changing environmental conditions, continuous learning, and reorienting the company's goals towards increasing value for contractors and customers (Siebenhüner & Arnold, 2007; Membrillo-Hernández et al., 2018; Gatti et al., 2019). It is necessary to undertake ecological investments and implement innovative ecological solutions, while generating additional costs (You et al., 2019; Qi, 2021; Andajani & Agustia, 2021). Hence, some managers prefer not to take social and environmental actions. Therefore, it is necessary to introduce a system of incentives, tools and instruments to encourage taking actions aimed at sustainable development (Forero-Montaña et al., 2018; Rendtorff, 2019).

The role of environmental taxes has increased recently, but their actual application is still quite limited. Environmental taxes are an environmental cost, and their function is to implement environmental goals rather than cover the state's fiscal needs (Gribnau & Jallai, 2019; Ambec & De Donder, 2020; Cadoret et al., 2020).

In our paper, we use the definition of environmental taxes proposed in Regulation (EU) No 691/2011, which indicates that it is "a tax whose base is a physical unit (or a proxy of a physical unit) of something that has a proven, specific negative impact on the environment, and which is identified in ESA as a tax" (Bashir et al., 2020; Fajczak-Kowalska et al., 2021).

Increasing the share of environmental taxes in total taxes is one of the elements of the environmental tax reform, and it is in line with the European Union's sustainable development strategy (Castellucci & Markandya, 2012; Munitlak Ivanović & Golušin, 2012; Busu & Trica, 2019). Environmental taxes are a way to reduce pollution from diffuse emission sources as they provide for a more rational and effective use of natural resources (Andreoni, 2019; Wolde-Rufael & Mulat-Weldemeskel, 2021).

Environmental taxes include energy, transport, pollution and natural resources taxes. Energy taxes comprise taxes on energy used in stationary processes and transport (gasoline, diesel) and carbon taxes (Hassan et al., 2020). Transport taxes are related to using motor vehicles and airplanes, and also include fees deriving from related services (Tirachini & Proost, 2021). Pollution taxes refer to pollutants and noise emission (Lee & Xu, 2018). Finally, taxes on natural resources include mining, forest use and water management (Ekins, 1999; Grundel et al., 2020; Jenkins & Newell, 2013).

The literature on the subject contains many scientific studies on sustainable development and environmental taxes, although there is no statistical assessment of the impact of fiscal burdens on the components of sustainable development. Theoretical studies indicate that environmental taxes affect a business's social and environmental responsibility (Kiesewetter & Manthey, 2017; Bian et al., 2021; Franco & Marin, 2017). In addition, many studies indicate the effectiveness of environmental taxes in the context of countries' environmental policies (Yip, 2018; Klenert et al., 2018; Khan et al., 2018). Still, the statistical assessment of the impact of environmental taxes on enterprises' functioning and sustainable development is either neglected or limited.

Many scientific studies relative to the transportation and storage sector focus on environmental taxes around the multi-level competitiveness of supply chains (Zhou et al., 2021; Doric & Dimovski, 2018). Implementation of the environmental tax policy affects the behavior of consumers, as they may exert pressure on an enterprise's actions aimed at sustainable development.

Research indicates that environmental taxes combined with investments in clean infrastructure, a financial support system and appropriate regulations may lead to the decarbonization of the transportation and storage sector (Santos, 2017; Krass et al., 2013).

Thought-provoking research results are presented in the study dedicated to the Polish transport sector, which shows the statistically significant impact of energy, transport and pollution taxes on the sustainable development of the transportation and storage sector. Moreover, the effectiveness of environmental taxes in implementing ecological goals requires an increase in their share in the total financial burden of state taxes (Misztal, 2020).

Researchers argue that an increase in environmental taxes leads to the sustainable development of enterprises (Chen et al., 2015) and the implementation of new clean and low-emission technologies (Drake et al., 2016; Kim, 2020). The right sustainable investment-sharing strategy can promote the interests of governments and businesses, and thus lead to improved sustainability of the supply chain.

2. Methodology of the research

Our research focuses on the transportation and storage enterprises in Bulgaria, Croatia, Romania and Slovenia (they joined the European Union in 2007 and 2008). We used Eurostat data from 2008 to 2018. These countries have different number of enterprises in the analyzed sector (in 2018 Bulgaria: 23 583 (6.9% of the entire enterprise sector), Croatia: 8 969 (5.8%), Romania: 48 565 (9.7%), Slovenia: 8 589 (5.9%).

The study's main hypothesis and the sub-hypotheses presented in the introduction are an extension of the research conducted so far. The justification for such a research goal is that environmental taxes are widely recognized as an instrument counteracting climate change, but in the opinion of many researchers, they are not fully used and, despite the reforms, still relatively ineffective.

We assumed that environmental development is characterized by higher dynamics than the other two pillars of sustainable development. Additionally, energy taxes are crucial to maintaining stable and sustainable development. Moreover, the impact of individual environmental taxes on the pillars of enterprises' sustainable development is negative because these instruments require further reforms for their effectiveness to be higher.

It should, naturally, be emphasized that the main goal of environmental taxes is not the sustainable development of enterprises, but the reduction of the emission of negative substances into the environment. Our research goes beyond the main goal of this environmental economy instrument, as we want to assess how these taxes affect all three pillars of sustainable development. The choice of the transportation and storage sector is not accidental either, as this sector plays a service role in other sectors of the economy and its negative impact on the natural environment is noticeable.

Our research includes the following stages:

1. Selection of analytical indicators for analysis. We chose indicators from structural business statistics: annual enterprise statistics for special aggregates of activities (NACE Rev. 2). Then we identified which indicators are stimulants (statistical feature, the increase in value of which indicates an increase in the level of the complex phenomenon) and which ones are destimulants (a statistical feature whose value increase leads to a decrease in the value of the dependent variable). And we created integrated indicators of sustainable development and its pillars. The normalization of = indicators in the tested model consists in finding the highest values for sustainable ratios stimulant indicators and the lowest value for the destimulant indicators in the analyzed period.

2. Creation of the OLS models.
3. Creation of the ARMAX models.

To verify the research hypothesis, we created sustainable development indicators of transport enterprises (Sus_d) and their components, and three types of models that show the impact of environmental taxes (En_{tax}, Tra_{tax}, and Pol_{tax}) on sustainable development. Sustainable development indicators are determined by the variable standardization method based on the following formula:

– for the stimulants:

$$Ed_{ij} / S_{d\,ij} / Env_{d\,ij} = \frac{x_{ij}}{\max x_{ij}},\ Ed_{ij} / \frac{\overline{S_{d\,ij}}}{Env_{d\,ij}} \in \left[0;1\right], \tag{1}$$

– for the destimulants:

$$Ed_{ij} / S_{d\,ij} / Env_{d\,ij} = \frac{\min x_{ij}}{x_{ij}},\ Ed_{ij} / \frac{\overline{S_{d\,ij}}}{Env_{d\,ij}} \in \left[0;1\right], \tag{2}$$

where $Ed_{ij} / S_{d\,ij} / Env_{d\,ij}$ – the normalized value of the j-th variable in the i-th year; x_{ij} is the value of the j-th variable in the i-th year.

We selected the indicators for the analysis based on the available statistical data at the sectoral level for all the surveyed countries. The economic indicator (Ed) is based on stimulants indicators, including turnover, total assets, production value, added value, gross operating surplus, total purchases of goods and services, gross investment, and investment rate. When selecting the variables to determine the economic development index, we were guided by data availability. We also chose those indicators that allow firms to survive and achieve a competitive advantage in the market. We used the asset approach, which consists in the assumption that the value of the enterprise is the sum of the values of its assets (Pieloch-Babiarz et al., 2021).

The social indicator (Sd) is based on stimulants, including the number of employees, wages, social security costs, turnover per employee, labor productivity, investment per employee, employment growth rate, gross value added per employee, and destimulants, including personnel costs and the share of personnel costs in the production. In the case of the social indicator, we used an approach in which social development means an improvement of the financial situation of employees, an increase in their efficiency, improvement of safety and development of training and education (Pieloch-Babiarz et al., 2021).

The environmental indicator (Env_d) is based on destimulants, including carbon, methane, nitrous oxide emission, sulfur oxides, carbon monoxide, nitrogen oxides, and ammonia emissions. Env_d is based on variables that allow to evaluate the actual results of environmental activities undertaken by enterprises.

To calculate the indicator of sustainable development (Sus_d) we use the following formula:

$$Sus_d = \frac{\sum_{j=1}^{n}\left(E_{d\,ij} + S_{d\,ij} + Env_{d\,ij}\right)}{n},\ Sus_{dij} \in \left[0;1\right]. \tag{3}$$

In the case of multi-equation models, the structural equations have the following formula:

$$\begin{cases} E_d = \propto_0 + \propto_1 S_d + \propto_2 Env_d + \propto_3 En_{tax\,t} + \propto_4 En_{tax\,t-1} + \propto_5 Tr_{tax\,t} + \propto_6 Tr_{tax\,t-1} + \propto_7 Pol_{tax\,t} + \propto_8 Pol_{tax\,t-1} + \varepsilon_i \\ S_d = \propto_0 + \propto_1 E_d + \propto_2 Env_d + \propto_3 En_{tax\,t} + \propto_4 En_{tax\,t-1} + \propto_5 Tr_{tax\,t} + \propto_6 Tr_{tax\,t-1} + \propto_7 Pol_{tax\,t} + \propto_8 Pol_{tax\,t-1} + \varepsilon_i \\ Env_d = \propto_0 + \propto_1 E_d + \propto_2 S_d + \propto_3 En_{tax\,t} + \propto_4 En_{tax\,t-1} + \propto_5 Tr_{tax\,t} + \propto_6 Tr_{tax\,t-1} + \propto_7 Pol_{tax\,t} + \propto_8 Pol_{tax\,t-1} + \varepsilon_I \end{cases}. \tag{4}$$

We used the Ordinary Least Squares method to estimate the multi-equation model:

$$\begin{cases} s\left(\hat{\propto}_0,\ldots,\hat{\propto}_8\right)=\sum_{i=1}^{n}e_i^2=\sum_{i=1}^{n}(E_{di}-\hat{E}_{di})^2\rightarrow\min \\ s\left(\hat{\propto}_0,\ldots,\hat{\propto}_8\right)=\sum_{i=1}^{n}e_i^2=\sum_{i=1}^{n}(S_{di}-\hat{S}_{di})^2\rightarrow\min \\ s\left(\hat{\propto}_0,\ldots,\hat{\propto}_8\right)=\sum_{i=1}^{n}e_i^2=\sum_{i=1}^{n}(Env_{di}-\widehat{Env}_{di})^2\rightarrow\min \end{cases}. \quad (5)$$

The second single-equation linear model is based on the following formula:

$$Sus_d=\propto_0+\propto_1 En_{taxt}+\propto_2 En_{taxt-1}+\propto_3 Tr_{taxt}+\propto_4 Tr_{taxt-1}+\propto_5 Pol_{taxt}+\propto_6 Pol_{taxt-1}+\varepsilon_i. \quad (6)$$

The OLS estimation is based on the following formula (Islam & Imteaz, 2020):

$$s\left(\hat{\propto}_0,\ldots,\hat{\propto}_6\right)=\sum_{i=1}^{n}e_i^2=\sum_{i=1}^{n}(Sus_{di}-\widehat{Sus}_{di})^2\rightarrow\min. \quad (7)$$

Then we used the ARIMAX model, i.e., the ARIMA model supplemented with a set of exogenous regressors:

$$\Delta^d Sus_{dt}=c+\propto_1 En_{taxt}+\propto_2 Tr_{taxt}+\propto_3 Pol_{taxt}+\sum_{i=1}^{p}\varnothing_i\Delta^d Sus_{dt-i}+\sum_{j=1}^{q}\theta_j\varepsilon_{t-j}+\varepsilon_t. \quad (8)$$

Estimated parameters refer to regression:

$$Sus_{dt}-m_t=\varepsilon_t+\sum_{i=1}^{p}\varphi_i(Sus_{dt-1}-m_{t-1})+\sum_{i=1}^{q}\theta_j\varepsilon_{t-I}, \quad (9)$$

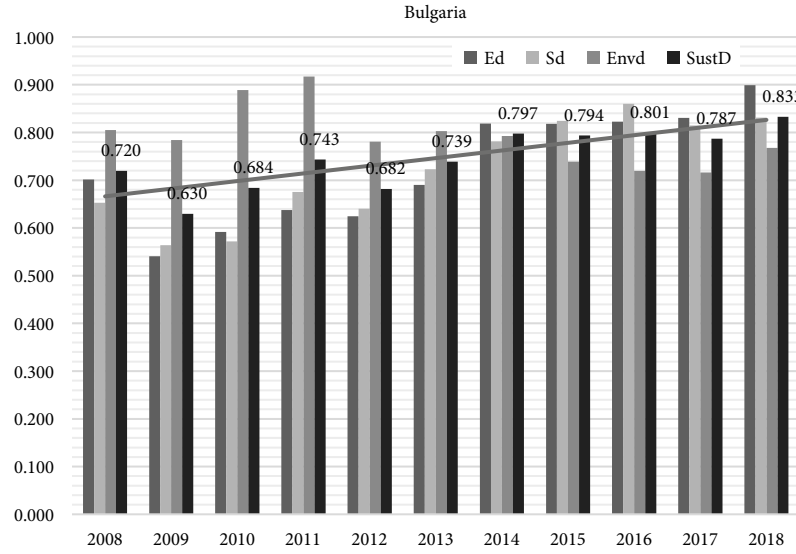
where m_t includes all exogenous (energy taxes, pollution taxes, transport taxes) variables:

$$m_t=c+\sum_{i=1}^{b}\eta_i d_{t-1}. \quad (10)$$

3. Research results

Figure 1 presents sustainable, economic, social and environmental indicators. The results show that all countries have a positive, sustainable development trend: Slovenia ($\alpha = 0.0228$), Romania ($\alpha = 0.0204$), Bulgaria ($\alpha = 0.016$) and Croatia ($\alpha = 0.0099$). This is a positive phenomenon because transportation and storage sector, apart from maximizing profits, takes effective actions aimed at social and environmental development.

The share of environmental taxes in the total fiscal burden of the analyzed countries is relatively low (Figure 2). The highest is in Bulgaria (2.91% in 2018), and the lowest is in Croatia (0.47% in 2018). A positive phenomenon is a stable increase in the share of environmental taxes in total taxes in 2008–2018. It is necessary to create national and EU legal solutions that would increase the importance of environmental taxes. It would be an important signal and set the path for sustainable development. Greater emphasis on environmental taxes would force enterprises to foster environmental protection.



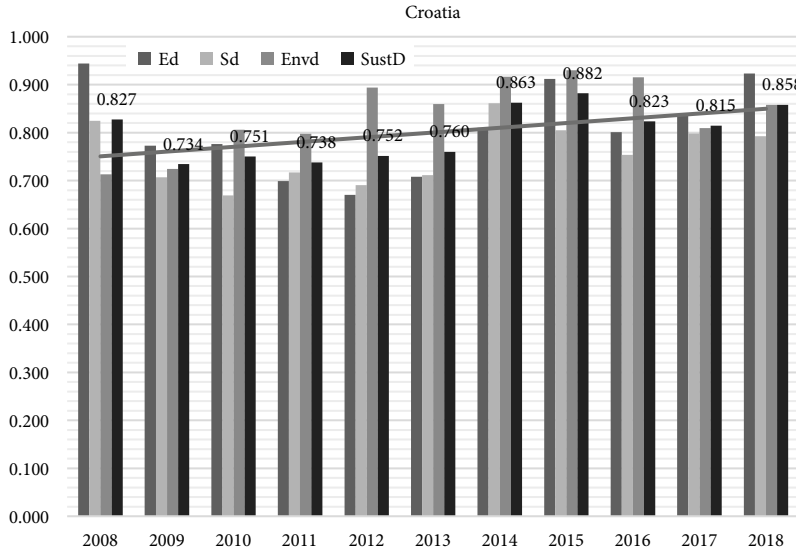


Figure 1. *To be continued*

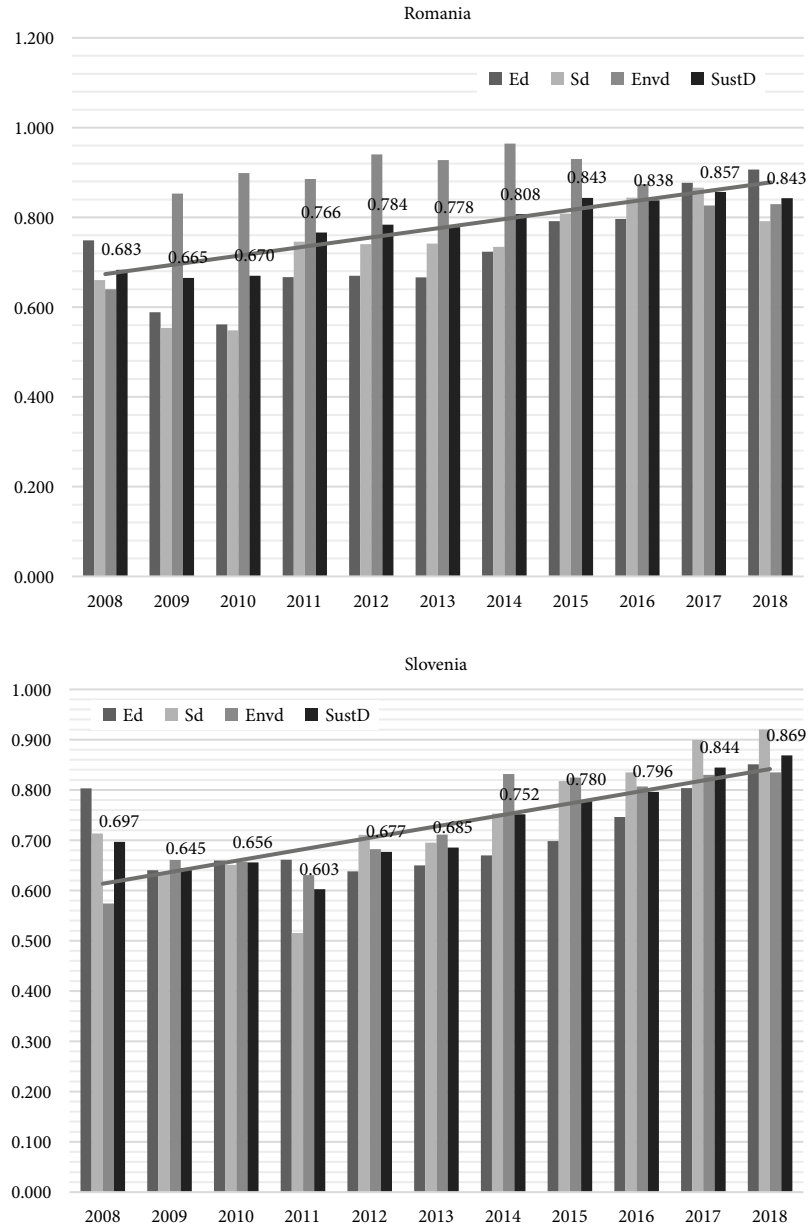
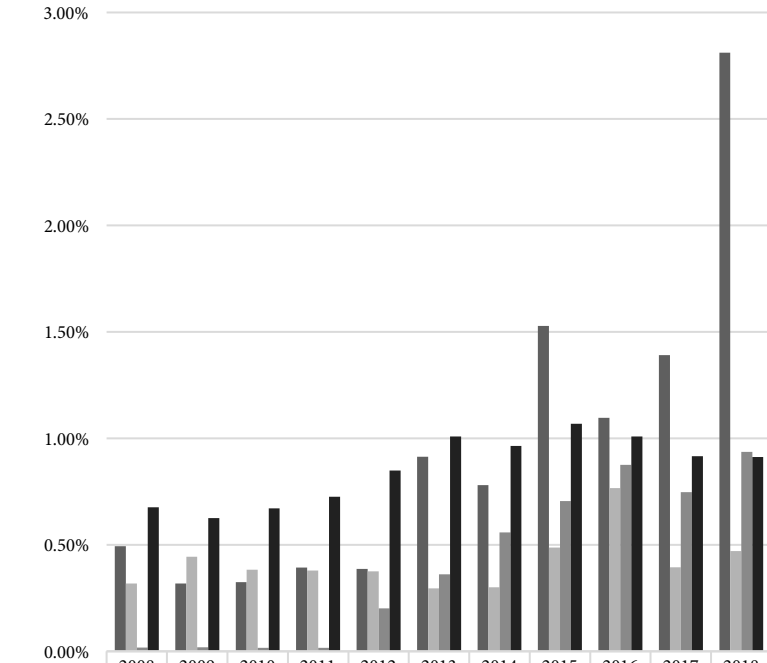


Figure 1. The indicators of sustainable, economic, social, and environmental development in Bulgaria, Croatia, Romania, and Slovenia (source: own elaboration)



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Bulgaria	0.49%	0.32%	0.32%	0.39%	0.39%	0.91%	0.78%	1.53%	1.10%	1.39%	2.81%
Croatia	0.32%	0.44%	0.38%	0.38%	0.38%	0.30%	0.30%	0.49%	0.77%	0.39%	0.47%
Romania	0.02%	0.02%	0.02%	0.02%	0.20%	0.36%	0.56%	0.71%	0.88%	0.75%	0.94%
Slovenia	0.68%	0.63%	0.67%	0.73%	0.85%	1.01%	0.97%	1.07%	1.01%	0.92%	0.91%

Figure 2. The share of environmental taxes in the fiscal burden of Bulgaria, Croatia, Romania, and Slovenia 2008–2018 (source: own elaboration)

Table 1 presents the estimation of multi-equation models. It is visible that the impact of environmental taxes on the pillars of sustainable development differs in the analyzed countries. It is due to the different number of transportation and storage enterprises, financial conditions, macroeconomic situation and environmental regulations. The pillars of sustainable development are also influenced by the environmental taxes from the previous period. Taxes reduce the financial result and therefore limit the investment possibilities of enterprises.

Table 2 presents the results of the impact of environmental taxes on the transportation and storage enterprises following sustainability principles. Sustainable development in Bulgaria is influenced by all three groups of environmental taxes (while the impact of energy and transport taxes in the *t*-1 period is negative, which is undesirable). Transport taxes positively impact the sustainable development of enterprises, which is a positive phenomenon, indicating that this group of taxes does not limit current investment decisions. The previous period's taxes on energy and transport hurt sustainable development. This is because of the specificity of the Bulgarian transport sector and the need to introduce new tax regulations and conditions for sustainable business.

In Croatia, only energy taxes have a statistically significant impact on the enterprises' sustainable development. In Romania, taxes on energy and pollution from period *t* and period *t*-1 positively affect the development of the transportation and storage sector. Finally, in Slo-

venia, it is energy and transport taxes that influence the sustainability of transport companies, which indicates the need to increase the role of pollution taxes. These results show that the other types of environmental taxes in Croatia, Romania and Slovenia are insufficient.

Table 1. Results of OLS estimation of multi-equation models ($p < 0.05$) (source: own elaboration)

Country	Endog	Equations	R^2
Bulgaria	E_d	$-0.634 \cdot \text{const} + 1.210 \cdot S_d + 0.640 \cdot Env_d + 0.002 \cdot Tra_{tax(t-1)} - 0.008 \cdot Pol_{tax}$	0.97
	S_d	$0.585 \cdot \text{const} + 0.755 \cdot E_d - 0.589 \cdot Env_d - 0.001 \cdot \text{Tra}_{tax(t-1)} + 0.007 \cdot Pol_{tax}$	0.98
	Env_d	$0.954 \cdot \text{const} + 0.753 \cdot E_d - 1.110 \cdot S_d - 0.002\ Tra_{tax(t-1)} + 0.011\ Pol_{tax}$	0.88
Croatia	E_d	$0.301 \cdot \text{const} + 0.614 \cdot S_d + 0.001 \cdot En_{tax} - 0.003 \cdot Tra_{tax} + 0.046 \cdot Pol_{tax(t-1)}$	0.92
	S_d	$0.512 \cdot \text{const} + 0.001 \cdot Tra_{tax} - 0.0313 \cdot Pol_{tax}$	0.51
	Env_d	$1.572 \cdot \text{const} - 0.001 \cdot Tra_{tax} - 0.044 \cdot Pol_{tax(t-1)}$	0.90
Romania	E_d	$0.099 \cdot \text{const} - 0.330 \cdot S_d + 0.498 \cdot Env_d + 0.000 \cdot En_{tax} + 0.000 \cdot En_{tax(t-1)} - 0.001 \cdot Tra_{tax} - 0.0003 \cdot Tra_{tax(t-1)} + 0.013 \cdot Pol_{tax(t-1)}$	0.99
	S_d	$-0.788 \cdot \text{const} - 0.399 \cdot E_d + 0.779 \cdot Env_d + 0.000 \cdot En_{tax(t-1)} - 0.0003 \cdot Tra_{tax(t-1)} 0.014 \cdot Pol_{tax} + 0.028 \cdot Pol_{tax(t-1)}$	1.00
	Env_d	$-0.192 \cdot \text{const} + 1.993 \cdot E_d + 0.664 \cdot S_d - 0.0001 \cdot En_{tax} - 0.0003 \cdot En_{tax(t-1)} + 0.001 \cdot Tra_{tax} + 0.001 \cdot Tra_{tax(t-1)} - 0.025 \cdot Pol_{tax(t-1)}$	0.99
Slovenia	E_d	$0.432 \cdot \text{const} + 0.544 \cdot S_d - 0.587580 \cdot Env_d - 0.001 \cdot En_{tax} + 0.001 \cdot En_{tax(t-1)} - 0.002 \cdot Tra_{tax} + 0.003 \cdot Tra_{tax(t-1)} - 0.003 \cdot Pol_{tax} + 0.001 \cdot Pol_{tax(t-1)}$	1.00
	S_d	$-0.794 \cdot \text{const} + 1.837 \cdot E_d + 1.079 \cdot Env_d + 0.001 \cdot En_{tax} - 0.002 \cdot En_{tax(t-1)} + 0.004 \cdot Tra_{tax} - 0.006 \cdot Tra_{tax(t-1)} - 0.006 \cdot Tra_{tax(t-1)} + 0.005 \cdot Pol_{tax} - 0.001 \cdot Pol_{tax(t-1)}$	1.00
	Env_d	$0.736 \cdot \text{const} - 1.702 \cdot E_d + 0.927 \cdot S_d - 0.001 \cdot En_{tax} + 0.001 \cdot En_{tax(t-1)} - 0.003 \cdot Tra_{tax} + 0.006 \cdot Tra_{tax(t-1)} - 0.005 \cdot Pol_{tax} + 0.001 \cdot Pol_{tax(t-1)}$	1.00

Table 2. Results of OLS estimation of single equation models (source: own elaboration)

Country		Coefficient	SD	p-value	R2
Bulgaria	const	0.660	0.128	0.004	0.93
	$En_{tax(t-1)}$	−0.001	0.000	0.065	
	Tra_{tax}	0.005	0.001	0.006	
	$Tra_{tax(t-1))}$	−0.002	0.001	0.073	
	Pol_{tax}	0.008	0.002	0.017	
Croatia	const	0.631	0.068	<0.0001	0.42
	En_{tax}	0.000	0.000	0.032	
Romania	const	0.089	0.145	0.562	0.92
	En_{tax}	0.000	0.000	0.000	
	Pol_{tax}	0.011	0.005	0.062	
	$Pol_{tax(t-1)}$	0.017	0.005	0.015	
Slovenia	const	−0.097	0.062	0.157	0.96
	En_{tax}	0.000	0.000	0.002	
	Tra_{tax}	0.003	0.000	0.000	

Table 3 shows the results of the ARMAX estimation. All variables are statistically significant. The values of the Schwarz information criterion are smaller than those relating to the previous models, and the roots of the AR and MA polynomials are outside the unit circle on the complex plane (they have modules greater than 1), which means that the AR polynomial is stable, and the MA polynomial is invertible.

Table 3. ARMAX estimation, 1960–1970 observations used (N = 11). Dependent variable: $Sus_{d.}$ (source: own elaboration)

Bulgaria		Const	phi_1	phi_2	phi_3	theta_1	theta_2	theta_3	En	Tr	Pol	R^2
	Coeff.	0.596	0.805	−0.761	0.857	2.498	2.498	1.000	−0.000	0.001	0.004	0.99
Croatia	const	phi_1	phi_2	theta_1	theta_2	Ener	Tr	Pol	R^2			
	0.571	0.882	−0.891	−1.888	1.000	0.000	0.001	−0.018	0.93			
Romania	const	phi_1	phi_2	theta_1	theta_2	En	Tr	R^2				
	0.756	0.542	−0.738	1.044	1.000	0.000	−0.0004	0.96				
Slovenia	const	phi_1	theta_1	En	Tr	Pol	R^2					
	0.131	−0.546	−1.00	0.000	0.004	−0.004	0.99					

The results of the ARMAX estimation show that sustainable development in Bulgaria depends on the value of the third lag (AR = 3, MA = 3). The phi and theta parameters are statistically significant at $p < 0.05$. At the same time, the impact of taxes on energy (negative correlation), transport and pollution (positive correlation) on the sustainable development of enterprises in the transport sector is also noted. In Croatia, the order of delays is two (AR = 2, MA = 2). Moreover, there is a positive impact of taxes on energy and transport, and a negative one on pollution. In Romania, the order of delays is also 2 (AR = 2, MA = 2), and the impact on sustainable development is due to energy and transport taxes (negative). In the case of Slovenia, the order of delays is one (AR = 1, MA = 1). Taxes on energy and transport have a positive impact on the transport sector, while taxes on pollution harm the transportation and storage sector.

The research results show that environmental taxes positively impact enterprises' development (energy taxes being the most efficient). Moreover, environmental taxes affect not only the environmental development of enterprises but also economic and social pillars. The plus/minus signs in front of the particular types of taxes indicate that their impact is multidirectional, which should be interpreted as the need to implement changes in environmental taxes. The pillars of sustainable development are interdependent (there is a strong correlation between economic and social development; ecological development depends on economic and social development).

4. Discussion

Enterprises' development in line with sustainability principles is an absorbing, vital and up-to-date research area. Sustainable development poses a challenge for states, organizations, ordinary people and company managers (Hummel, 2021; Pieloch-Babiarz et al., 2021; Štrukelj & Zabukovšek, 2019). It requires green investment solutions, tools and financial support mechanisms (Gangone & Gănescu, 2014; Fukuda & Ouchida, 2020).

Our results corroborate those of other scientists who indicate the complexity of sustainable development and its determinants (Siebenhüner & Arnold, 2007; Bebbington & Unerman, 2018; Weidinger, 2014; Dhahri & Omri, 2018). We prove that environmental taxes have a statistically significant (p-value < 0.05) impact on the development of transportation and storage enterprises happens within the sustainability principle (Castellucci & Markandya, 2012; Misztal, 2020; Cadoret et al., 2020; Fajczak-Kowalska et al., 2021).

The research hypothesis is true because. In Romania and Slovenia, environmental taxes positively impact sustainable development, so the efficiency of environmental taxes is at a good, significant level. It means that the environmental tax system in both countries is effective, not inhibiting but favoring development based on the three pillars. In Croatia, the coefficient of determination is relatively low at 0.42, representing a weak impact of the environmental tax system on sustainable development. The low level of relation may result from the relatively minor importance of the transport sector to the Croatian economy. There is a negative correlation between energy taxes in the t-1 period and transport taxes in the t-1 period in Bulgaria, which means that the burden of these two types of taxes hurts the sustainable development of the transportation and storage sector, and it is necessary to take specific steps to improve the efficiency of the fiscal system.

The first research sub-hypothesis is true, as environmental development has higher levels in three countries than economic and social development. The exception here is Slovenia, although the dynamics of environmental development is high here. Therefore, the surveyed countries' storage sector has successfully introduced ecological solutions and innovations.

The second research sub-hypothesis is true because the results of the OLS estimation indicate that energy taxes have a statistically significant impact on the sustainable development of enterprises in the transport and storage sector. Therefore, environmental taxes should be reformed to increase their efficiency and effectiveness.

The third sub-hypothesis is true because, in many cases, environmental taxes negatively impact economic, social and environmental development, which confirms that it is necessary to implement further tax reforms to ensure sustainable and stable development of the sector.

The ARMAX estimation shows an autoregressive trend (the lag in Bulgaria is three, whereas in Croatia, Romania and Slovenia, it is two), which proves that sustainable development is dynamic and depends on the results achieved in previous periods.

The estimates of the coefficients in the models (α) and the significance levels (p-value) indicate a need to implement a more efficient tax system, as it appears that this tool is not yet fully and efficiently used. We confirm that there is a need to implement changes to the environmental tax system (Kiesewetter & Manthey, 2017; Klenert et al., 2018; Andreoni, 2019; Misztal, 2020; Hassan et al., 2020).

The study's main limitation is its focus on quantitative measures, short research periods and limited data availability. The research results are also influenced by the selection of variables for the models and the method of determining synthetic indicators and analytical indicators. Moreover, the choice of estimation methods itself influences the results.

It is worth emphasizing that the Balkan region is highly diverse as far as its ecosystems, ethnic groups, religions, cultures, economies and geographies.

Conclusions

The enterprises' development in conformity with sustainability principles is important for stable economic growth and natural environment protection, because the transportation and storage sector is one of the largest emitters of pollutants. Several endogenous and exogenous factors determine the development of enterprises within sustainability principles.

As the research results show, environmental taxes statistically impact the transportation and storage sector development in Bulgaria, Croatia, Slovenia and Romania. The estimations indicate that the strength and direction of the impact on the development of enterprises are varied and relatively low. Hence, it is necessary to implement tax reforms that would intensify socially and environmentally responsible activities.

In further research, we wish to focus on introducing various paths of reforms concerning environmental taxes in the European Union in the context of the transportation and storage sector.

Availability of data and materials

All data are available on Eurostat database.

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Authors contributions

Anna Misztal: introduction, literature review, methodology of the research, part of discussion; Magdalena Kowalska: research results, Adam Sadowski: discussion and conclusions, Per Engelseth: discussion and supervision of the article; Ryszard Jędrzejczak: part of calculations and conclusions; Andrzej Bujak: supervision and conclusions; Beata Skowron-Grabowska: part of literature review.

Disclosure statement

The authors declare not to have any conflicts of interest.

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