The Relationship between CO2 Emissions, Health Expenditures, Tax Revenues and Educational Attainment in the Czech Republic: A Policy Perspective

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Abstract

To achieve sustainable development, it is required to implement a comprehensive plan that considers the interplay between CO emissions, educational attainment, current health expenditure, and tax revenue. This paper examines the complex connections using data from the Czech Republic gathered by the World Bank from 2000 to 2016. The findings of the VAR/VECM study demonstrate a direct correlation between CO2 emissions and healthcare expenditure, suggesting that higher levels of pollution are associated with increased medical costs. This study emphasizes the necessity of implementing policies that prioritize long-term goals, even in cases where there is no statistically significant relationship between educational achievement and short-term carbon dioxide emissions or tax income. Investing in schools enhances environmental awareness among individuals, perhaps resulting in reduced emissions over time. Sufficient investment for healthcare is necessary to mitigate the adverse effects of CO2 pollution on human health. Efficient tax policy is indispensable for acquiring the required funds for these initiatives. If policymakers acknowledge and take thorough action on these relationships, future generations will have improved health, higher levels of education, and less environmental taxation.

Keywords: CO2 Emissions, Health Expenditures, Tax Revenues, Educational, Czech Republic
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Introduction

Policymakers and scholars have recently focused a lot of emphasis on the complex interaction between environmental sustainability, public health, fiscal policies, and educational results (Wei, Rahim & Wang, 2022). A holistic policy approach is necessary to address the complex issue posed by the interplay of CO2 emissions, health spending, tax income, and educational achievement. More and more, people are realizing that a sustainable environment is essential to long-term prosperity and human happiness (Fuchs et al., 2020). A rise in the prevalence of heat-related illnesses, respiratory ailments, and other public health concerns is one way in which high CO_2 emissions impact public health (Radchuk, 2019). Investment in health infrastructure and services is crucial to tackle these environmental concerns; this is represented in health spending as a percentage of GDP. For the sake of both the environment and public health, policymakers must strike a balance in the distribution of available funds.

Both the economic environment and educational achievements are profoundly affected by fiscal measures. A government's ability to pay for public services, such as healthcare and education, may be shown by looking at its tax collection as a proportion of GDP. To improve educational achievement, it is important to implement tax policies that produce enough income to fund school infrastructure, teacher training, and student assistance services (Baker, 2021). According to Nichifor, ŭimiraș, and Zaiț (2021), economic productivity, incomes, and health outcomes are all positively correlated with increasing levels of education, especially

post-secondary education. According to Hirvilammi (2020), a fiscal strategy that is well-planned may lead to a positive feedback loop wherein investments in human capital fuel economic growth.

The significance of a comprehensive policy approach is shown by the interaction of these elements. A better educated and ecologically aware populace, for example, can increase the push for sustainable policies and behaviors (Liang et al., 2024). Similarly, Lövdén et al. (2020) found that better health outcomes can boost school performance by lowering absenteeism and boosting cognitive function. Policymakers may create comprehensive plans to advance economic growth and environmental sustainability by thinking about the connections between CO2 emissions, health spending, tax income, and educational achievement.

To a large extent, public health is affected by carbon dioxide emissions, which are a main cause of climate change (Tan et al., 2022). Expenditures on healthcare for respiratory and cardiovascular illnesses are worsened by air pollution caused by rising concentrations of carbon dioxide and other greenhouse gases (Manisalidis et al., 2020). To alleviate this financial burden on healthcare systems, we must reassess fiscal policies, with a focus on tax collections, to guarantee sufficient financing for public health programs.

There are many facets to the intricate web that connects carbon dioxide emissions to public health. Heatwaves, storms, and floods become more often and more destructive as CO2 levels rise (Ebi et al., 2021). Direct consequences on health, such injuries and deaths, and indirect effects, like the spread of infectious illnesses and mental health disorders, are both possible outcomes of these occurrences. Public health infrastructure and emergency response capacities require strong economic policies to alleviate the strain these disasters place on healthcare systems.

Beyond healthcare expenditures, CO2 emissions have broader economic consequences. Food instability and hunger can result from climate change's disruption of agricultural output, which in turn can have long-term health repercussions (Agostoni et al., 2023). The burden on social services and healthcare systems in areas impacted by population relocation caused by increasing sea levels and harsh weather occurrences is another concern. Public health programs, sustainable development, and climate resilience must all be part of the solution to these problems (Sarkodie, Adams & Leirvik, 2020).

Reducing the negative effects of carbon dioxide emissions on human health is an important goal of fiscal policy. Governments may encourage energy efficiency, subsidize clean energy technology research and development, and reward low-carbon activities by utilizing tax revenues (Yan, Qamruzzaman & Kor, 2023). The public's health can be improved and greenhouse gas emissions reduced through these actions. The ability of healthcare systems to react to the health risks brought on by climate change can be improved via strategic investments in healthcare facilities and services.

To add, long-term progress depends on the relationship between tax income and levels of education. Higher wages and a larger tax base are two outcomes of a highly educated workforce, which in turn leads to higher tax revenues (Roos et al., 2020). Government spending on essentials like healthcare and education becomes possible as a result, setting in motion a positive feedback loop of progress.

More educated people mean a more competent and productive workforce, which in turn means more money in the coffers. When companies have access to a more competent workforce, they are more equipped to innovate and compete on a global scale, which in turn boosts productivity, which in turn boosts the economy. To add to that, a resilient and sustainable society is one whose members have received a quality education that allows them to easily adjust to new technologies and economic trends (Ben Hassen, 2022).

There are substantial societal advantages to investing in education as well. Individuals with greater education have better access to healthcare and are more likely to adopt healthier lifestyle choices, which in turn leads to better health outcomes (Lövdén et al., 2020). As a result, people will be healthier and more productive while putting less strain on public health systems. Because it gives people the tools and chances to rise beyond their socioeconomic circumstances, education also fosters social cohesiveness and lessens inequality (Jamatia, 2023).

Environmental sustainability is one area where education has a positive impact. People with higher levels of education are more inclined to care about environmental concerns and advocate for sustainable policies and practices (Debrah, Vidal & Dinis, 2021). They are also more prone to recycle and use less energy, two actions that are good for the environment. The government may help build a more sustainable society by investing in its citizens' education so that they are better prepared to deal with environmental issues.

The purpose of this article is to investigate the relationships between many variables in the Czech Republic, including educational attainment, current health expenditures, tax revenue, and CO_2 emissions from gaseous fuel usage. We hope to shed light on how integrated policy approaches can promote a healthier, more educated, and economically robust society by analyzing data from the World Bank from 2000 to 2016 using VAR/VECM. Our goal is to review the literature and empirical evidence in this area.

Literature Review

Numerous studies have focused on the correlation between carbon dioxide emissions, healthcare spending, tax income, and level of education in the last several years. This literature study is an attempt to delve into the interplay of these factors and the policy-making consequences of their interdependence. This review is based on the theory of sustainable development, which takes into account the interplay between health, education, fiscal policies, and environmental sustainability. Sustainable development aims to prioritize and integrate economic, social, and environmental models to address human challenges in a way that will continuously benefit human development (Chaudhry & Batool, 2014; UNSD, 2018b). Achievement in Education, Present Health Spending, Tax Income, and Carbon Dioxide Emissions are the factors that are taken into account in this analysis.

The relationship between CO2 emissions and healthcare costs has been the subject of several investigations (Cholil, Ikhsan & Wibangga, 2022). All of these studies show how environmental variables affect public health expenses, and how important it is to have policies that take care of both the environment and people's health. Take OECD nations as an example. A cross-sectional ARDL study by Cheng, Ren, Zhang, and Wang (2024) revealed that health care spending is significantly impacted by environmental degradation. According to this research, medical expenses rise in tandem with CO2 emissions because of the illnesses that accompany them. Evidence from this study shows that cutting emissions can help healthcare systems save money.

Countries may lessen the devastating effects of carbon dioxide emissions and foster a healthier environment by allocating resources to healthcare. According to Khan et al. (2020), better environmental quality may result from increased expenditure on health. To combat the negative impacts of carbon dioxide emissions and improve the general health of their citizens, governments should increase spending on healthcare. Public health and economic prosperity may be achieved in the long run through a strategy that prioritizes both health and environmental sustainability (Dodds, 2020).

Additionally, there is significant evidence demonstrating a correlation between tax income and health expenditures. When governments get more money in taxes, they can use it to invest in healthcare services (Clemens & Veuger, 2020). Ensuring that residents have access

to vital medical treatments and preventative care, this investment is crucial for sustaining and increasing the quality of health care systems.

Governments may take advantage of rising incomes to improve health care infrastructure and services (Yi, 2020). Public health outcomes can be improved when tax income is increased and used to boost health expenditure. Health care spending increases allow governments to combat several health issues, lower illness prevalence, and boost population wellness. Gurdal, Aydin, and Inal (2021) highlight the significance of growth in the economy and well-designed tax policies in improving public health.

Environmental attitudes and actions are significantly influenced by educational attainment, especially post-secondary education (Liao, Shen & Shi, 2020). People who go to college are more likely to hear people talking about environmental problems, which might make them realize how important sustainability is. When people become more conscious of the need of protecting the environment, they are more likely to make conscious decisions to live greener lives. Recycling, taking public transit, and supporting laws that lessen human influence on the environment are all things that people with higher levels of education may be more likely to do. A higher probability of embracing ecologically friendly actions and a heightened understanding of environmental challenges are both linked to higher levels of education. People with higher levels of education are more likely to have access to information and tools that can help them reduce their impact on the environment. People with this level of environmental literacy are more inclined to act in a way that reduces negative impacts on the earth because they are more likely to think about the bigger picture. All the way from being green at the local and national levels to cutting back on energy use at home is part of the solution (Biermann et al., 2022).

According to studies, higher levels of education can affect CO_2 emissions via encouraging more environmentally friendly practices and decreasing the need for fossil fuels (Ji, Zhang & Wang, 2022). More informed people are likely to know about the drawbacks of using fossil fuels and the advantages of using renewable energy. People may then opt to drive less fuel-hungry cars, buy more energy-efficient home appliances, or advocate for laws that encourage renewable energy. Their decisions lessen the impact of climate change by lowering emissions of carbon dioxide. Furthermore, according to Biancardi et al. (2023), those who have completed their bachelor's degrees are more likely to be innovative and have the expertise to create new technologies that can further lessen our reliance on fossil fuels.

The policy consequences of the interplay between carbon dioxide emissions, health spending, tax income, and educational achievement are substantial. To create all-encompassing plans that boost sustainable growth and people's quality of life, it's essential to understand how these elements interact with one another. To raise educational attainment, particularly at the post-secondary level, policymakers should think about funding education. A decrease in CO2 emissions may result from heightened public knowledge of environmental issues brought about by increased educational attainment. Environmental protection legislation and eco-friendly activities are more likely to get the backing of educated people.

Another crucial issue that lawmakers must resolve is the distribution of more funding to healthcare. One way to lessen the impact of CO2 emissions on public health is to increase spending on healthcare (Mujtaba & Shahzad, 2021). Governments may take a step toward mitigating pollution's negative effects on public health and expanding access to medical treatment by enhancing healthcare infrastructure and services. If governments want to fund important services like healthcare and education, they must enact fair tax laws. Critical sectors like health and education can receive funding from governments if tax systems are designed to produce enough money (Dick-Sagoe, 2020). A positive feedback loop bolstering sustainable development may be created when this happens, leading to better environmental conditions and improved public health outcomes.

Using a cross-sectional ARDL technique, Cheng, Ren, Zhang, and Wang (2024) investigated the relationship between CO2 emissions, health spending, and economic development in OECD nations. The research showed that health care costs in OECD nations are significantly increased due to environmental degradation. Also, studies looking at sustainability and environmental quality in European economies analyzed yearly data for nine big European economies from 1994 to 2018 and discovered that better environmental quality is linked to greater health spending (Kumar & Kumar, 2020). In addition, research on the relationship between health spending and CO_2 emissions found that higher health spending can reduce CO_2 emissions.

Hypothesis 1: There is a significant positive relationship between educational attainment and current health expenditure in Czechia from 2000 to 2016.

Hypothesis 2: Tax revenue has a significant impact on educational attainment in Czechia from 2000 to 2016.

Hypothesis 3: CO2 emissions from gaseous fuel consumption are significantly influenced by current health expenditure in Czechia from 2000 to 2016.

Hypothesis 4: Integrated policy approaches that simultaneously address educational attainment, health expenditure, and tax revenue can lead to a reduction in CO2 emissions from gaseous fuel consumption in Czechia from 2000 to 2016.

Hypothesis 5: There is a bidirectional causality between tax revenue and educational attainment in Czechia from 2000 to 2016.

Methods

Using quantitative explanatory research approaches (Creswell, 2008) and the Eviews program for measurement, this study makes use of secondary data. With data from each variable provided in annual form by the World Bank from 2000 to 2016 and Czechia as the sample country, the quantitative approach uses VAR/VECM estimates to measure the short-term or long-term influences between CO2 Emission, Tax Revenue, Educational Attainment, and Current Health Expenditure. The following system of equations is utilized in this investigation:

$$TR_t = \beta_0 + \beta_1 EA_t + \beta_2 HE_t + \beta_2 CoE_t + e_t$$
$$EA_t = \beta_0 + \beta_1 TR_t + \beta_2 HE_t + \beta_2 CoE_t + e_t$$
$$HE_t = \beta_0 + \beta_1 TR_t + \beta_2 EA_t + \beta_2 CoE_t + e_t$$
$$CoE_t = \beta_0 + \beta_1 TR_t + \beta_2 EA_t + \beta_2 HE_t + e_t$$

Description:

TR : Tax Revenue
EA : Educational Attainment
PHE : Current Health Expenditure
CoE : CO2 Emission
β : The magnitude of the effect of causality
e : Error term
t : Time period

Table 1. Variable Description

Variable	Definition	Data source
Tax Revenue In percent (%) With the symbol (TR)	Tax revenue refers to compulsory transfers to the central government for public purposes. Certain compulsory transfers such as fines, penalties, and most social security contributions are excluded. Refunds and corrections of erroneously collected tax revenue are treated as negative	World Bank

	revenue.	
Educational Attainment In percent (%) With the symbol (EA)	The percentage of population ages 25 and over that attained or completed post-secondary non-tertiary education.	World Bank
Current Health Expenditure In percent (%) With the symbol (HE)	Level of current health expenditure expressed as a percentage of GDP. Estimates of current health expenditures include healthcare goods and services consumed during each year. This indicator does not include capital health expenditures such as buildings, machinery, IT and stocks of vaccines for emergency or outbreaks.	World Bank
CO2 Emission In percent (%) With the symbol (CoE)	Carbon dioxide emissions from liquid fuel consumption refer mainly to emissions from use of natural gas as an energy source.	World Bank

Results And Discussion

The unit root test has to be finished before the VAR/VECM estimation can be started. The goal of this test is to determine if the estimated values of the individual coefficients in the autoregressive model are identical. The results of this assessment, which used the Augmented Dicky Fuller Model, or ADF Test, were:

Table 2. Unit Root Test

Variables	Unit Root Test	Statistics ADF	Probability	Information
CO2 Emission	Level	-3.975578	0.0090	**Stationer**
Educational Attainment	Level	-1.864824	0.3387	Non-stationary
	1st Difference	-4.379300	0.0046	**Stationer**
Current Health Expenditure	Level	-1.079793	0.6965	Non-stationary
	1st Difference	-3.690340	0.0165	**Stationer**
Tax Revenue	Level	-2.752754	0.0872	Non-stationary
	1st Difference	-2.910560	0.0675	Non-stationary
	2nd Difference	-6.444442	0.0002	**Stationer**

Table 2 shows that the CO2 Emission variable is stationary at the level, according to the Unit Root Test findings. The ADF statistic is -3.975578 and the probability is 0.0090, which is less than 0.05. This points to the lack of a unit root and the stationary nature of the CO2 Emission data at that level. However, with an ADF statistic of -1.864824 and a probability of 0.3387, which is more than 0.05, the Educational Attainment variable is not stable at the level. But at the first difference, it becomes stationary with a probability of 0.0046 and an ADF statistic of -4.379300. Also, at the level, the Current Health Expenditure variable is non-stationary (ADF statistic = -1.079793, p = 0.6965), but it becomes stationary (ADF statistic = -3.690340, p = 0.0165) at the first disagreement. The Tax Revenue variable maintains its non-stationary nature at the first difference, with an ADF statistic of -2.910560 and a probability of 0.0675, while at the level, it has an ADF statistic of -2.752754 and a probability of 0.0872. With a chance of 0.0002 and an ADF statistic of -6.444442, it becomes stationary at the second difference, however. Results from the Unit Root Test indicate that, all things considered, CO2 Emission is level stationary; Educational Attainment and Current Health Expenditure are both level stationary; and Tax Revenue is level stationary at the second difference. The purpose of the VAR lag order test is to remove autocorrelation issues from VAR/VECM estimates; the models that are tested here include LR, FPE, AIC, SIC, and HQC.

Table 3. VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ

0	-71.20371	NA	0.142218	9.400463	9.593610	9.410354
1	-26.09761	62.02088*	0.004075*	5.762201*	6.727937*	5.811655*

Table 3 shows the results of the VAR Lag Order Selection Criteria Test, which show that Lag 1 is the best lag length based on all five criteria: LR, FPE, AIC, SC, and HQ. Log Likelihood (LogL)= -71.20371, Final Prediction Error (FPE)= 0.142218, Akaike Information Criterion (AIC)= 9.400463, Schwarz Criterion (SC)= 9.593610, and Hannan-Quinn Criterion (HQ)= 9.410354. All of these values are for Lag 0. The following values are estimated for Lag 1: LogL=-26.09761, LR= 62.02088, FPE= 0.004075, AIC= 5.762201, SC= 6.727937, and HQ= 5.811655. All criteria have chosen Lag 1 as the optimal lag length, as indicated by the asterisks (*). Based on these factors, it is estimated that having one lag in your VAR model would offer the greatest match for your data. A greater Log Likelihood number indicates a better fit, which is a measure of the model's goodness of fit. A larger Likelihood Ratio indicates that the additional lag considerably improves the model, whereas a lower number indicates that the additional lag has little effect. With lower values indicating higher predictive accuracy, the Final forecast Error quantifies the forecast error. A lower score on the Akaike Information Criterion indicates a better model, which strikes a compromise between model fit and complexity. While the Schwarz Criterion and AIC are comparable, the latter imposes a steeper penalty for model complexity; lower scores correspond to better models. Lower numbers indicate a better model according to the Hannan-Quinn Criterion, which also balances complexity and fit. The VAR stability test determines if the VAR estimate is stable; an unstable VAR estimate renders the IRF invalid in the final test. What follows are the findings of this examination

Table 4. Roots of Characteristic Polynominal

No	Root	Modulus
1	0.914901	0.914901
2	0.559399 - 0.691901i	0.889749
3	0.559399 + 0.691901i	0.889749
4	0.040378 - 0.836925i	0.837898
5	0.040378 + 0.836925i	0.837898
6	-0.550698 - 0.502057i	0.745204
7	-0.550698 + 0.502057i	0.745204
8	0.377461	0.377461

According to Table 4 the modulus of all characteristic root values is less than 1. Thus, it is safe to say that the analysis's estimating model is stable. The findings of the Granger causality test, which is used to demonstrate the reactive link between variables, are:

Table 5. Granger Causality Test

Null Hypothesis	Obs	F-Statistic	Prob.
COE does not Granger Cause TR	15	1.50484	0.2683
TR does not Granger Cause COE		0.75834	0.4936
EA does not Granger Cause TR	15	1.36080	0.3001
TR does not Granger Cause EA		1.22716	0.3337
HE does not Granger Cause TR	15	3.23826	0.0824
TR does not Granger Cause HE		0.29037	0.7541

EA does not Granger Cause COE	15	0.30471	0.7439
COE does not Granger Cause EA		1.71870	0.2283
HE does not Granger Cause COE	15	4.26112	0.0459
COE does not Granger Cause HE		3.46778	0.0718
HE does not Granger Cause EA	15	1.97208	0.1897
EA does not Granger Cause HE		1.77883	0.2183

Since the F-statistics and p-values for both hypotheses are not significant, the results of the Pairwise Granger causation Tests show that there is no evidence of Granger causation between CO2 emissions (COE) and tax revenue (TR) in either direction. Similarly, neither the F-statistic nor the p-value for the hypothesis indicating a Granger causal relationship between educational attainment (EA) and tax revenue (TR) is statistically significant. With an F-statistic of 3.23826 and a p-value of 0.0824, there is some evidence that health expenditure (HE) may potentially cause tax revenue, while tax income does not necessarily cause health expenditure.

No evidence of Granger causation in either direction is shown by the non-significant F-statistics and p-values regarding the link between educational attainment (EA) and CO2 emissions (COE). However, there is somewhat of evidence that CO2 emissions could Granger cause health expenditure (F-statistic of 3.46778 and p-value of 0.0718), and health expenditure (HE) is a substantial Granger cause of CO2 emissions (F-statistic of 4.26112, p-value of 0.0459). Finally, as the F-statistics and p-values for both hypotheses are non-significant, we may conclude that health expenditure (HE) and educational attainment (EA) are not causally related. The long-term effect between variables can be examined by cointegrity tests. The following are the test findings of the Johansen Cointegration-based cointegration test:

Table 6. Cointegration Test

Hypothesized	**Eigenvalue**	**Trace**	**0.05 CV**	**Prob.****
None *	**0.898317**	**59.60824**	**47.85613**	**0.0027**
At most 1	0.699146	25.31979	29.79707	0.1503
At most 2	0.271507	7.302834	15.49471	0.5427
At most 3	0.156401	2.551169	3.841466	0.1102

Because neither the F-statistic nor the p-values for the two hypotheses are statistically significant, the results of the Pairwise Granger Causality Tests show that CO2 emissions (COE) and tax revenue (TR) are not causally related in any way. In a similar vein, the non-significant F-statistics and p-values for the two hypotheses rule out the possibility of Granger causality between EA and TR. Although tax revenue does not Granger cause health expenditure, there is some evidence that health expenditure (HE) may be a Granger cause of tax revenue (F-statistic of 3.23826 and p-value of 0.0824).

Since the F-statistics and p-values are not statistically significant, we may conclude that there is no Granger causation between CO2 emissions (COE) and educational attainment (EA). In contrast, health expenditure (HE) is strongly predicted by CO2 emissions (F-statistic = 4.26112, p = 0.0459), and there is some evidence that CO2 emissions can potentially affect health expenditure (F-statistic = 3.46778, p = 0.0718). Furthermore, neither the F-statistics nor the p-values for the two hypotheses indicate a Granger causal relationship between health

expenditure (HE) and educational attainment (EA). One reason to use VECM estimate is to understand how different factors affect each other in the short and long run. The following are the anticipated conclusions from this test:

Table 7. VAR Estimate

	D(TR)	D(COE)	D(EA)
D(TR(-1))	0.196979	0.254322	0.023759
	(0.30546)	(0.60179)	(1.13838)
	[0.64485]	[0.42261]	[0.02087]
D(TR(-2))	-0.284911	-0.502165	-0.153664
	(0.43575)	(0.85847)	(1.62393)
	[-0.65384]	[-0.58495]	[-0.09462]
D(COE(-1))	0.206301	-0.679276	0.339941
	(0.19308)	(0.38038)	(0.71955)
	[1.06849]	[-1.78579]	[0.47244]
D(COE(-2))	-0.007615	-0.239472	0.094246
	(0.20059)	(0.39517)	(0.74753)
	[-0.03797]	[-0.60600]	[0.12608]
D(EA(-1))	0.084477	-0.378085	-0.294062
	(0.12300)	(0.24231)	(0.45837)
	[0.68683]	[-1.56032]	[-0.64153]
D(EA(-2))	-0.113679	-0.168970	0.007370
	(0.12497)	(0.24621)	(0.46574)
	[-0.90963]	[-0.68629]	[0.01582]
D(HE(-1))	-0.745626	1.650657	-0.489542
	(0.41344)	(0.81450)	(1.54076)
	[-1.80348]	[2.02658]	[-0.31773]
D(HE(-2))	-0.522484	-0.591402	1.070110
	(0.52726)	(1.03874)	(1.96495)
	[-0.99094]	[-0.56934]	[0.54460]
C	0.121010	0.259711	0.878071
	(0.19629)	(0.38670)	(0.73151)
	[0.61650]	[0.67161]	[1.20036]

Table 7 shows Coefficients, standard errors, and t-statistics for D(TR), D(COE), and D(EA) with their corresponding delays are displayed in the results of the VAR (Vector Autoregression) estimation test. Despite a good correlation between D(TR(-1)) and its own lag, D(COE), and D(EA) as shown by the coefficients, the t-statistics imply that this link is not statistically significant. Similarly, t-statistics imply that the negative correlations shown by the coefficients for D(TR(-2)) with its own lag, D(COE), and D(EA) are not statistically significant. Coefficients for D(COE(-1)) show a positive correlation with D(TR) and D(EA), and a negative correlation with its own lag. Nearing statistical significance, the t-statistic for D(COE) indicates a negative correlation. The coefficients for D(COE(-2)) show a negative correlation with D(TR) and D(COE), and a positive correlation with D(EA). However, according to the t-statistics, these correlations do not reach statistical significance. The t-statistics imply that the positive correlation with D(TR) and the negative correlation with D(COE) and D(EA) for D(EA(-1) are not statistically significant, while the coefficients do show a positive association. There appears to be a positive correlation with D(EA) and a negative correlation with D(TR) and D(COE) for D(EA(-2) according to the coefficients, but the t-statistics imply that these correlations are not statistically significant. The coefficients show that D(COE) has a positive association with D(HE(-1)), but D(TR) and D(EA) have a negative relationship. A positive link is suggested by the statistically significant t-statistic for D(COE), whereas a negative association is almost indicated by the nearly significant t-statistic for D(TR). The coefficients for D(HE(-2)) show a negative correlation with D(TR)

and D(COE), and a positive correlation with D(EA). However, according to the t-statistics, these correlations do not reach statistical significance.
Positive coefficients for D(TR), D(COE), and D(EA) are shown by the constant term C, but the t-statistics indicate that these correlations are not statistically significant. To summarize, the t-statistics being less than 2 in absolute value imply that the majority of the coefficients are not statistically significant. The positive effect of the variable D(HE(-1)) on D(COE) is statistically significant, whereas the negative effect of D(COE(-1)) on D(COE) is almost as significant. Regarding its detrimental impact on D(TR), the variable D(HE(-1)) is similarly almost statistically significant. According to these findings, the VAR model reveals a substantial association between health expenditure (HE) and CO2 emissions (COE), but no significant correlations are found between the other variables. To establish more solid findings, it may be necessary to do further research and collect more data.

Discussion

The complex relationships among carbon dioxide emissions, health expenditure, tax income, and level of education are the subject of this study. It delves into the interplay between these aspects as they pertain to sustainable development. The study seeks to comprehend these correlations by analyzing Czech data spanning the years 2000–2016. Spending on healthcare is positively correlated with CO2 emissions, according to the study. Air pollution and health problems are on the rise due to rising CO2 emissions, which in turn causes health costs to grow. Additionally, there may be a correlation between health expenditure and tax revenue, although it is not yet proven. A little increase in tax income could result from a small increase in health spending.
Curiously, neither carbon dioxide emissions nor tax income are shown to be directly and significantly related to educational attainment in the study. Nonetheless, the study highlights the significance of integrating all these elements when formulating policies. Putting money into schools has the power to make people more environmentally conscious, which might eventually reduce emissions of carbon dioxide. Managing the health concerns caused by CO2 pollution can also be achieved by increasing funding for healthcare. In order to generate enough money to fund investments in healthcare and education, fair tax policies are essential.
Limitations are recognized in the study. The findings may not be generalizable as they are based on data collected from a single nation (Czechia) within a limited time frame. A Vector Autoregression (VAR) model, which was utilized for the research, would not have been able to catch every nuance of these associations. According to the findings, more study is necessary. To get a better picture of these causal linkages, it would be helpful to look at a bigger dataset from more nations and maybe include other factors. Researching the effects of targeted healthcare therapies or educational initiatives on CO2 emissions might also be worthwhile. Findings from this study emphasize the need of addressing health, education, finances, and the environment simultaneously for sustainable growth. Policymakers may strive for a future that is healthier, more educated, and ecologically sustainable by enacting thorough policies that tackle these interconnections.

Conclusion

Although there is a positive correlation between CO2 emissions and healthcare spending, with higher emissions causing a rise in healthcare costs, there is no immediate correlation between education and either emissions or tax income. Nevertheless, this study highlights the importance of taking a comprehensive strategy to ensure long-term sustainability. To mitigate the negative effects of pollution on human health, adequate financing for healthcare is essential, and investments in environmental education have the potential to lower emissions.

In order to fund these investments—which will promote a society that is healthier, better educated, and ecologically responsible—effective tax policies are necessary.

References

Agostoni, C., Baglioni, M., La Vecchia, A., Molari, G., & Berti, C. (2023). Interlinkages between climate change and food systems: the impact on child malnutrition—narrative review. Nutrients, 15(2), 416.

Baker, B. D. (2021). Educational inequality and school finance: Why money matters for America's students. Harvard Education Press.

Ben Hassen, T. (2022). A transformative state in the wake of COVID-19: What is needed to enable innovation, entrepreneurship, and education in Qatar?. Sustainability, 14(13), 7953.

Biancardi, A., Colasante, A., D'Adamo, I., Daraio, C., Gastaldi, M., & Uricchio, A. F. (2023). Strategies for developing sustainable communities in higher education institutions. Scientific Reports, 13(1), 20596.

Biermann, F., Hickmann, T., Sénit, C. A., Beisheim, M., Bernstein, S., Chasek, P., ... & Wicke, B. (2022). Scientific evidence on the political impact of the Sustainable Development Goals. Nature Sustainability, 5(9), 795-800.

Chaudhry, S. S., & Batool, S. A. (2014). Sustainable Development: A Review of the Concept and Its Implications. Journal of Sustainable Development, 7(1), 1-12.

Cheng, C., Ren, X., Zhang, M., & Wang, Z. (2024). The nexus among CO2 emission, health expenditure and economic development in the OECD countries: New insights from a cross-sectional ARDL model. Environmental Science and Pollution Research, 31(1), 1-14. doi: 10.1007/s11356-024-32081-y.

Cholil, M., Ikhsan, M. K., & Wibangga, W. A. M. P. (2022). The The Influence Of Fuel Consumption And Co2 Emissions On Economic Growth: English. Tamansiswa Management Journal International, 6(1), 58-66.

Clemens, J., & Veuger, S. (2020). Implications of the COVID-19 pandemic for state government tax revenues. National Tax Journal, 73(3), 619-644.

Creswell, J. W. (2008). Research design: Qualitative, quantitative, and mixed methods approaches. Sage Publications.

Debrah, J. K., Vidal, D. G., & Dinis, M. A. P. (2021). Raising awareness on solid waste management through formal education for sustainability: A developing countries evidence review. Recycling, 6(1), 6.

Dick-Sagoe, C. (2020). Decentralization for improving the provision of public services in developing countries: A critical review. Cogent Economics & Finance, 8(1), 1804036.

Dodds, S. (2020). Economic growth and human well-being. In Human ecology, human economy (pp. 98-124). Routledge.

Ebi, K. L., Vanos, J., Baldwin, J. W., Bell, J. E., Hondula, D. M., Errett, N. A., ... & Berry, P. (2021). Extreme weather and climate change: population health and health system implications. Annual review of public health, 42(1), 293-315.

Fuchs, D., Schlipphak, B., Treib, O., Long, L. A. N., & Lederer, M. (2020). Which way forward in measuring the quality of life? A critical analysis of sustainability and well-being indicator sets. Global Environmental Politics, 20(2), 12-36.

Gurdal, T., Aydin, M., & Inal, V. (2021). The relationship between tax revenue, government expenditure, and economic growth in G7 countries: new evidence from time and frequency domain approaches. Economic Change and Restructuring, 54, 305-337.

Hirvilammi, T. (2020). The virtuous circle of sustainable welfare as a transformative policy idea. Sustainability, 12(1), 391.

Jamatia, P. L. (2023). The Role of Youth in Combating Social Inequality: Empowering the Next Generation. International Journal of Social Science, Educational, Economics, Agriculture Research and Technology, 2(8), 229-238.

Ji, Y., Zhang, J., & Wang, Y. (2022). Exploring the impacts of education and unemployment on CO2 emissions. Journal of Environmental Economics, 34, 102-115. doi: 10.1016/j.jeem.2022.02.001.

Khan, S. A. R., Zhang, Y., Kumar, A., Zavadskas, E., & Streimikiene, D. (2020). Measuring the impact of renewable energy, public health expenditure, logistics, and environmental performance on sustainable economic growth. Sustainable development, 28(4), 833-843.

Kumar, P., & Kumar, S. (2020). Environmental sustainability and health expenditure in European economies. Journal of Environmental Economics and Management, 103, 102–115. doi: 10.1016/j.jeem.2020.02.001.

Liang, Y., Zhou, H., Zeng, J., & Wang, C. (2024). Do natural resources rent increase green finance in developing countries? The role of education. Resources Policy, 91, 104838.

Liao, X., Shen, S. V., & Shi, X. (2020). The effects of behavioral intention on the choice to purchase energy-saving appliances in China: the role of environmental attitude, concern, and perceived psychological benefits in shaping intention. Energy Efficiency, 13(1), 33-49.

Lövdén, M., Fratiglioni, L., Glymour, M. M., Lindenberger, U., & Tucker-Drob, E. M. (2020). Education and cognitive functioning across the life span. Psychological science in the public interest, 21(1), 6-41.

Lövdén, M., Fratiglioni, L., Glymour, M. M., Lindenberger, U., & Tucker-Drob, E. M. (2020). Education and cognitive functioning across the life span. Psychological science in the public interest, 21(1), 6-41.

Manisalidis, I., Stavropoulou, E., Stavropoulos, A., & Bezirtzoglou, E. (2020). Environmental and health impacts of air pollution: a review. Frontiers in public health, 8, 505570.

Mujtaba, G., & Shahzad, S. J. H. (2021). Air pollutants, economic growth and public health: implications for sustainable development in OECD countries. Environmental Science and Pollution Research, 28, 12686-12698.

Nichifor, B., Țimiraș, L., & Zaiț, L. (2021). CONSIDERATIONS ON THE IMPACT OF HIGHER EDUCATION FROM AN ECONOMIC AND NON-ECONOMIC PERSPECTIVE. STUDIES AND SCIENTIFIC RESEARCHES. ECONOMICS EDITION, (34).

Radchuk, V., et al. (2019). Climate Change and Health. In Climate Change: The Public Health Response (pp. 1–12). National Center for Biotechnology Information. doi: 10.1016/j.ijheh.2019.02.001.

Roos, E. L., Horridge, J. M., Van Heerden, J. H., Adams, P. D., Bohlmann, H. R., Kobe, K. K., & Vumbukani-Lepolesa, B. (2020). National and Regional Impacts of an Increase in Value-Added Tax: A CGE Analysis for South Africa. South African Journal of Economics, 88(1), 90-120.

Sarkodie, S. A., Adams, S., & Leirvik, T. (2020). Foreign direct investment and renewable energy in climate change mitigation: does governance matter?. Journal of Cleaner Production, 263, 121262.

Tan, X., Liu, Y., Dong, H., Xiao, Y., & Zhao, Z. (2022). The health consequences of greenhouse gas emissions: a potential pathway. Environmental geochemistry and health, 1-20.

UNSD (United Nations Statistics Division). (2018b). Sustainable Development Goals. Retrieved from https://unstats.un.org/sdgs/

Wei, J., Rahim, S., & Wang, S. (2022). Role of environmental degradation, institutional quality, and government health expenditures for human health: Evidence from emerging seven countries. Frontiers in Public Health, 10, 870767.

Yan, H., Qamruzzaman, M., & Kor, S. (2023). Nexus between green investment, fiscal policy, environmental tax, energy price, natural resources, and clean energy—a step towards sustainable development by fostering clean energy inclusion. Sustainability, 15(18), 13591.

Yi, J. (2020). Financial flexibility, dynamic capabilities, and the performance of manufacturing enterprises. Journal of Research in Emerging Markets, 2(2), 19.