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The Environmental Footprint of Foreign Investment in Bulgaria

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ABSTRACT

Foreign direct investments, a crucial strategy for attracting foreign capital, include certain downsides alongside their benefits. An illustration of this is the rise in carbon dioxide (CO_2) emissions discharged into the environment. The aim of this study is to investigate the relationship between CO_2 emissions in Bulgaria and foreign investments. The study is quantitative research, and the Granger method was used. The study was based on World Bank data for the years 1998-2022. The study's limitation to 24 years of data stems from the unavailability of data for more years. Based on the findings of the study, there was no correlation found between CO_2 emissions in Bulgaria and investments from other countries. It is possible that foreign investments will have a greater impact on the environment over the long term, even if this impact is not visible during the period of investment. Using the Granger method, it has been empirically proven that there is no causal relationship between CO_2 emissions and foreign direct investments in Bulgaria in the period 1998-2022. Policymakers have the ability to design policies that encourage foreign investments in environmentally friendly and sustainable technology, as well as laws that assist in directing future investments toward projects that are ecologically favorable.

Keywords: Economics, Environmental Economy, Carbon Dioxide, Foreign Investment, Macroeconomic Analysis, Bulgaria
JEL Classifications: E22, O13, O44, Q56, C82, O11

1. INTRODUCTION

The growth of human cultures and attempts to improve economic prosperity may lead to environmental damage. Deforestation is a prevalent phenomenon in evolution that presents immediate and perhaps permanent environmental hazards, although ecological and modernization efforts to mitigate these risks (Tsiantikoudis et al., 2019). In recent decades, deforestation, driven by social modernization and urbanization, has become an essential mechanism for the irreversible conversion of forested areas to alternative land uses (Chew, 2021). The significance of renewable energy, urbanization, and foreign direct investment (FDI) has been extensively examined in environmental literature (Awan et al., 2022; Niftiyev, 2024). Deforestation inside the European Union (EU) is an environmental issue that has had detrimental effects in recent decades. The motivating policies regarding deforestation are complex and vary among regions and nations (Tsiantikoudis et al., 2019).

Evaluations of global economic advancement indicate upward tendencies, with issues of environmental degradation linked to this growth. Nonetheless, governments are working to draw in foreign funding for their nations. Foreign investments are one kind of financial resource. While several factors have been found in the literature as impacting carbon emissions, Kamaci et al. (2019) state that foreign direct investments are primarily considered an explanatory variable, primarily because of the influence of the economic globalization process.

In the past several years, Bulgaria has made tremendous progress in comparison to other nations that are members of the European Union (EU) by drastically lowering the amount of greenhouse gas emissions it has produced. Nevertheless, this achievement is also confronted with a number of obstacles that are connected to the energy policy and economic interests of the nation. According to the statistics for the year 2022, it is reasonable to assert that

Bulgaria's emissions from fossil fuels amount to roughly 50.1 million tons of carbon dioxide (CO_2), which is equivalent to around 0.13% of the total emissions produced by the European Union (www.worldometers.info). This amounts to 7.34 tons of carbon dioxide emissions per person. By the year 2023, Bulgaria is projected to have reduced its emissions of greenhouse gases by around 19.6%, making it the second biggest drop among EU members (sofiaglobe.com, 2024).

In 2021, greenhouse gas emissions in Bulgaria were 8.5% lower than the pre-pandemic levels in 2019. Over the same time, ETS and Effor Sharing emissions declined by 1% and by 1.3%, respectively. In 2021, net GHG emissions, including LULUCF, were 54.5% lower than the levels recorded in 1990 (European Commission, 2023). Bulgaria, with a population of 6,975,761 and an urban demographic of 5,256,027, or 75.35% of the total, emitted 42,560,210 tons of CO_2 in 2022. This equates to a per capita CO_2 output of 6.18 tons, indicating that each individual produces around 6 tons of CO_2 per year. To evaluate the influence of economic activity on CO_2 emissions, it is beneficial to analyze the Carbon Intensity of GDP. In Bulgaria, this metric is 0.49 kg of CO_2 every International dollar ($USD) of economic activity generated (Montoya, 2023). In the second quarter of 2023, Bulgaria had the most substantial reduction in greenhouse gas emissions within the EU, with a decline of 23.7% relative to the same time in 2022, according to Eurostat numbers released on Wednesday. The decline corresponds with an annual increase in this nation's GDP growth during the second quarter (Vodenicharova, 2023). Consequently, both nations exhibit a reduction in emissions since 1990, with Bulgaria's greenhouse gas emissions per GDP being twice the EU27 norm, while Lithuanian emissions are also notable (Kotseva-Tikova and Dvorak, 2022).

The influx of FDI may lead to increased CO_2 emissions in the host country, especially in areas aggressively seeking economic expansion and likely to relax environmental restrictions to attract foreign money. Conversely, foreign direct investment inflows can lead to beneficial knowledge transfer and drawbacks, as well as promote efficient energy use and reduced CO_2 emissions in host countries. Thus, understanding the complex interactions between FDI inflows and CO_2 emissions is crucial for developing enhanced policy suggestions on these issues (Awan et al., 2022).

Bulgaria continues to be a compelling destination for foreign direct investment, as the government in Sofia provides various incentives to encourage the establishment of businesses within its borders. The economy of the country experienced a setback in 2020 due to the Covid pandemic; however, it has since rebounded, showing an expansion of 3.8% in 2022. The European Commission anticipates that Bulgaria's GDP will maintain growth, albeit at a reduced rate of 2.0% in 2023 (Dojan, 2023). Preliminary data indicates that the net flows of FDI in Bulgaria, as per the directional principle, achieved a positive value of EUR 3,173.4 million (3.3% of GDP) during January - September 2023. This reflects an increase of EUR 1,034.8 million (48.4%) compared to the same period in 2022, which recorded a positive value of EUR 2,138.6 million (2.5% of GDP). In September 2023, Bulgaria experienced a net inflow of foreign direct investment amounting to EUR 423.4 million, a decrease from the EUR 472.1 million recorded in September 2022 (Bulgarian National Bank, 2023). This study aims to empirically investigate the relationship between CO_2 emissions in Bulgaria and the influx of foreign investments into the country.

2. LITERATURE REVIEW ON CO_2 EMISSION AND FOREIGN INVESTMENT

The cleanliness and pollution of the environment is more noticeable in some sectors. One of the sectors where environmental cleanliness and pollution is the most is the energy sector. The energy sector can be evaluated in three ways in terms of environmental pollution: (1) Traditional energy; (2) Renewable energy; (3) Hybrid energy. However, the energy sector covers a wide range of areas. Most of these areas are also examined from two perspectives: (1) From the perspective of production (at the country level) and (2) from the perspective of consumption (at the company and individual level).

Environmental pollution is a very important issue and is affected by the country's economic growth and the sectors that play a role in this growth. Research exists about the potential contribution of the tourism sector to environmental damage. Tourism may also facilitate development in rural, ecologically fragile, or impoverished areas (Rodríguez et al., 2020; Gao et al., 2021). Another important factor causing environmental pollution comes from the energy sector.

As the issue of global warming has gained recognition beyond the domain of climatologists, many statistical methodologists have carried out analyses on the relationship between temperatures and greenhouse gases. Another area that causes environmental pollution is related to deforestation and decrease in biomass. FAO figures (2016) indicate that in Bulgaria, 36.1% of the total area, around 3,927,000 hectares, is forested; of this, 8.6% (338,000 hectares) is designated as primary forest, characterized by high biological diversity and carbon content. There are forest plantations spanning 815,000 hectares. As a result of the fact that Bulgaria's forests contain 202 million metric tons of carbon in living biomass, deforestation has become a problem of serious consideration. The overexploitation of forests in Bulgaria, absent a sustainable management initiative and appropriate monitoring, has led to an annual loss of 30,000 hectares, equating to 0.90% (Dimitrova and Buzogány, 2014). Prevalent techniques of deforestation in Bulgaria include incineration and the cutting down of trees.

Bulgaria is considered to be a pollution haven, and there is a positive correlation between foreign direct investment and carbon dioxide emissions (Pavlović et al., 2021). The Sustainable Development Report (United Nations Economic Commission for Europe, 2013) indicates that Bulgaria has significant problems in attaining sustainable development objectives in climatic sectors and in providing clean and cheap energy. Significant deforestation is universally acknowledged as a human-induced environmental issue (Chew, 2021; Rudel, 2013). According to Kindermann et al. (2008), the reason for the association between deforestation, forest degradation, and climate change is that a smaller number of trees absorbs less greenhouse gases (GHGs). As a result, deforestation indirectly contributes to an increase in carbon dioxide emissions. According to Bala et al. (2007), deforestation is linked to both the cooling impact and the warming carbon cycle on a global scale. These effects are the consequence of changes in albedo and evapotranspiration.

The upward trajectory of many nations' economic development, which includes the pursuit of FDI, often conflicts with the ever-increasing demands for pollution management on both the local and international levels. The balance between these trends has emerged as a significant focus for ecological economists, particularly in nations that have not historically engaged in capital exports and have therefore not amassed adequate financial resources for domestic investments (Pavlović et al., 2021). An alternate causality test was presented by Kodra et al. (2011), and it shown that the linear causal relationship between CO_2 and global temperature is greater than those that exist in the other direction.

Tsiantikoudis et al. (2019) analyze the use of carbon emission equivalents from deforestation as a metric for environmental deterioration in Bulgaria, a recent member of the European Union (EU). Kotseva-Tikova and Dvorak (2022) examined the climate policies and initiatives included in the national recovery and resilience plans of Bulgaria and Lithuania, designed to promote green transformation and economic stability after the COVID-19 economic decline. Investment in carbon-neutral solutions, renewable energy, electric vehicles, a circular economy, sustainable food systems, and forestry, with the replacement of fossil fuel technology, is crucial for attaining climate neutrality and alleviating temperature rise (Kotseva-Tikova and Dvorak, 2022).

Research exists on this topic in the literature. Hoffmann et al. (2005) and Lee (2013) established that no causal link exists between FDI and CO_2 emissions. Omri et al. (2014) established a bidirectional relationship between FDI and CO_2 emissions in 54 countries from 1990 to 2011. Kamaci et al. (2019) analyzed the correlation between foreign direct investment, trade openness, and CO_2 emissions using data from 24 EU nations spanning the years 1995-2019.

Alshubiri and Elheddad (2020) found that the correlation between foreign money and environmental quality in OECD countries has an inverted U shape. The early effect of foreign finance was detrimental; but subsequently, the observed indicators began to influence the decrease in CO_2 emissions. Dhrifi et al. (2020) established a unidirectional causal relationship from FDI to CO_2 emissions in 98 developing countries from 1995 to 2017. Marques and Caetano (2020) analyzed 21 countries, classifying Greece as a high-income country and Bulgaria, Croatia, and Romania as middle-income nations, finding that FDI contributes to the reduction of CO_2 emissions in high-income countries. This outcome has exacerbated the circumstances in middle-income nations. In these nations, FDI originally established a pollution haven effect, however, are recognized for lowering CO_2 emissions over the long term.

Zubair et al. (2020) shown that FDI inflows mitigate CO_2 emissions by facilitating a cleaner environment. Pavlović et al. (2021) investigated the effects of FDI and economic development on environmental deterioration in the Balkans from 1998 to 2019. Awan et al. (2022) investigated the impact of renewable energy, internet use, and FDI on CO_2 emissions, using data from 10 developing nations from 1996 to 2015.

Foreign investments also influence the economy of the host country. An essential metric of this influence is economic growth and the significance of foreign investments in that growth. Economic growth, a crucial indicator of a nation's expanding economic share, is a significant determinant for every country.

3. RESEARCH METHODOLOGY

3.1. Data Set

Although underdeveloped or developing countries tend to attract foreign direct investments due to the benefits they provide, developed countries are more sensitive in this regard. Again, one of the most important reasons for this is air pollution released into the environment. Consequently, the correlation between CO_2 emissions and foreign investments is always important. Based on this, the aim of this study is to investigate the relationship between CO_2 emissions in Bulgaria and foreign investments.

The data set utilized in this analysis encompasses annual data spanning from 1998 to 2022. The data used was sourced from the World Bank platform. While the percentage structure of foreign investments in GDP is taken as basis, the logarithmic values of CO_2 emissions are included in the analysis. Data on CO_2 emissions (Figures 1 and 2) and foreign direct investments (Figure 3) were obtained from the World Bank.

As seen in Figure 1, although there are increases and decreases in CO_2 emissions from 1998 to 2022, they are generally decreasing.

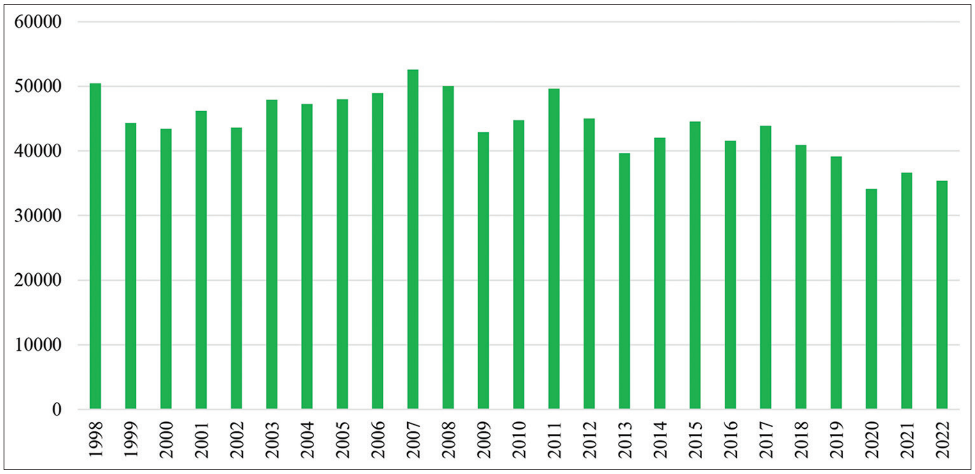
Figure 2 illustrates that the proportion of CO_2 emissions relative to GDP in Bulgaria experienced a reduction of about 80% from 1998 to 2022.

Figure 3 shows the level of foreign investments made in Bulgaria between 1998 and 2022. It is seen that investments, which have increased over a 24-year period since 2003, peaked in 2007. However, there were sharp declines in 2008 and 2009, and it is seen that it has remained at current levels since 2010.

3.2. Analyses Method

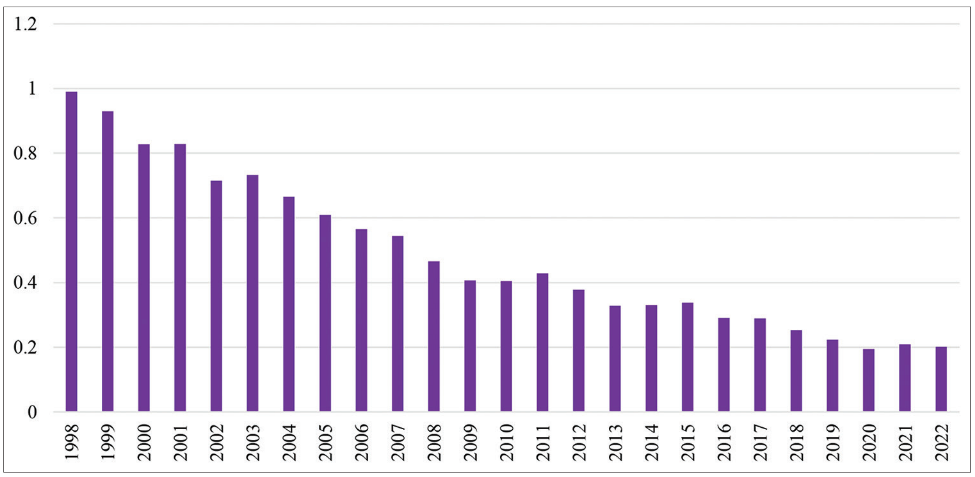
Our global examination of vegetation anomalies induced by environmental factors was facilitated by the Granger Causality method. In the scientific discipline of econometric time series analysis, the Granger causality hypothesis was validated. In 1969, Granger created a statistical concept of causation that was based on the notions that (i) a cause precedes its effect and (ii) understanding a cause aids in predicting its consequence (Stokes and Purdon, 2017). Granger (1969) devised the Granger causality test, which states that if the past and present values of a variable (in this

Figure 1: Data on CO_2 emissions (kt) in Bulgaria



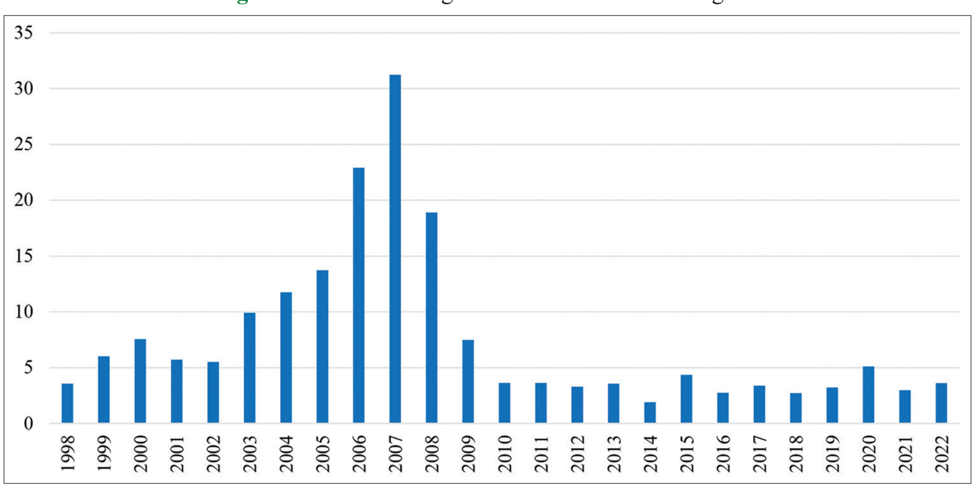
Source: World Bank

Figure 2: Data on CO_2 emissions (kg per PPP, $ of GDP) in Bulgaria



Source: World Bank

Figure 3: Data on foreign direct investments in Bulgaria



Source: World Bank

example, exports) assist to forecast GDP, then that variable (exports) is said to Granger cause another variable (GDP). This study uses Granger's (1969) causality test to determine if exports are a cause of GDP.

In order to use the Granger Causality approach, it is necessary to take into consideration two time series: $x = (x1, x2,\dots, xN)$ and $x= (y1, y2,\dots, yN)$, where N is the number of days associated with the time series. Both the environmental surface variable y and the vegetation variable x are taken into consideration here. Employing the historical values of x and y from previous timestamps, Granger's predictive causality seeks to forecast the value of x (t) at a certain timestamp t. This is accomplished by employing their respective values (Papagiannopoulou et al., 2017). If the autoregressive prediction of x improves with more information from variable y, then Granger posits that variable x is Granger-caused by y (Kovács et al., 2023).

Granger causality has been used by a numerous number of researchers in order to investigate the factors that are contributing to the increase in the average temperature of the planet (Sun and Wang, 1996; Kaufmann and Stern, 1997; Attanasio, 2012; Papagiannopoulou et al., 2017; Stokes and Purdon, 2017; Kovács et al., 2023). The direct effect of greenhouse gases was examined in the research by Sun and Wang (1996), and their radiative forcing—rather than their concentrations or even emissions—was often used to explain the effect. Granger causality was used in a multivariate framework in Kaufmann and Stern's (1997) study, but dimensionality quickly became apparent because there were more free parameters in the models than there were time series lengths. This increased the likelihood of overfitting and made it uncertain whether the estimation parameters would be effective. Granger causality was used by Attanasio (2012) to test his analysis from CO_2 radiative forcing (RF) to temperatures.

4. ANALYSES AND RESULTS

The variables used for the analysis part of the study were determined as CO_2 emissions and foreign investments. Information about the analysis variables is included in Equation 1.

$$Variables = (CO_2, foreign\ investment) \tag{1}$$

After the variables were determined, two models were established to measure the effects of these variables on each other. One variable in each was considered as the dependent variable. In this way, the effects of the variables on each other were tried to be measured. Information about the analysis model is included in Equations 2 and 3.

$$CO_2\ emission = \beta 0 + \beta 1\ foreign\ investment \tag{2}$$

$$Foreign\ investment = \beta 0 + \beta 1\ CO_2\ emission \tag{3}$$

There are a number of assumption tests required to test Granger causality analysis, which must be applied first. The initial step is to assess the stationarity of the series. The application of the ADF (Augmented Dickey-Fuller) test indicated that the data series exhibited non-stationarity at the level. The data, which were later tried to be made stationary, were observed to be second-order stationary. Information regarding level-order and second-order stationarity is given in Table 1.

ADF test results and series stationarity status at the statistical level are displayed in Table 1. This test is frequently used to assess whether or not time series data are stationary, particularly when analyzing time series data. The term "stationarity" refers to the situation in which the mean, variance, and covariance of a time series stay unchanged across the course of several time periods. Non-stationary series should be handled carefully since they might produce false results in econometric analysis (Amornbunchornvej et al., 2021; Wang et al., 2018; Pastorino and Zanin, 2023). For both the Level-Level Series and the Second-Degree Stationarity Status of the CO_2 emissions and foreign investment variables, the ADF tests' t-statistics and P-values are shown in Table 1. This data makes it possible to assess the series' stationarity status. The stationarity of both variables was examined at the level analysis level. Taking into consideration the outcomes of the ADF test for CO_2 emissions, the P-value was 0.0697 and the t-statistic was −2.625116. The P-value for foreign investment was 0.1406 and the t-statistic was −2.447691. In comparison to the crucial values of 1%, 5%, and 10%, these results demonstrate that neither of the variables is stationary. Specifically, P-values larger than 0.05 suggest that the series must be modified before being utilized in the study since they are not stationary at the level.

The series was then subjected to second-degree stationarity tests, which revealed that both variables were second-degree stationary. Foreign investments had a t-statistic of −5.289947 and a P = 0.0004, whilst CO_2 emissions had a t-statistic of −6.504068 and a P = 0.0000. Both variables are second-degree stationary, according to these results, making them appropriate for inclusion in the study.

It demonstrates that the data on foreign investments and CO_2 emissions were initially non-stationary but became second-degree stationary when the required adjustments were done. For the Granger causality test that is conducted later on to be reliable, this step is crucial. Making the series stationary cleared the path for the study to produce healthy results, as studies carried out using non-stationary series may produce deceptive results.

Following the determination of whether or not the data were stationary, the necessary lag duration was then calculated. It was decided in the ninth phase that the length that was the most ideal was selected based on the results of the proper delay test. Test results for appropriate delay are in Table 2. Accurately calculating the lag length is crucial for model correctness and result validity in time series analysis like Granger causality testing. Results might be skewed by either too much or too little lag selection. The analysis of the tests conducted in accordance with the different criteria used to determine the ideal lag length is thus presented in Table 2.

Table 1: Information on stationarity levels of data

ADF test result	CO_2 emission		Foreign investment	
	t-statistics	P-value	t-statistics	P-value
Level values of series				
ADF testing statistics	−2.625116	0.0697	−2.447691	0.1406
Test critical values				
1%	−3.737853		−3.752946	
5%	−2.991878		−2.998064	
10%	−2.835542		−2.638752	
Stationarity level of second order series				
ADF testing statistics	−6.504068	0.0000	−5.289947	0.0004
Test critical values				
1%	−3.808546		−3.788030	
5%	−3.020686		−3.012363	
10%	−2.650413		−2.646119	

The statistical test results for different lag durations are shown in Table 2, along with a comparison of them. The following criteria are applied in the tests:

- LogL (Log-likelihood): It is a measure of the model's fit and a higher LogL value indicates that the model fits the data better.
- LR (Likelihood Ratio Test): It is a test used to compare two models. A high LR value supports the validity of the model.
- FPE (Final Prediction Error): When the FPE number is lower, it shows that the model is a better match for the data. It assesses the predicting success of the model.
- AIC (Akaike Information Criterion): It is a criterion that strikes a balance between the complexity of the model and its suitableness. An improved model fit is shown by an AIC value that is lower.
- SC (Schwarz Criterion): It aims to make the model simpler and more accurate. Similar to AIC, a lower SC value indicates a better model.
- HQ (Hannan-Quinn Criterion): It is another criterion used in model selection, similar to AIC and SC.

Table 2 presents the test results corresponding to different lag lengths, comparing various criteria to determine the most suitable lag length.

- Lag 0: For the first lag length of the model, 0, the test statistics show a very poor fit. In particular, the AIC and SC values are high, and there is no significant result for the LR test. This means that lag 0 is not suitable for the model.
- Lag 1: For a lag length of 1, the LR test shows a high value of 49.47641*, indicating that the model provides a significantly better fit with one lag. In addition, AIC and SC values have improved significantly, but FPE still remains high.
- Lag 2: At the 2nd lag length, AIC and SC values decrease slightly, while FPE decreases even more. However, the LR test statistic remains slightly lower.
- Lag 3-5: Between these lag lengths, AIC, SC and HQ values generally continue to improve, but LR test and FPE values remain stable. In terms of model fit, 3rd and 4th lag lengths seem quite suitable.
- Lag 6: At the 6th lag length, FPE has decreased to a very low value (0.007112*), indicating that the model can make high-accuracy predictions. However, AIC and SC values are still more negative and improved. This lag length exhibits strong fit, especially in terms of LR test.
- Lag 8 (Most Optimal Lag Length): In the Table, the 8th lag length is indicated as the most suitable lag. Here, AIC and SC values reached the lowest level and LR test was zero (0), which indicates that the model provides a very good fit and gives a high reliability result. HQ also remains at low levels.

The model performs best at the eighth lag length, which may be found in Table 2. Specifically, this lag length is the best choice for the model based on the lowest values found in the AIC, SC, and HQ criterion. Furthermore, the 8th lag length is the most suitable and legitimate choice, according to further tests like the LR test and FPE. These findings are crucial for establishing the lag length that will be applied in the study's later analyses. The model will produce the most accurate findings if a lag length of 8 is chosen, and this lag length may be used in subsequent Granger causality experiments. After the necessary assumption tests, a transition was made to causality analysis. Granger causality test results are given in Table 3.

As can be seen from Table 3, the H_1 hypothesis is rejected for both models. In other words, no causal relationship could be detected between the variables included in the analysis. There is no significant relationship between CO_2 emissions considered within the framework of Bulgaria and foreign investments coming to this country.

5. DISCUSSION AND CONCLUSION

In their study, Tsiantikoudis et al. (2019) discovered that the inverted U form of the EKC hypothesis is not confirmed. Instead, they showed that the inverted N model is justified. The use of forest lands and other resources or related industries, such as agroforestry, ecotourism, and scientific research, is not immediately correlated with the implementation of appropriate policies for environmental protection via the diversification of economic activities. This is because the policies are not directly tied to the activities themselves. The research conducted by Kamaci et al., (2019) established a directional causality from foreign direct investments to trade openness. In their study, Awan et al. (2022) discovered that there is a link between economic expansion and environmental deterioration that takes the form of an inverted U.

The Balkan countries are progressing towards economic prosperity and environmental sustainability; however, the journey is challenging. Countries encounter various challenges, including poverty, unresolved political issues, ambiguous environmental protection laws, and brain drain. Over the course of 20 years, the economic performance of the nations in the Balkans improved, and

Table 2: Appropriate delay length

Lag	LogL	LR	FPE	AIC	SC	HQ
0	−39.18235	NA	0.435831	4.844982	4.943007	4.854726
1	−9.143095	49.47641*	0.020512	1.781541	2.075616	1.810772
2	−3.277096	8.281410	0.016942	1.562011	2.052137	1.610731
3	2.943295	7.318106	0.013967	1.300789	1.986965	1.368996
4	10.33947	6.961107	0.010728	0.901239	1.783465	0.988934
5	12.55142	1.561376	0.017052	1.111598	2.189874	1.218780
6	28.04966	7.293291	0.007112*	−0.241137	1.033189	−0.114466
7	36.15617	1.907413	0.012472	−0.724255	0.746121	−0.578097
8	836.8696	0.000000	NA	−94.45524*	−92.78882*	−94.28960*

*Indicates the appropriate lag length for the relevant test

Table 3: Granger causality test

Hypotheses	F-value	Probability value (P)	Decision at 1% significance level
The change in foreign investments is one reason for the change in CO_2 emissions.	2.006064	0.3668	Rejected
Changes in CO_2 emissions are the reason for changes in foreign investments	1.691893	0.4292	Rejected

the international community adjusted its policies regarding trade, different assistance programs, and the possibility of inclusion in the European Union. These countries view FDI as an opportunity for economic growth, leading them to compete for the attraction of foreign investors. The environmental situation is not as anticipated (Pavlović et al., 2021).

Within the scope of the research, the Granger causality test was used to analyze the connection between FDI and carbon dioxide emissions in Bulgaria. The data utilized for this investigation included the years 1998 through 2022. The initial steps involved conducting a unit root test on the time series of the variables employed in the research. When the second differences of the series were calculated, it was found that the series had become stationary. This was due to the fact that the level values of the series had unit roots. Granger analysis was performed once the series had reached a stationary state. This was followed by the determination of the proper settling length for Granger research. The investigation concluded that there is no correlation between carbon dioxide emissions in Bulgaria and foreign investments.

In light of the findings of this study, it is essential to continuously evaluate the environmental implications of investments in a variety of industries, despite the fact that there is no obvious connection between CO_2 emissions and foreign investments in Bulgaria. It is important to keep in mind that investments made in various industries may have impact on the environment that is distinct from one another. It is possible that the environmental impact of foreign investments will become more noticeable over the course of the long run if it is not detected in the short term period. For this reason, policymakers have the ability to design policies that encourage foreign investments in environmentally friendly and sustainable technology, as well as laws that assist in directing future investments toward projects that are environmentally favorable.

The fact that the research was carried out using data from only 24 years is one of the most significant limitations of the study. This is due to the fact that statistics for further years were not accessible. On the other hand, the data set that was utilized in the research was gathered from the data that was provided by the World Bank. Due to the fact that the data provided by the World Bank often consists of macroeconomic and general statistical information, it is possible that it does not include precise sectoral data. It is possible that the effects of foreign investments in various industries are distinct from one another; however, this study does not undertake a sectoral analysis, thus it is possible that these distinctions are not reflected in the findings thereof.

A causal association between CO_2 emissions and foreign investments in Bulgaria is investigated in this study, which uses data spanning the years 1998-2022 to conduct its analysis. It is possible that in subsequent research, conducting analyses of a similar nature over longer time periods will assist us in gaining a more comprehensive understanding of the connection between foreign investments and the environment. However, taking into consideration the fact that foreign investments may have environmental repercussions on a sectoral level, it is possible to conduct in-depth evaluations on a sectoral basis. In this work, Granger causality analysis was used to evaluate the hypothesis. Additionally, in subsequent studies, researchers have the ability to conduct analyses utilizing a variety of methodologies.

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