

THE EFFECT OF GOOD GOVERNANCE ON CO2 EMISSIONS AND FDI INFLOWS

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Abstract: In the contemporary context, people's attention has turned to the relationship between foreign direct investment (FDI) and environmental concerns. And the good governance that wants to increase the level of FDI inflows and decrease the level of CO2 emissions has also aligned with this trend, to achieve a sustainable development. Thus, through the present research we want to analyse the effect of good governance on CO2 emissions and FDI inflows. The analysed period is between 2002-2021, and to carry out a more detailed analysis we introduced groups of countries. We used panel data methods to test relationships through multiple regression in Stata. In the analysis we considered the 2 factors, FDI and CO2, as dependent variables. We will measure good governance through the prism of 4 indicators, which we will consider as independent variables in our study, namely Trade, the sum of exports and imports of goods and services, Gross capital formation, Government effectiveness and Consumer price index. The results demonstrate a higher level of good governance in reducing CO2, respectively attracting FDI in the group of countries that are part of the EU zone, respectively of the euro zone.

Keywords: CO2 emissions, FDI inflows, good governance

Introduction

In recent years, climate change and global warming are topics of discussion worldwide. And the main cause of these disastrous situations for the environment and population is considered to be carbon emission. CO2 is a global pollutant and generally comes from burning fuel from vehicles, factories, or households.

The international model shows us that European countries have recorded an increase in CO2 emissions along with the economic expansion. At the same time, the economic expansion of these countries is also due to FDI flows. And the flow of FDI is considered to affect the environment (Zhang et al., 2023). Large amounts of CO2 contribute to climate change and have serious negative effects on the economy (Choi et al., 2023).

Figure 1 shows the level of CO2 emissions at the level of European countries in 2021.

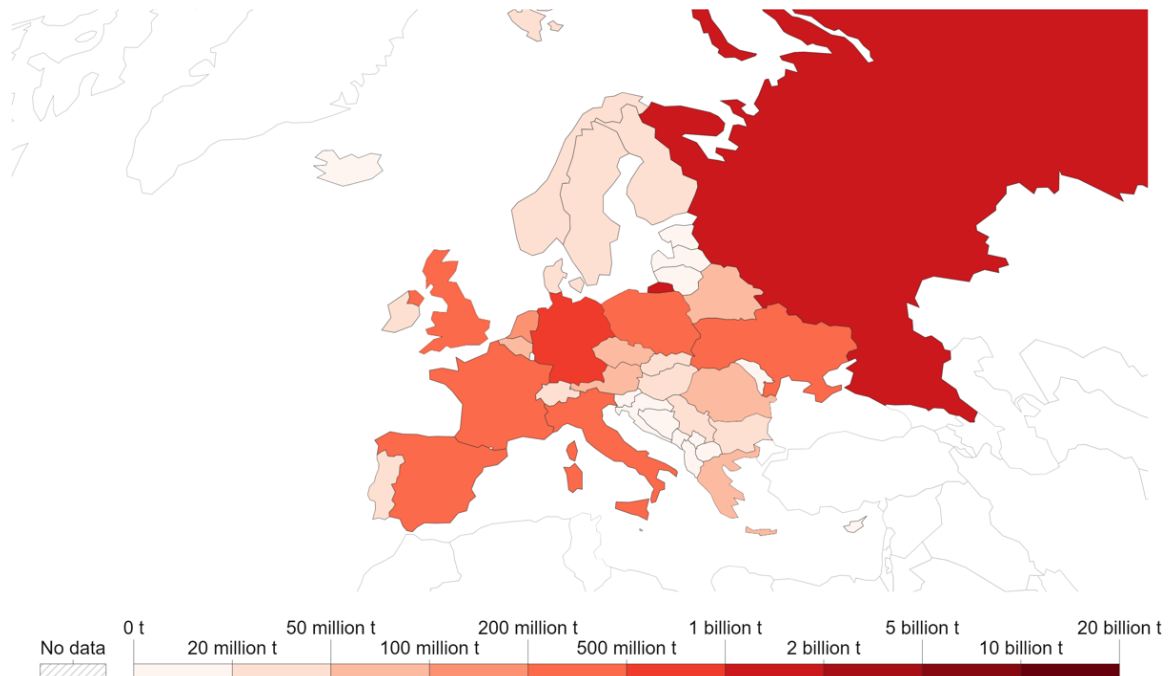


Figure 1: The level of CO2 emissions at the level of European countries in 2021

Source: Our World in Data, 2023

The Covid-19 pandemic negatively influenced energy demand in 2020. Thus, a 5.2% reduction in CO2 emissions was recorded in 2020 compared to 2019 (IEA, 2021). However, at the level of 2021, an extremely rapid economic recovery was achieved thanks to fiscal and monetary incentives, as well as the rapid release of vaccines. Also, the unfavorable weather conditions in 2021 accentuated the electricity crisis. And finally, this fact translated into the large-scale use of energy from the burning of coal. For this reason, in this reference year, emissions have increased by approximately 2.1 Gt compared to the previous year. In general, good governance is a process that can be seen through the transparency, accountability, and regulatory reforms of a state. We can also say that the present concept caters to the needs of the masses and not the select groups.

Literature review

Since the 1980s, there has been an upward trend in the flow of FDI globally. This is outlined by the benefits for both host countries and investors. And among the benefits brought to the host country by this type of investment, Jahanger (2021), mentions "the transfer of foreign capital, technology, skills and access to new markets to improve exports". However, the specialized literature in this field is divided into two schools of thought, namely the Pollution Haven Hypothesis and the Pollution Halo Hypothesis (Al-Nimer et al., 2022). The first type of thinking emphasizes the negative impact of FDI on the environment, and the second type emphasizes the constructive role of FDI in environmental protection (Adeel-Farooq et al., 2021).

Xiao (2015) studies the link between FDI and intra-host pollution in developing countries. The results of this study demonstrate that openness to FDI is beneficial for the environment. In general, locations for this type of investment must possess stricter environmental regulatory policies. And this fact is fulfilled if there is a good infrastructure as well as

technological equipment. At the same time, Millimet and Roy (2015) argue through their paper that developing economies are intentionally relaxing their environmental standards. In this way, foreign investors are attracted to support economic growth by creating new employment opportunities. Zhang (2011) argues that the environment is affected by CO2 emissions, energy use and economic growth. Likewise, other studies (Qayyum et al., 2021, Yang et al., 2022; Yuan et al., 2022) argue that transportation, international trade, fossil fuel burning, and foreign direct investment are other important variables that explain environmental damage. natural. And the study by Shabir, Rashid Gill and Ali (2022) claims that the major factors of energy consumption are represented by transport and foreign direct investment. And the increased level of FDI and transport activities play a vital role in propelling economic growth.

On the other hand, there are also studies that support a positive link between FDI and environmental quality. Thus, a study (Zhang and Zhou, 2016) supports the pollution halo hypothesis. Thus, foreign firms can export greener technologies from developed countries to developing countries and conduct business in an environmentally friendly way. Also, another study (Panayotou, 1997) argues that policies and institutions can significantly reduce environmental degradation to low levels. Thus, if economic development is achieved with sufficient funds, government institutions also give priority to environmental protection. And finally, the quality of the environment returns to normal. And the absorption of funds, implicitly by FDI, creates a point of competition, namely environmental protection instead of economic competition. Thus, investors will be encouraged to imitate pollution control methods.

Methodology and data

This study investigates the effect of good governance on CO2 emissions and FDI inflows. To observe this fact, we perform a comparative analysis on 3 samples, the first sample (I) being made up of EU member countries, the second sample (II) made up of countries that use the euro currency, and the third sample (III) is made up of countries that do not use the euro currency. We perform this segmentation because developed countries are considered to be less vulnerable to climate change due to their well-established economies, good governance, and timely and effective preparedness strategies (Saeed et al., 2023).

The analyzed period consists of the time interval 2002-2021.

Table 1. Description of the variables used in the empirical analysis

Symbol	Name	Measurement Unit	Source
Dependent variables			
CO2	CO2 emissions from solid fuel consumption	% of total	World Bank
FDI	Foreign direct investment, net inflows	% of GDP	World Bank
Independent variables			
T	Trade, the sum of exports and imports of goods and services	% of GDP	World Bank
GCF	Gross capital formation	% of GDP	World Bank
G_ef	Government effectiveness	Index	World Bank

CPI	Consumer price index	Index	World Bank
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Source: authors' processing

We have introduced trade as an independent variable because, according to the theory of comparative advantage, it is considered that trade brings benefits to all parties involved. Thus, we can say that a result of international trade is represented by the increase in efficiency. At the same time, trade allows countries to benefit from foreign direct investment. Through FDI, foreign exchange and expertise are brought into a country, raising employment and skill levels locally (Ye and Zhao, 2023). Also, states are in constant need of capital goods because with their help they can replace old capital goods to produce goods and services. In the situation where capital goods cannot be replaced, then the respective state will experience a decrease in production decreases. In other words, if an economy experiences higher capital formation, then it can grow its aggregate income much faster. Thus, we introduce Gross capital formation as an independent variable.

Generally, a state turns to its policies to raise additional capital. For this reason, we also want to analyze the connection between our variables of interest and the quality of public policy. Thus, we introduce Government effectiveness as an independent variable. This variable is part of the Global Governance Indicators (WGI). The last variable included in our study is represented by the Consumer Price Index. We introduce this variable because this index is also used as a measure of inflation, followed closely by decision makers, financial markets, businesses, and consumers. In the analyzed period, the CO2 variable registers an average value of 27.23% which can fluctuate by 21.23%, and the FDI variable registers in the analyzed period an average value of 12.27% which can fluctuate by 39.91%, as can be seen in table 2.

Table 2. Descriptive statistic

	Min.	Max.	Mean	Std. dev.	Obs.
CO2	0	96.17	27.58885	21.23204	401
FDI	-57.53	449.08	12.2738	39.91086	540
T	45.42	388.12	121.5377	63.8289	540
GCF	11.89	54.95	23.05433	4.698171	540
G ef	-.37	2.35	1.092944	.6000371	540
CPI	52.7	133.46	100.7451	12.35573	540

Source: authors' processing

To analyze the effect of good governance on CO2 emissions and FDI inflows, we used the panel data method. Below is the general formula for multiple linear regression:

$$y = \beta_0 + \beta_1X_1 + \dots + \beta_nX_n + \varepsilon \tag{1}$$

And the form of this type of regression used in this research is:

$$y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \varepsilon \tag{2}$$

where,

y = the predict value of the dependent variable

β_0 = the value of y when all other parameters are set to 0

β_1X_1 = the regression coefficient (β_1) of the first independent variable (X_1)

β_2X_2 = the regression coefficient (β_2) of the 2nd independent variable (X_2)

β_3X_3 = the regression coefficient (β_3) of the 3rd independent variable (X_3)

$\beta_4 X_4$ = the regression coefficient (β_4) of the 4th independent variable (X_4)

$\beta_5 X_5$ = the regression coefficient (β_5) of the 5th independent variable (X_5)

ε = model error

We also formulated two models alternating the two proposed dependent variables. The equations for the two models are described as follows:

$$CO_2 = \beta_0 + \beta_1 * FDI + \beta_2 * T + \beta_3 * GCF + \beta_4 * G_{ef} + \beta_5 * CPI + \varepsilon \quad (3)$$

and

$$FDI = \beta_0 + \beta_1 * CO_2 + \beta_2 * T + \beta_3 * GCF + \beta_4 * G_{ef} + \beta_5 * CPI + \varepsilon \quad (4)$$

Results

Table 3 contains the correlation matrix.

Table 3. Correlation matrix

	CO2	FDI	T	GCF	G ef	CPI
CO2	1.000					
FDI	-0.2479	1.000				
T	-0.2189	0.2772	1.000			
GCF	0.2666	-0.0440	-0.0059	1.000		
G ef	-0.2467	0.0471	0.1644	-0.0768	1.000	
CPI	-0.0450	-0.0495	0.2065	-0.2475	0.0810	1.000

Source: authors' processing

It is observed that there is a negative relationship between FDI and CO2 (-0.2479). The result obtained is also supported by other studies in the field (Al-Mulali and Tang, 2013; Gao et al., 2022) as FDI is considered to improve green energy and environmental performance. It is observed that there is still a negative relationship between CO2 and T (-0.2189). The relationship is also supported by other studies (Shapiro, 2016, Kim et. al., 2019). To avoid the problem of spurious results in regression analysis we will apply stationarity testing by applying Augmented Dickey-Fuller unit root tests. Table 4 contains the results of the ADF unit root tests.

Table 4: Results for the ADF unit root test

	Level	
	Statistics	Prob.
CO2	-11.978	0.0000
FDI	-17.108	0.0000
T	-24.052	0.0039
GCF	-7.245	0.0000
G ef	-13.318	0.0000
CPI	-7.627	0.0000

Source: authors' processing

As we can see from Table 4, all the variables included in the model are stationary at the level through the Augmented Dickey-Fuller test. Table 5 contains the regression analysis analyzing the impact of good governance on the dependent variable CO2.

Table 5. The effect of good governance on CO2

Dependent Variable	(I)	(II)	(III)
CO2			
FDI	-0.0854*** (-3.67)	-0.0701** (-3.27)	-0.344 (-1.57)
T	-0.0477** (-2.78)	-0.0480** (-2.93)	0.00632 (0.09)
GCF	1.204*** (5.26)	1.334*** (5.54)	0.427 (0.78)
G_ef	-6.569*** (-4.05)	1.881 (0.89)	-11.20*** (-3.79)
CPI	0.232* (2.37)	0.384** (3.21)	0.0152 (0.10)
_cons	-8.551 (-0.69)	-40.64** (-2.73)	41.98* (2.06)
N	401	296	90
R2	0.185	0.173	0.172
Prob > F	0.0000***	0.0000***	0.0064**

t statistics in parentheses

* p < 0.05, ** p < 0.01, *** p < 0.001

Source: authors' processing

The final regression equation for the 27 EU Countries for CO2 is:

$$CO_2 = -0.69 + (-3.67) * FDI + (-2.78) * T + 5.26 * GCF + (-4.05) * G_{ef} + 2.37 * CPI \quad (5)$$

We observe that the GCF and CPI variables have a positive impact on the CO2 variable, while the rest of the independent variables have a negative effect. From the value of R2, we can say that 18.5% of the variation of the CO2 variable is explained by the rest of the variables included in the model.

The final regression equation for the Eurozone for CO2 is:

$$CO_2 = -2.73 + (-3.27) * FDI + (-2.93) * T + 5.54 * GCF + 0.89 * G_{ef} + 3.21 * CPI \quad (6)$$

We observe that the GCF, G_ef, and CPI variables have a positive impact on the CO2 variable, while the rest of the independent variables have a negative effect. From the value of R2, we can say that 17.3% of the variation of the CO2 variable is explained by the rest of the variables included in the model.

The final regression equation for the Non-Eurozone for CO2 is:

$$CO_2 = 2.06 + (-1.57) * FDI + 0.09 * T + 0.78 * GCF + (-3.79) * G_{ef} + 0.10 * CPI \quad (7)$$

We observe that the T, GCF, and CPI variables have a positive impact on the CO2 variable, while the rest of the independent variables have a negative effect. From the value of R2, we can say that 17.2% of the variation of the CO2 variable is explained by the rest of the variables included in the model.

Table 6 contains the regression analysis analyzing the impact of good governance on the FDI variable.

Table 6. The effect of good governance on FDI inflows

Dependent Variable	(I)	(II)	(III)
CO2	-0.386*** (-3.67)	-0.506** (-3.27)	-0.0824 (-1.57)
T	0.217*** (6.17)	0.210*** (4.89)	0.114*** (3.52)
GCF	-0.208 (-0.41)	-0.169 (-0.25)	0.394 (1.48)
G_ef	-2.115 (-0.60)	1.737 (0.30)	-1.923 (-1.24)
CPI	-0.263 (-1.26)	-0.223 (-0.68)	-0.198* (-2.63)
_cons	32.03 (1.22)	26.37 (0.65)	8.693 (0.85)
N	401	296	90
R2	0.144	0.141	0.227
Prob > F	0.0000***	0.0000***	0.0005***

t statistics in parentheses

* p < 0.05, ** p < 0.01, *** p < 0.001

Source: authors' processing

The final regression equation for the 27 EU Countries for FDI is:

$$\mathbf{FDI = 1.22 + (-3.67) * CO_2 + 6.17 * T + (-0.41) * GCF + (-0.60) * G_{ef} + (-1.26) * CPI} \quad (8)$$

We observe that only the T variable has a positive impact on the FDI variable, while the rest of the independent variables have a negative effect. From the value of R2, we can say that 14.4% of the variation of the FDI variable is explained by the rest of the variables included in the model.

The final regression equation for the Eurozone for FDI is:

$$\mathbf{FDI = 0.65 + (-3.27) * CO_2 + 4.89 * T + (-0.25) * GCF + 0.30 * G_{ef} + (-0.68) * CPI} \quad (9)$$

We observe that the T, and G_ef variables have a positive impact on the FDI variable, while the rest of the independent variables have a negative effect. From the value of R2, we can say that 14.1% of the variation of the FDI variable is explained by the rest of the variables included in the model.

The final regression equation for the Non-Eurozone for FDI is:

$$\mathbf{FDI = 0.85 + (-1.57) * CO_2 + 3.52 * T + 1.48 * GCF + (-1.24) * G_{ef} + (-2.63) * CPI} \quad (10)$$

We observe that the T, and GCF variables have a positive impact on the FDI variable, while the rest of the independent variables have a negative effect. From the value of R2, we can say that 22.7% of the variation of the FDI variable is explained by the rest of the variables included in the model.

Conclusions

In conclusion, good governance is an important component in creating sustainable development. Through this process, active measures can be taken to reduce CO2 levels. On the other hand, this political action can also increase the level of FDI inflows within a

country. In the present study we investigated the impact of good governance on the 2 current problems of the world, namely the level of CO₂ and the level of FDI inflows. The contemporaneity of demonstrates that public policy measures are more harmonious with society and the environment if they are under the guidance of a guiding umbrella. The result of this study aligns with this statement. Thus, at the EU level, we observe that governance succeeds through the prism of FDI, T and G_{ef} variables to negatively influence the CO₂ level. At the Eurozone level, good governance negatively influences the level of CO₂ through the variables FDI, T, GCF and CPI. At the Non-Eurozone level, good governance negatively influences the level of CO₂ emissions only through the variable G_{ef}. Therefore, it is observed that the environmental problem is being tried to be solved through several courses of action. Although the impact of CO₂ on the environment is relatively explained by the variables introduced in the model (between 17.2-18.5%), it is observed that good governance really tries to reduce the problems on this level. On the other hand, good governance influences the level of FDI inflows in the 3 clusters only through the variable T. The need to implement more effective actions in this area for good governance is observed.

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