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The Link between Economic Growth and Co_2 Emissions in Afghanistan. A Long-Run Cointegration Approach

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ABSTRACT

The study aims to investigate the link between CO_2 emissions and economic growth in Afghanistan. Carbon dioxide emission, energy use, foreign direct investment, trade liberalization, and human capital were selected as independent variables while economic growth was selected as a dependent variable. The study collected data from 2018 to 2022 a total of 5 years. Data was collected from the world's bank development indicators. Furthermore, the study used ARDL regression for long-term Cointegration. The results reflect that carbon dioxide emissions, foreign direct investment, and labor have a positive significant impact on the economic growth of Afghanistan. However, energy consumption and trade openness were found insignificant towards economic growth. These results suggest that, in the context of Afghanistan, a symbiotic relationship exists between economic expansion and the variables of carbon emissions, foreign direct investment, and labor.

Keywords: Carbon Dioxide Emissions, Foreign Direct Investment, Economic Growth, Trade liberalization

INTRODUCTION

Over the last several decades, climate change has attracted the attention of governments, international environmental organizations, scientists, and academics. (Mirza & Kanwal, 2017) asserts that it is often regarded as the most significant environmental predicament. The whole of global warming may be ascribed to an increase in energy use. The 1997 research done by (Liu et al., 2017). The increase in the Gross Domestic Product (GDP) has resulted in a proportional growth in carbon emissions. The economic framework facilitates and encourages the growth and expansion of the economy The economic progress has led to notable environmental issues, including the emission of carbon dioxide.

This research employs many factors to assess their impact on the economic development of Afghanistan. All the variables examined in this research have a significant influence on the economy and are crucial for accomplishing the objectives of this study. Foreign Direct Investment (FDI) has a direct impact on Gross Domestic Product (GDP). The calculation of GDP include an investment element that includes, among other things, fixed capital investment in factories. The addition will occur after foreign individuals build factories and install equipment at this location. There are indirect effects, such as job creation and the use of transportation, utilities, and property purchases. Foreign Direct Investment (FDI) exerts significant leverage on some countries, such as Pakistan , particularly in cases when domestic investments are lacking, as seen by its impact on the Gross Domestic Product (GDP). Ultimately, it is widely recognized that trade liberalization has the potential to enhance long-term economic development via facilitating access to goods and services, achieving trade efficiency, and stimulating total factor productivity by means of technology diffusion and information dissemination (Tong et al., 2020).

The main elements that influence his connections are foreign direct investment, liberalization of trade, energy consumption, and labor. Consequently, it is essential to analyze the consequences of their interplay. Unfortunately, we have been unable to find any study that investigates these connections in order to examine this specific association. Therefore, it is crucial to investigate these connections; yet, we were unable to find much study on this matter. This research specifically aims to establish correlations between carbon dioxide emissions and GDP growth.

MATERIALS AND METHODS

The study was based on secondary data hence it was quantitative research. The study used a deductive approach where the researcher tested the hypotheses developed in the light of the literature review. Positivism

research philosophy was used and data was collected from secondary sources (L. Zhang et al., 2019b). Data was collected from 2018 to 2022. The data was for a total of 5 years. Data was collected from the World Bank's (World Development Indicator).

RESULTS

Table 1 Unit Root Analysis

	At Level		At 1st Difference	
Variable	Test Stats	Time lag	Test Stats	Sign Level
CO_2	-1.215	1	-5.729	1%
EU	-1.371	2	-4.706	5%
FDI	-1.212	1	-6.516	1%
TO	-1.204	1	-4.105	1%
L	-1.304	1	-4.355	1%
GDP	-2.691	1	-5.651	1%
Critical Value				
1%	-	-5.26	-	-
5%	-	-4.86	-	-
10%	-	-4.51	-	-

Before analyzing the long-term ARDL model, we evaluated the stationary degree of each variable. The given evidence confirms the rejection of the null assumption about the presence of a unit root. The findings indicate that all variables demonstrate stationarity at both the original level and after being differenced once. The expected results indicate that the ARDL model is appropriate for analyzing the enduring correlation between the variables being studied.

Table 2 Lag Length Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	97.5723	87.36	1.19E-07	-3.48579	-3.36342	-7.73818
1	370.2169	463.397	2.64E-10	-14.3867	-22.1652	-10.23
2	658.8213	25.52634	1.74E-08	-23.7907	-9.4723	-10.1542
3	922.4145	38.33744	4.25E-10	-28.9359	3.6541	-9.91635
4	311.7789	15.67283	2.32E-08	-10.4851	-8.40479	-9.69289
5	527.057	20.42108	1.39E-08	-19.0325	-7.57784	-8.12339

Typically, researchers use the AIC and SC criterion to identify the appropriate lag time, since these two methods are considered preferable for small sample sizes. We have chosen the appropriate AIC lag duration from the provided table. Based on the AIC lag length selection criterion, lag 2 is the optimal choice for determining the suitable lag length in the ARDL technique.

Table 3 Johansen Co-Integration Test

Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.	Max-Eigen Statistic	0.05 Critical Value	Prob.
0.46145	42.3175	49.1586	0.001	22.461	25.869	0.025
0.32766	27.3023	32.7767	0.095	20.058	23.244	0.082
0.13199	11.8541	12.3957	0.611	11.850	11.412	0.502
0.00005	0.0051	6.9146	0.851	0.005	3.654	0.902

The Johansen co-integration test aims to determine the enduring connection between the variables under investigation in the model. The research variables were tested for co-integration using the maximum eigenvalue and trace statistic tests. At a significance level of 5 percent, the greatest eigenvalue and trace statistic indicated the presence of 4 co-integrating equations. In this case, the outcomes of the co-integration analysis will define whether we should use a VAR model or a VECM model.

Table 1 Serial Correlation

Breusch-Godfrey Serial Correlation LM Test			
F-statistic	1.6674	Prob. F	0.2179
Obs*R-squared	4.9521	Prob. Chi-Square	0.0982

The LM test outcome reveals that the probability chi-square is extremely significant because it is above the 5% threshold. This suggests that our data is not affected by the issue of serial correlation.

Table 5 Heteroskedasticity

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.8914	Prob. F	0.7022
Obs*R-squared	9.6571	Prob. Chi-Square	0.6935

The Breusch-Pagan-Godfrey chi-square statistic of 0.7259 is more than the 5% threshold, suggesting that there is no heteroskedasticity issue present in our data.

Table 6 ARDL regression

Model Summary

R-squared	0.621	F-statistic	54.215
Adjusted R-squared	0.581	Prob(F-statistic)	0.0000

The R-square value indicates that 62.1% of the variations in the dependent variable can be attributed to changes in the independent variables, demonstrating the overall impact of these factors on the model. The F-statistic has a value of 54.215 and a p-value of 0.000, indicating that the model is very significant at a 5% level of significance.

Coefficients

GDP	Coefficient	Std. Error	t-Statistic	Prob.
CO_2	0.057	0.022	2.591	0.021
EU	0.032	0.057	0.561	0.418
FDI	0.108	0.019	5.708	0.000
TO	0.021	0.012	1.750	0.171
L	0.152	0.034	4.484	0.000

The results showing that CO_2, FDI and L are found significant towards economic growth while EU and TO were found insignificant towards GDP. The CO2 coefficient is 0.057, indicating that a one-unit rise in CO2 would result in a corresponding increase of 0.057 units in GDP. Furthermore, research indicates that Foreign Direct Investment (FDI) has a beneficial effect on Gross Domestic Product (GDP). The findings demonstrate that a single unit shift in FDI has favorable outcomes. will brings 0.108 units change in GDP. L also effecting GDP positively and have will highest change among other variables i.e. 0.152 units change in GDP by moment of 1-unit change.

DISCUSSION

The results reflect that carbon dioxide emissions, foreign direct investment, and labor have a positive significant impact on the economic growth of Afghanistan. However, energy consumption and trade openness were found insignificant towards economic growth. These results suggest that, in the context of Afghanistan, a symbiotic relationship exists between economic expansion and the variables of carbon emissions, foreign direct investment, and labor. On the other hand, the future direction for the researchers can be related to the link between green houses and pollution.

CONCLUSION

As a whole, this study sheds light on important questions regarding the link between Afghanistan's growing economy and its emissions of carbon dioxide. Sustainable development strategies should incorporate environmental and economic considerations due to the positive impacts of carbon dioxide emissions, FDI, and labour on GDP. Finding a middle ground in Afghanistan between rapid economic development and environmental sustainability is an ongoing challenge, and these findings add to that conversation. The results show that in Afghanistan's unique setting, variables including CO2 emissions, FDI, and labour (L) strongly correlate with economic progress. With a coefficient of 0.057 for CO2, we can see that for every one-unit increase in emissions of this gas, GDP goes up by 0.057 units. The importance of environmental variables, especially CO2 emissions, in driving economic growth is shown by this. A coefficient of 0.108 indicates that FDI positively affects economic growth. This indicates that there is a statistically significant relationship between a one-unit increase in FDI and a 0.108-unit increase in GDP. When companies from outside Afghanistan put money into Afghanistan's economy, it helps boost growth. The research also reveals that labour (L) is a major factor that positively affects GDP. This highlights the importance of a skilled and growing labour force in boosting economic prosperity.

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