



Foreign Direct Investment, Industrial Value Added, Trade Liberalization and Environmental Degradation in South Asian Countries

Ismat Nasim¹, Furrukh Bashir², Farzana Munir³, Iqra Kiran⁴

¹ Department of Economics, The Govt Sadiq College Women University Bahawalpur, Pakistan.

Email: ismat.nasim@gscwu.edu.pk

² Assistant Professor, School of Economics, Bahauddin Zakariya University, Multan, Pakistan.

Email: furrukh@bzu.edu.pk

³ Assistant Professor, School of Economics, Bahauddin Zakariya University, Multan, Pakistan.

Email: farzanamunir@bzu.edu.pk

⁴ MS Scholar, Department of Economics, The Govt Sadiq College Women University Bahawalpur, Pakistan.

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ABSTRACT

To explore the impact of industrial value added, Foreign direct investment, population growth and Trade openness on Environment in Pakistan, India, Bangladesh, Nepal, Sri Lanka and Bhutan is the aim of this study. This study used the data of Pakistan, India, Bangladesh, Nepal, Sri Lanka and Bhutan from year 1990 to 2021 getting from World Development Indicators. Panel Autoregressive Distributed Lag model was conducted for south Asian countries as a panel. We have found that industry value added and CO₂ have a negative relation with each other in the empirical section. It is found that the positive correlation between Foreign direct investment and CO₂ conclude that FDI is harmful for the environment, trade has negative correlation with the environment. The study found that the population growth has positive impact and renewable energy consumption has positive relation with CO₂. This study suggests that trade liberalization measures have been pursued by promoting financial increase in south Asian countries but they have few potentially unfavorable environmental consequences. The findings are advised that the human behaviors could create consciousness in peoples to shield environment in south Asian regions.

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Corresponding Author's Email: furrukh@bzu.edu.pk

1. Introduction

The only thing necessary for life to exist on earth is an environment. The environment is important because it supports human endurance, provides the source of common resources, protects biodiversity, and gives unexpected grandeur. The climate is also responsible for air purification and crisis management. The main focus of many governments is finding ways to increase environment quality in their nations.

In addition to creating significant environmental issues, the speeding up of industrialization has provided nations with hitherto unheard-of prospects for growth (Lei et al., 2021). A number of international environmental regulations, such as the "Kyoto Protocol", "Paris Agreement" and "the World Environmental Pact" have been passed in response to global warming and the increasing frequency of major natural catastrophes. Although China's economy has seen a miracle of development, the challenges of energy depletion and environmental pollution have become more significant due to the growth model that prioritizes material resources and the ecological environment (Ren, Hao, & Wu, 2022).

The majority of global economic activity is supported by the environment. In order to survive, many economic activities, like fishing, agriculture, manufacturing, and tourism, rely heavily on the environment. For instance, sufficient rainfall and fertile soils are necessary for

agriculture. In this aspect, disregard for the environment may have a negative impact on employment, food security, and output from such businesses.

To find a middle ground between environmental protection and economic development, the world's most polluted nations must examine urbanization and tourism through the prism of the Sustainable Development Goals. Most polluting nations are also increasing their focus on the nature of foreign direct investment (FDI) in an effort to achieve environmental sustainability. To determine the impact of FDI, tourism, urbanization, and economic growth on CO₂ emissions in the world's 10 most polluted nations from 2000 to 2019, the study used a panel data analysis approach (Ahmad, Ahmed, Yang, Hussain, & Sinha, 2022; Kayani, Sadiq, Aysan, Haider, & Nasim, 2023).

Greenhouse gas emissions, notably CO₂, have been steadily rising alongside the expansion and improvement of human industrialization. As Minxiao and Hongwei (2018) point out, global warming is a problem for all nations. To slow global warming, energy efficiency and emission cuts are crucial. China and South Korea's per capita carbon emissions have been on the rise due to the countries' burgeoning economies and high rates of industrialization. Carbon dioxide emissions were higher per person in 2007 than in Sweden. There has been a parallel rise in CO₂ emissions in South Korea and China. Although U.S. carbon emissions remain far greater than those of other countries, a recent declining trend has been seen. Carbon emissions per person are relatively constant in wealthy nations like Japan and Austria because of their high standards of living and robust economies (Du & Lin, 2018; Xinyu Zhang, Jiao, Zhang, & Guo, 2021).

The United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in June 1992 embraced Agenda 21 and the Rio Declaration, the two of which stressed the significance of exchange and natural linkages. They additionally highlighted the significance of exchange and the climate accomplishing reasonable turn of events, as well as the requirement for commonly supporting exchange and ecological approaches. This outcome in higher energy use and, accordingly, expanding ecological issues. Over the long haul, exchange advancement adds to expand contamination of the air and water. The discoveries show that deregulation impacts ecological markers. The utilization of petrol subsidiaries for power age and as commitments to the advancement of current regions sullies the environment. The association among exchange and advancement Pakistan has been focused on in different ways. Regardless, research on the impact of trade straightforwardness on tainting levels in the environment is as yet sparse in the country. CO₂ spreads and examination are a critical policy centered issue, and it is unquestionably a main pressing concern for flower children. CO₂ transmissions, of course, have gained little influence, inferable from the shortfall of a local impact. It's moreover worth remembering that CO₂ is a basically overall externality that is presumably not going to be settled through open control (Adenikinju & Olofin, 2000).

In 2019, Li et al. found spatial dependency and agglomeration impacts for high-tech industries, FDI, population, and carbon emissions. High-tech sectors, FDI, and population expansion impact carbon emissions. Thus, the government should promote greener manufacturing technologies to boost high-tech industry and resource-efficient and environmentally friendly tertiary sector to create a low-carbon economy. Local governments should also leverage their position to encourage industry transfer and technology, high interregional carbon industry flow, and acceptable geographical distribution.

Energy use and carbon dioxide emissions varied considerably amongst factories, according to an analysis of available data. There may be room to improve operations and save money by decreasing daily energy use by 7 percent, the difference between the median and the 90th percentile. Moreover, the greater range in CO₂ footprint indicates that adjusting the fuel mix might lead to significant decrease in carbon emissions without necessarily hurting cost or performance. Based on the evidence, this discrepancy cannot be attributed to unexpected plant outages but rather to normal fluctuations that occur during continuous operations. As such, it provides a ballpark figure for the potential gains in productivity that could result from tweaking internal processes (Summerbell, Barlow, & Cullen, 2016).

The main things that help fundamentally to accomplishing manageable improvement are exchange progression and a perfect climate. They affect long term improvement in both

immediate and backhanded ways. A few pundits contend that more exchange progression makes emerging nations become quicker. This should bring about expanded modern contamination and natural harm in the impacted nations. Besides, exchange progression can enable agricultural nations to take on new innovations (Brack, Grubb, & Windram, 2000; Jakob, 2022; Qiu et al., 2022; Tamiotti, 2009).

Ecological financial experts guarantee that contamination control and regular asset the board issues are overlooked in exchange strategy, causing a conflict among business analysts. Furthermore, the new monetary worldview supports send out development, privatization, liberation, and streamlined commerce across nations. All of these components fundamentally affect social structure. It has brought about the crumbling of social frameworks, expanding social imbalance, and dislodged populaces, as well as expanded migration. It has formed driven a creation and utilization model with extensive impacts on the actual climate all over the world (Bhagwati, 1999).

A few financial experts, then again, contend that exchange is great for the climate since it increments seriousness by bringing down exchange hindrances, further developing item quality, and implementing ecological guidelines. Besides, exchange drove success increases the living expectations of arising nations while additionally further developing ecological quality. Using cross-country and time series information, numerous observational examinations have investigated the connection between pay, exchange progression, and contamination at different periods of improvement. It's conceivable that pay and contamination have a modified U-molded relationship.

The utilization of sustainable power assets delivers impressively less CO₂ emanations when contrasted with non-inexhaustible sources. Our decision is in accordance with the past exploration and is by and large held as truth. The manageable financial development of emerging nations is firmly connected to the usage of inexhaustible sources. These countries keep on expanding the utilization of sustainable power, which would diminish their carbon impression as sustainable power utilization altogether lessens the CO₂ discharges.

Each person increases fossil fuel byproducts and environmental change casualties—the impoverished more than the privileged. Population growth also affects the Earth's ability to withstand environmental change and retain emissions, such as through deforestation to feed a growing population.

By exploring previous literature there is the evidence that relationship between trade, foreign direct investment, industrial growth and environmental quality exist. But we have not a clear relationship among three, whether trade, FDI, industrial value added and environmental quality positively or negatively. The research objective is to focus on the methodology to obtain the impacts of trade liberalization, FDI and industrialization on environmental degradation in south Asian countries.

2. Literature Review

The study examines how industrial expansion and trade openness affect environmental degradation in 16 Asian economies from 1992 to 2020. Panel ARDL estimates results following a panel unit root test. The unit root test suggests panel ARDL and calculates its short- and long-term impacts. Trade openness, government expenditure, and GDP lower Asian CO₂ emissions, whereas industrial value addition and population density raise them (Bashir & Javaid, 2023).

Siddique (2023) examined how urbanisation and industrialisation affect South Asian environmental degradation. AMG, CCEMG, Westerlund co-integration, and Dumitrescu-Hurlin causality tests were used to analyse the 1984–2016 South Asian panel. Industrial value-added measures economic progress, whereas CO₂ measures environmental pollution.

Kumar, Upadhyay, and Prajapati (2022) This report assessed carbon emission growth charges in 35 OECD economies from 1970 to 2019. It examined how democracy and trade liberalisation affect carbon emissions. Both variables drive emission-reducing technology adoption. Change liberalisation raised CO₂ emissions, but democracy lowered them. Trade liberalisation and democratisation also reduced CO₂ emissions. These data show that exchange

liberalisation had a less severe impact on carbon dioxide emissions in more democratic nations. Democracies have better climate change coverage than autocracies, hence its conclusions had several weather alternate disaster coverage ramifications.

Mengdi and Yongbo (2022) International change's environmental impact on poorer nations is a major issue. He anticipated exchange liberalization's environmental impact on China's exact firm-stage pollution statistics. He discovered that import price reduction reduce SO₂ emissions by employing maximum tariff charges from China's accession agreement as instrumental variables for real tariff quotations. Changes in product mix in polluting and non-polluting sectors may explain the substantial increase in average SO₂ emission. He validated the exchange-brought-on technique impact that trade liberalisation can boost cleanser output using numerous firm-level measures.

Feng et al. (2021) tried the Environmental Kuznets bend (EKC) speculation in BRICS nations while at the same time exploring the effect of data and correspondence innovation, monetary development, and monetary improvement on carbon dioxide discharges. The impacts of the informative factors shift across various quantiles of carbon dioxide emanations, as indicated by this study's Methods of Moments - Quantile Regression. Generally speaking, the discoveries showed that monetary extension and monetary improvement add to carbon dioxide outflows at all quantiles, though data and correspondence innovations significantly decrease carbon dioxide emanations fundamentally at lower quantiles. Besides, the discoveries upheld the presence of the EKC speculation.

Zandi, Haseeb, and Malaysia (2019) conducted the study with the objective to explore the effect of exchange progression on CO₂ emissions. They utilized board information from 105 created and non-industrial nations from 1990 to 2017. All variables were associated over the long haul, as per the FMOLS and DOLS data. A proof of sustainable power utilization essentially affecting natural debasement has been uncovered. Finally, the discoveries of heterogeneous board causality show that exchange advancement and ecological debasement have a one-way causal relationship, with causality moving from exchange progression to natural deterioration. However, they noticed a bi-directional causal connection between ecological weakening and energy use and environmentally friendly power use in completely chosen industrialized and emerging nations.

R. Zhang and Naceur (2019) planned to explore the connection between carbon emanations, energy utilization and financial development in farming area utilizing a time series information during 1996-2015 from china's principal grain creating regions. The analysts utilized ARDL model and Granger Causality test on the yearly information somewhere in the range of 1996 and 2015 taken from China Rural Statistical Yearbook. The assessed results upheld EKC speculation for farming area's fossil fuel byproducts in noticeable grain creating regions. Experimental consequences of ARDL showed a negative effect of farming energy utilization on agrarian fossil fuel byproducts in lengthy run as well as in short run though farming monetary development had a positive influence on horticulture fossil fuel byproducts in short run and adverse consequence in lengthy run.

In the literature review, different examinations have been summed up. As per few financial analysts, modern worth added, populace, unfamiliar direct venture, energy utilization and exchange is reason for natural corruption the countries. On the opposite side, great administration, markets, monetary framework, exchange transparency gives motivator to the firm to decreasing CO₂ emanation. CO₂ outflow is straightforwardly connected with modern development. Various informational collections and strategies were embraced in past examinations. Yet, it is exceptionally elusive any review inspecting the effect of natural quality on sectoral development. Likewise laying out the connection between modern development and exchange is indispensable requirement for strong arrangement structure. Board investigation among south Asian nations ought to be directed considering relationship between trade, industrial development and ecological quality.

3. Data, Model and Methodology

Assessment of Panel information the factors like Trade, Environment and foreign direct investment is a serious worry of the Economists and policy makers of present. In this study, the South Asian countries Pakistan, Bangladesh, Sri Lanka, Bhutan and India are included to find the

impact of trade, foreign direct investment and population growth rate on environment. For the Panel information of selected nations, the timespan from 1990 to 2021 is chosen in this review. World Bank Organization created World Development Indicators and its data was provided on its website. Table 1 is explaining the description of variables and its measurements.

Following the objectives of the study, the operational model is given below in functional form;

$$CO_2 = f (\text{Trade, Industrialization, FDI, Population growth, Renewable Energy Consumption})$$

The same functional form may be written in equation form as below;

$$CE = A + B \text{ TRADE} + C \text{ INVAD} + D \text{ FDI} + E \text{ POPGR} + F \text{ RECOM} + u_i$$

In the above equation, A is intercept while B, C, D, E, F are slope coefficients and u_i is error term. Variables of the model are abbreviated as follow:

Table: 1 Description of Variables

Variables	Abbreviation
Trade Openness	TRADE
CO2 emissions (kt)	CE
Industry (including construction), value added (% of GDP)	INVAD
Population growth (annual %)	POPGR
Renewable energy consumption (% of total final energy consumption)	RECOM
Foreign direct investment	FDI

4. RESULTS AND DISCUSSIONS

In thus far as goals of the observe this is to study the effectiveness of Trade Liberalization and industrial value addition on environmental quality of south Asian Countries, this part of the study is organized to meet this objective considering the trade openness and industrial value addition by estimating the correlation matrix and co-integration analysis of south Asian countries according to the results of panel unit root test.

4.1. Correlation Matrix

Table 2 explains that correlation between carbon dioxide and industry value added is (0.552717) which indicate positive correlation. The correlation between carbon dioxide and trade is (-0.20381) show negative correlation. The correlation between carbon dioxide and renewable energy consumption is (-0.07673) indicating negative correlation. The correlation between carbon dioxide and population growth is (-0.34707) indicating negative correlation. The correlation between foreign direct investment and carbon dioxide is (0.48091) show positive correlation.

Table 2: Correlation Matrix

	CE	INVAD	TRADE	RECOM	POPGR	FDI
CE	1					
INVAD	0.552717	1				
TRADE	-0.20381	0.371491	1			
RECOM	-0.07673	-0.20049	-0.03588	1		
POPGR	-0.34707	-0.54248	0.085039	0.242903	1	
FDI	0.48091	0.592386	-0.02069	-0.12041	-0.3448	1

4.2. Panel unit root results

There are various approached to check order of integration or to test trouble of unit root in panel data variables and one of those methods is Levin Lin and Chu. Its estimates are provided in Table 3 are in 1st column record the values for Test Statistics and their chances at Level and at 1st Difference concerning to all variables.

It is evident that the values of carbon dioxide, industry value added, trade openness, population growth and renewable energy consumption are stationary at 1st difference. All the variables are stationary at 1st difference except foreign direct investment with 6 cross sections and 174 observations.

Table 3: Levin, Lin & Chu panel Unit Root Results

Variables	t-stat	Prob. value	Integration order	
TRADE	-7.13898	0.000	1 st	Individual Intercept
CE	-3.64959	0.000	1 st	Individual Intercept
INVAD	-4.45457	0.000	1 st	Individual Intercept
POPGR	-8.99367	0.000	1 st	Individual Intercept
RECOM	-4.74801	0.000	1 st	None
FDI	-2.75892	0.003	Level	Individual Intercept

4.3. Panel ARDL Results**Table: 4 Long Run Results**

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
INVAD	-1277.62	208.8641	-6.11698	0.000
TRADE	363.7217	68.03914	5.345772	0.000
RECOM	-0.168794	0.037326	4.522145	0.000
POPGR	-195.361	61.86547	-3.15784	0.0023
FDI	-2678.79	755.244	-3.54693	0.0007

The estimated results stated within the table 4 are primarily based on the Panel ARDL where carbon dioxide (CE) depended on various independent variables that are TRADE, INVAD, POPGR, FDI, and RECOM.

INVAD is expected to be negatively correlated with CE and the results are also depicting the same picture as the estimated coefficient of industry value added is -1277.62 and this negative association is consistent with (Yang & O'Connell, 2020; Xinxin Zhang, Li, & Wang, 2021). Trade is expected to be positively correlated with carbon dioxide and the results are also depicting the same picture as the estimated coefficient of trade is statistically significant (Boutabba, 2014; Chaudhry, Farooq, & Nasim, 2015; Nasim & Chaudhry, 2020). Renewable energy consumption is negatively correlated with carbon dioxide because the estimated coefficient is 0.168794. The estimated result is statistically significant also indicated by the probability (Ibraheem & Nasim, 2021; Long, Naminse, Du, & Zhuang, 2015). Population growth rate is expected to negatively correlated with carbon dioxide and the results are also depicting the same picture as the estimated coefficient of population growth is -195.361. The estimated result is statistically significant also indicated by the probability 0.0023 (C. Zhang & Tan, 2016; Zhu & Peng, 2012). Foreign direct investment is expected to be negatively correlated with carbon dioxide and the results are also depicting the same picture as the estimated coefficient of foreign direct investment is -2678.79. The estimated result is statistically significant also indicated by the probability value 0.0007 (Bashir, Ahmad, Nasim, & Parveen, 2017; Kayani et al., 2023).

Table 5: Short Run Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
COINTEQ01	-0.13064	0.157244	-0.83078	0.4086
D(CO2(-1))	-0.22898	0.077551	-2.95264	0.0041
D(INVAD)	400.2602	4078.734	0.098133	0.9221
D(INVAD(-1))	6808.486	11139.91	0.61118	0.5428
D(INVAD(-2))	4879.629	10763.09	0.453367	0.6515
D(TRADE)	1951.454	1645.48	1.185948	0.2392
D(TRADE(-1))	-950.292	2510.178	-0.37858	0.706
D(TRADE(-2))	-4661.57	5260.769	-0.8861	0.3783
D(RECOM)	-29869.6	23159.52	-1.28973	0.2009
D(RECOM(-1))	-16524.6	11611.74	-1.42309	0.1586
D(RECOM(-2))	-17996.7	12303.54	-1.46272	0.1475
D(POPGR)	-499012	321720.7	-1.55107	0.1249
D(POPGR(-1))	314111.7	219661.4	1.429981	0.1567
D(POPGR(-2))	-69144.7	140204.7	-0.49317	0.6233
D(FDIRT)	-3608.12	6735.96	-0.53565	0.5937
D(FDIRT(-1))	-5632	4254.021	-1.32392	0.1893
D(FDIRT(-2))	-4027.36	2593.777	-1.5527	0.1245
C	-40216.7	33737.97	-1.19203	0.2368

*Note: p-values and any subsequent tests do not account for model Selection

The table 5, without lagged terms industry value added is positive with carbon dioxide while with their lagged terms are positive as well as negative with carbon dioxide. While without lagged terms, trade is positive with carbon dioxide while with their lagged terms are negative with carbon dioxide. Without lagged terms, foreign direct investment is positive with carbon dioxide. while with their lagged terms are positive with carbon dioxide Without lagged terms, population growth rate is negative with carbon dioxide while their lagged terms are negative with carbon dioxide.

5. Conclusion and Policy Recommendations

The main objective of this study is to explore the impact of TRADE, INVAD, POPGR, FDI, and RECOM on environmental degradation in Pakistan, Bangladesh, India, Bhutan and Sri Lanka. Carbon dioxide is used as an indicator of environmental degradation ARDL dash board, a unique long-term approach to determine between carbon dioxide and the explanatory variables. The results show that the trade is positively affect the environment. Econometric models are estimated to predict the effects of TRADE on CE, and model find that free trade significantly increases emissions. It means that trade barriers should be increase to protect the environment and to reduce the emission.

While the industry value added negatively impact the environment. And it is significant. It means that if we restrict the industrial production that damage our environment than the environment can be protected. Similarly, renewable energy consumption is negatively and significantly impacts the environment. The traditional energy consumption use should be declining to protect the environment. Population growth is negatively affect the environment. We can and should slow and eventually end human populace development through moral, decision based arrangements which engage individuals to pick more modest families. Accomplishing this would lessen natural corruption and arising sicknesses, as well as the speed and size of transmission.

This paper suggests the need for alternative environmental policies so one can correspond south Asian international locations in future with better environmental policies inclusive of those related to worldwide commitments with admire to Agenda 21 and the UN Framework Convention for Climate Change.

Trade liberalization in developing nations may additionally bring about shifts in the composition of manufacturing and exports of extra pollutants-intensive production industries. The effects from this look show that there is growth in air and water pollution extensive manufacturing industries after trade liberalization. The study suggests that to protect the environment from industrial sector, though it might appear to be safeguarding the climate might cost an organization more, the inverse really stands valid. By expanding process proficiency, changing item configuration, controlling legitimate obtaining of unrefined components and garbage removal, modifying framework designs, and going to suitable lengths during bundling and transport, an organization can set aside huge amounts of financial burden.

5.1. Contribution

The contribution of this study is to add more in the literature review. The significance of this study is also that all the objectives are achieved and this study is consistent with previous studies. This study is also help to make the policies for environmental protection.

5.2. Limitations

This study is not analyses the impact of trade, industrial growth, foreign direct investment, renewable energy consumption and population growth on environment during the big crises of covid 19. The future research can be conducted during the period of covid-19. The future researchers can work on other panel of countries by getting the more variables and more data.

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