

## Effects of foreign direct investment on climate change in the Asian region

Ehsanullah

Department of Economics, Hannam University, Hannam Ro, Daeduck Gu, Daejeon, South Korea

\*Corresponding author: [ehsan3171@gmail.com](mailto:ehsan3171@gmail.com)

### Article Info

#### Article history:

Received 05 March 2024

Accepted 16 October 2024

Published 30 October 2024

#### JEL Classification Code:

P34, Q56.

#### Author's email:

[ehsan3171@gmail.com](mailto:ehsan3171@gmail.com)

DOI: [10.20885/ejem.vol16.iss2.art5](https://doi.org/10.20885/ejem.vol16.iss2.art5)

### Abstract

**Purpose** — This research aims to empirically investigate and compare the effects of foreign direct investment on climate change in five South Asian nations.

**Methodology** — This research uses yearly data covering 1980–2020 in five South Asian nations: Bangladesh, India, Nepal, Pakistan, and Sri Lanka. Vector Autoregressive (VAR) methods, with variance decomposition and impulse response functions, provide the basis of the empirical data comparison.

**Findings** — This research shows that foreign direct investment's impact on pollution ranges from 1% to 10% in four countries and 16.13% in Pakistan. This indicates that in five South Asian states, there is little endogenous correlation between foreign direct investment and pollution. Furthermore, a shock to foreign investment improves the environmental conditions in Bangladesh and India while harming the growth of other nations.

**Implications** — The impact of foreign direct investment on pollution may vary based on each country's economic situation. Public efforts to enhance capital goods, education, health, and infrastructure are essential for reducing pollution and attracting foreign investment. Therefore, improved transparency and governance are essential for a positive relationship between growth and foreign investment.

**Value/Originality** — This research contributes to the analysis and comparison of the effects of foreign direct investment on climate change across five South Asian nations using Vector Autoregressive (VAR) methods.

**Keywords** — Climate change, foreign direct investment, South Asia, vector autoregressive

## Introduction

Environmental contamination is a growing issue that concerns many nations and is studied by many academics. However, it still needs to be clarified and debated exactly what factors contribute to environmental contamination. Because of rising emissions from manufacturing and consumption, the environment is worsening. In addition to harming people's health and quality of life, this also contributes to global warming, a grave threat to human survival. Natural disasters, including super typhoons, droughts, and forest fires, are occurring more frequently and resulting in greater losses due to climate change (Omri & Kahouli, 2014; Behera & Dash, 2017).

The industrial sector is one of the main drivers of economic growth in these states, accounting for almost 26% of GDP. The most crucial factor influencing development in this

industry is the increasing mobilization of foreign resources, which is needed to improve industrial production (Khan & Kim, 1999). In addition to a wide range of structural reforms and incentives to be friendly to foreign investors and local sectors, South Asia is implementing good macroeconomic policies (Khan & Samad, 2010; McKinnon, 2010; Sims, 1992). The relationship between FDI inflows and their drivers has been studied (Afza et al., 2019; Hakro & Ghumro, 2021). However, prior research on the connection between pollutant emissions and FDI needs to be more extensive. The role of foreign direct investment in economic growth is gradually growing, as is concern over environmental issues. As a result, the role of FDI has raised questions about how to enhance its capacity for innovation and efficiency (De Gregorio et al., 1998). Foreign direct investment (FDI) is a source of capital and can be essential for investments in technology, infrastructure, and other productive assets. This inflow of capital promotes economic growth and helps finance development initiatives. FDI often leads to the creation of new jobs. When foreign businesses invest in a nation, they typically hire local labourers, thereby reducing unemployment and creating job opportunities (Alfaro et al., 2021).

Foreign businesses frequently introduce cutting-edge management techniques, technology, and expertise to the nation where they operate. Increased productivity and competitiveness in home industries can result from this technology and skill transfer, advancing economic growth. FDI can increase imports and exports. Foreign businesses may export products and services made in the destination nation to increase export revenue. They might also import intermediate products and services, boosting commerce (Ndikumana & Verick, 2018). Foreign direct investment (FDI) frequently includes investments in the construction of factories, transportation networks, and utilities. In addition to helping foreign businesses, these investments strengthen the nation's infrastructure and encourage more trade. Foreign direct investment can produce positive spillover effects on domestic businesses and industries. For instance, through partnerships with regional suppliers, competition, and knowledge sharing, domestic businesses

Compared with developed countries, developing countries may have less stringent environmental laws. Several causes could include a need for more enforcement resources, conflicting development goals, or a desire to attract foreign capital to boost the economy. This could include measures or regulations that prioritize economic growth over environmental preservation, such as easing the process of obtaining permits or enforcing existing laws loosely. Due to lax environmental regulations, international investors may find it profitable to relocate their operations to these countries. By doing this, they may be able to avoid incurring expenses associated with meeting more stringent environmental regulations back home. The situation presents an opportunity for global investors to capitalize on the comparatively lighter regulatory burden. (Khan & Kim, 1999).

The literature has differing opinions on how foreign direct investment (FDI) affects environmental risk. Most studies (Frutos-Bencze et al., 2017; Jorgenson et al., 2007; Omri & Kahouli, 2014) conclude that FDI toxins the environment. On the other hand, other researchers contend that FDI enhances the host country's environment by deploying advanced climate-resilient technologies (Hines & Rice, 1994). This makes it challenging for policymakers and researchers to fully understand how FDI impacts the environment. According to empirical data (De Gregorio et al., 1998; McKinnon, 2010), the availability of capital resources supports economic activity. For this reason, the empirical literature (Frutos-Bencze et al., 2017; Jorgenson et al., 2007; Zhu et al., 2016) is leaning toward examining the impact of capital resources on environmental risk. There is little doubt that South Asia and Africa require additional funds to expand their economies (Ho et al., 2007).

For several reasons, the impact of FDI on the environment is very important. Advanced nations tighten environmental regulations as they become wealthier, making it increasingly costly for businesses that use a lot of carbon to stay in business. Most of these businesses relocate to emerging and developing nations with laxer environmental regulations. This is another reason why studies have found that FDI increases environmental risk. For instance, Singhania and Saini (2021) examined the relationship between FDI and environmental sustainability from 1990 to 2016 using a sample of 21 countries and a dynamic system GMM. The findings indicate that FDI significantly reduces environmental risk.

Empirical findings indicate that FDI significantly increases environmental risk in Africa (Halliru et al., 2020). This study also investigated the impact of foreign direct investment on the environment in Western Africa and found results that agreed with those of Bokpin (2017) and Yang et al. (2017). Numerous studies have linked foreign direct investment to poor environmental quality (Frutos-Bencze et al., 2017; Omri & Kahouli, 2014; Sbia & Shahbaz, 2017; Zheng & Sheng, 2017). The pollution haven theory is the foundation of every study that claims FDI pollutes the environment. This suggests that multinational corporations (MNCs) tend to select countries with the lowest labour, material, and land costs when establishing global branches (Levinson & Taylor, 2008). Conversely, other researchers contest the arguments of advocates of the pollution-haven theory by pointing out several flaws in their work, including inappropriate measurement methods and scant empirical evidence (Kim & Adilov, 2011; Demena & Afesorgbor, 2020). They conducted a thorough evaluation of the research examining how FDI affects emissions.

The main reasons for the contradictions in the literature include disparities in data samples (which combine industrialized and developing nations), variations in econometric approaches, differences in environmental indicators, and diverse control variables. The heterogeneity issues in the plethora of research are exacerbated by the use of different levels of development and emissions, which is why Halliru et al. (2020) employed 65 primary studies to create 1006 elasticities in their meta-analysis of the impact of FDI on environmental emissions. They also state that the underlying impact of FDI on environmental emissions is almost zero. However, after accounting for heterogeneity in the study, they found that FDI significantly reduces environmental emissions. Thus, the results of the studies on the effect of FDI on pollution levels have been conflicting. Few researchers have examined the effect of FDI on CO<sub>2</sub> emissions across many countries. Instead, most of the literature focuses on the effect of FDI on carbon emissions in a single country.

Due to a shortage of domestic capital, South Asian countries are known for attracting the most foreign direct investment. They mainly rely on foreign finance to accelerate the state's pollution level and economic growth. This study examines the impact of Foreign Direct Investment (FDI) on environmental quality in five South Asian countries: Bangladesh, India, Nepal, Pakistan, and Sri Lanka. Time series data are available from 1980 to 2020 for these countries. By comparing the potential effects of foreign direct investment on pollution for each of the five South Asian countries, this study seeks to present empirical data. Generally, a complex interplay of variables, including the nature of investments, legal frameworks, technical developments, and the commitment of both local and foreign parties to environmental sustainability, determines how Foreign Direct Investment (FDI) affects pollution in South Asian nations. Effective environmental management and regulatory compliance are crucial for minimising potential drawbacks and optimising the benefits of FDI for sustainable development.

## Methods

This study employs a vector autoregression (VAR) model using data from five South Asian countries from 1980 to 2020. The World Development Indicators, produced by the World Bank, provided the data for the three variables: real GDP per capita (hereafter, PGDP), pollution measured by carbon dioxide (hereafter, CO<sub>2</sub>), and foreign direct investment (hereafter, FDI).

The VAR model assesses the relative significance of numerous dynamic influences on macroeconomic variables (Bernanke, 1986; Sims, 1992). Additionally, the variance decomposition and impulse response function approaches are used to conduct the empirical analysis. The VAR model can be expressed as:

$$CO2_t = \alpha_0 + \sum_{i=1}^p \alpha_1 CO2_{t-1} + \sum_{i=1}^p \alpha_2 GDP_{t-1} + \sum_{i=1}^p \alpha_3 FDI_{t-1} + \epsilon_t \quad (1)$$

$$GDP_t = \beta_0 + \sum_{i=1}^p \beta_1 CO2_{t-1} + \sum_{i=1}^p \beta_2 GDP_{t-1} + \sum_{i=1}^p \beta_3 FDI_{t-1} + \mu_t \quad (2)$$

$$FDI_t = \gamma_0 + \sum_{i=1}^p \gamma_1 CO2_{t-1} + \sum_{i=1}^p \gamma_2 GDP_{t-1} + \sum_{i=1}^p \gamma_3 FDI_{t-1} + \epsilon_t \quad (3)$$

Where CO<sub>2t</sub>, GDP<sub>t</sub>, and FDI<sub>t</sub> represent the values of CO<sub>2</sub> emissions, PGDP, and FDI at time t, respectively.  $\alpha_0$ ,  $\beta_0$ , and  $\gamma_0$  are the intercept terms.  $\alpha_1$ ,  $\beta_1$ , and  $\gamma_1$  are the coefficients representing the effects of lagged values of CO<sub>2t</sub>,  $\alpha_2$ ,  $\beta_2$ , and  $\gamma_2$  are the coefficients representing

the effects of lagged values of  $GDP_t$ ,  $\alpha_3$ ,  $\beta_3$ , and  $\gamma_3$  are the coefficients representing the effects of lagged values of  $FDI_t$  on the current values of each variable.  $\varepsilon_t$ ,  $\mu_t$ , and  $\epsilon_t$  are error terms representing the stochastic disturbances or shocks in the system.

The time series of endogenous variables must be stationary, and no cointegration exists to estimate a VAR model. A VAR model helps assess the association among a set of economic variables. Each variable has an equation describing its evolution based on its lags and the lags of all the other variables in the model. This is how all variables in a VAR model are handled symmetrically. The estimates produced can also be used for forecasting. However, if a long-term association between the variables is found, a VEC model is calculated before variance decomposition and impulse response function techniques are used.

## Results and Discussion

Unit root tests are conducted before the empirical analysis to determine whether the time series data are stationary. That is, the stationarity requirement of the data is ensured using the conventional technique of the augmented Dickey-Fuller (ADF) test. All conceivable instances of "intercept," "intercept + trend," and "none" are considered, using a selection criterion to identify the best lags for the unit root tests. The results of unit root tests are shown in Table 1, where all variables are non-stationary at levels but stationary when transformed to the first differences, i.e., when each variable is integrated of order one (I(1)), the most basic form of integration.

**Table 1.** Unit root test

Country	Variable	Intercept		Intercept and Trend		None	
		Level	1st Diff.	Level	1st Diff.	Level	1st Diff.
Bangladesh	CO2	12.23 (1.00)	-0.95 (0.82)	1.83 (1.00)	-7.96** (0.00)	1.88 (0.96)	0.90 (0.90)
	PGDP	-2.54 (0.50)	-7.23** (0.00)	-2.76 (0.22)	-6.14** (0.00)	0.86 (0.88)	-9.04** (0.00)
	FDI	-0.67 (0.84)	-7.54** (0.00)	-1.39 (0.38)	-4.17* (0.01)	-2.69* (0.01)	-2.62 (0.10)
India	CO2	3.06 (1.00)	-4.82** (0.00)	-1.29 (0.88)	-6.04** (0.00)	7.81 (1.00)	-0.21 (0.60)
	PGDP	-0.91 (0.77)	-7.27** (0.00)	-4.33 (0.06)	-7.12** (0.00)	0.55 (0.83)	-7.29** (0.00)
	FDI	0.07 (0.96)	-7.22** (0.00)	-1.21 (0.89)	-5.09** (0.00)	-1.61 (0.10)	-6.71** (0.00)
Nepal	CO2	1.67 (1.00)	-6.88** (0.00)	-0.82 (0.96)	-7.86** (0.00)	7.81 (1.00)	-0.21 (0.60)
	PGDP	-0.91 (0.77)	-7.27** (0.00)	-2.50 (0.33)	-7.21** (0.00)	0.55 (0.83)	-7.29** (0.00)
	FDI	0.07 (0.96)	-7.22** (0.00)	-2.07 (0.55)	-7.35** (0.00)	-1.61 (0.10)	-6.71** (0.00)
Pakistan	CO2	-0.89 (0.75)	-5.05** (0.00)	-3.71 (0.24)	-5.05** (0.02)	7.75 (1.00)	-3.73* (0.01)
	PGDP	-2.30 (0.62)	-7.60 (0.00)**	-5.16* (0.01)	-6.73** (0.00)	4.07 (1.00)	-8.24** (0.00)
	FDI	0.40 (0.98)	-8.11** (0.00)	-2.48 (0.34)	-8.24** (0.00)	2.16 (0.99)	-7.42** (0.00)
Sri Lanka	CO2	1.17 (1.00)	-5.16** (0.00)	-374 (0.72)	-6.23* (0.01)	14.91 (1.00)	-1.28 (0.21)
	PGDP	-0.21 (0.93)	-8.25** (0.00)	-2.42 (0.37)	-8.30** (0.00)	2.42 (1.00)	-7.40** (0.00)
	FDI	-3.58 (0.11)	-7.95** (0.00)	-3.42 (0.06)	-7.82** (0.00)	0.08 (0.71)	-8.05** (0.00)

Notes: (i)  $p$ -values are provided in parentheses. (ii) \* and \*\* are significant at 5% and 1% significance levels, respectively.

Examining whether FDI and CO2 have a long-term relationship is crucial because I(1) governs all variables. Table 2 presents the test results for cointegrating relationships using the efficient method proposed by Johansen (1988). The null hypothesis is that there is no cointegrating relationship between CO2, FDI, and GDP. As a result, the analysis is based on VAR models.

**Table 2.** Cointegration test

Country	H <sub>0</sub>	Trace Test		Max-Eigenvalue Test	
		H <sub>1</sub>	Statistic	H <sub>1</sub>	Statistic
Bangladesh	$\gamma = 0$	$\gamma \geq 1$	32.71** (0.00)	$\gamma = 1$	25.52** (0.00)
	$\gamma \leq 1$	$\gamma \geq 2$	7.19 (0.30)	$\gamma = 2$	4.20* (0.51)
India	$\gamma = 0$	$\gamma \geq 1$	64.12** (0.00)	$\gamma = 1$	39.82** (0.00)
	$\gamma \leq 1$	$\gamma \geq 2$	24.30** (0.00)	$\gamma = 2$	17.83** (0.05)
Nepal	$\gamma = 0$	$\gamma \geq 1$	37.77 (0.13)	$\gamma = 1$	16.23 (0.76)
	$\gamma \leq 1$	$\gamma \geq 2$	20.53 (0.31)	$\gamma = 2$	12.79 (0.61)
Pakistan	$\gamma = 0$	$\gamma \geq 1$	26.43** (0.00)	$\gamma = 1$	18.24** (0.00)
	$\gamma \leq 1$	$\gamma \geq 2$	9.18 (0.44)	$\gamma = 2$	7.99 (0.37)
Sri Lanka	$\gamma = 0$	$\gamma \geq 1$	41.31 (0.54)	$\gamma = 1$	24.62 (0.77)
	$\gamma \leq 1$	$\gamma \geq 2$	4.68 (0.39)	$\gamma = 2$	4.75 (0.40)

Notes: (i)  $p$ -values are provided in parentheses. (ii) \* and \*\*: significant at 5% and 1 % significance level, respectively

**Table 3.** Variance decomposition of FDI

Period	Bangladesh	India	Nepal	Pakistan	Sri Lanka
FDI impact on CO2					
1	0.90	3.20	2.90	8.42	5.71
2	1.10	4.22	4.56	11.11	7.37
3	1.44	5.31	5.96	13.11	8.73
4	1.60	6.63	7.16	14.12	9.23
5	1.95	7.80	8.16	16.13	10.94
FDI impacts on GDP					
1	0.00	0.00	0.00	0.00	0.00
2	0.35	5.77	3.28	14.62	2.22
3	3.13	25.22	3.13	26.16	2.89
4	7.48	45.29	3.26	29.47	2.83
5	9.06	54.59	3.64	28.30	3.56

Note: The figures denote the impact of FDI on pollution.

The outcomes of variance decomposition for FDI shocks are shown in Table 3. The results of the fifth period show that the impacts of changes in FDI on the calculation of CO2 are 1.95%, 7.80%, 8.16%, 16.13%, and 10.94%, respectively, for Bangladesh, India, Nepal, Pakistan, and Sri Lanka. In other words, the effect of FDI shocks on CO2 variation ranges from 1% to 16%, with Pakistan exerting the greatest influence (16.13%) and Bangladesh the least (1.95%). Apart from Pakistan, the CO2 shock alone accounts for over 90% of the CO2 volatility in five nations. This indicates that in five South Asian countries, the endogenous relationship between foreign investment and pollution is insignificant. However, when comparing Bangladesh and Pakistan, the

impact of an FDI shock on pollution is estimated to vary greatly across countries, depending on each country's economic environment.

On the other hand, the FDI's impact on GDP for the fifth period is 9.06%, 54.59%, 3.64%, 28.30%, and 3.56%, respectively. In this case, India has the highest impact on GDP (54.59%), and Sri Lanka has the lowest (3.56%). FDI significantly impacts India's GDP due to its advantageous economic policies, sizable and expanding market, sectoral diversity, and strategic advantages.

Table 4 displays the results of the variance breakdown of CO2 shocks. The fifth period's findings indicate that for Bangladesh, India, Nepal, Pakistan, and Sri Lanka, the effects of variations in CO2 on the computation of FDI are 33.45%, 1.21%, 3.97%, 0.89%, and 2.82%%, respectively. Otherwise, any shock to CO2 impacts FDI variation, which ranges from 0.5% to 33%. Notably, Bangladesh has the greatest impact (33.45%), while Pakistan has the least (0.89%). This suggests that the endogenous association between pollution and foreign investment is insignificant in five South Asian countries. However, comparing Bangladesh and Pakistan reveals that the predicted effects of a foreign direct investment shock on pollution differ significantly across the two countries' economic environments.

Conversely, in that order, the fifth period's CO2 impacts on GDP are 14.38%, 50.48%, 0.91%, 1.41%, and 2.30%. In this instance, Nepal has the least impact on GDP (0.91%), while India has the greatest (50.48%). Several factors contribute to India's high GDP despite its high CO2 emissions, including reliance on agriculture, health impacts, energy-sector issues, urbanization, the effects of climate change, water resource management, financial costs associated with mitigation, and the tourism industry. When considered as a whole, these elements illustrate the intricate relationship between India's economic growth and environmental sustainability. Integrated policies and investments that balance environmental preservation and economic development are necessary to control CO2 emissions and mitigate their effects. In the case of Nepal, CO2 has a low impact because CO2 emissions on Nepal's GDP can be attributed to several factors, including its low industrial base, reliance on renewable energy, emphasis on sustainable tourism, efficient government policies, small urban footprint, adaptive economic practices, limited dependency on fossil fuels, and international support. Nepal can manage its environmental impact and preserve economic stability.

**Table 4.** Variance decomposition of CO2

Period	Bangladesh	India	Nepal	Pakistan	Sri Lanka
CO2 impact on FDI					
1	0.00	0.00	0.00	0.00	0.00
2	2.16	0.88	3.38	0.78	2.27
3	19.62	2.35	4.20	1.06	3.33
4	29.51	1.82	4.20	1.00	3.13
5	33.45	1.21	3.97	0.89	2.82
CO2 impacts on GDP					
1	0.00	0.00	0.00	0.00	0.00
2	0.48	9.65	0.25	0.05	0.00
3	6.70	26.95	0.26	0.25	0.02
4	13.14	42.41	0.35	0.83	0.45
5	14.38	50.48	0.91	1.41	2.30

The variance decomposition of GDP is presented in Table 5. The impact on FDI in the fifth period varies from 1% to 10%, with the highest digit in Bangladesh and the lowest in India. The disparities in economic size, structure, sectoral focus, and growth stages contribute to higher FDI shocks to GDP in Bangladesh than in India. While India's more significant and diversified economy produces milder GDP responses to FDI inflows, Bangladesh's smaller and more concentrated economy leaves it more vulnerable to significant effects from FDI. GDP's impact on CO2 emissions ranges from 2% to 37%, with the highest value in India and the lowest value in Pakistan.

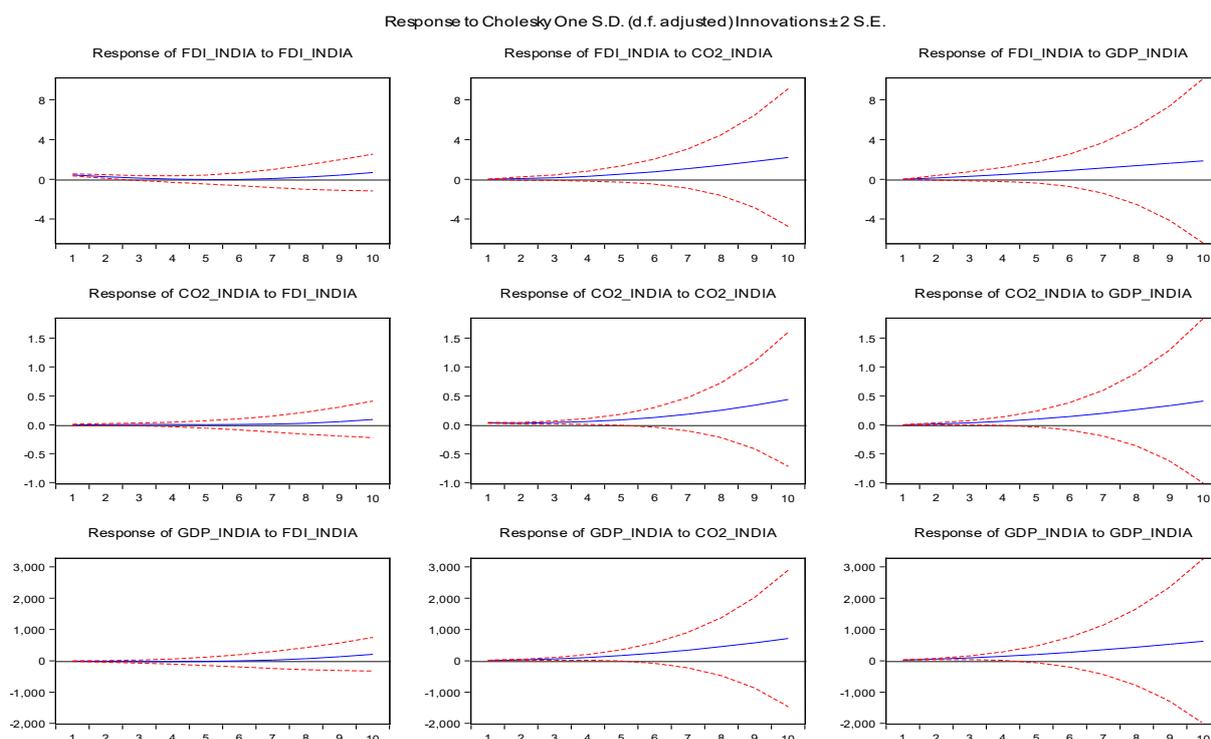
In conclusion, India's broad and diverse industrial base, high fossil fuel consumption, rapid urbanization, and historical emphasis on economic expansion over environmental sustainability are the leading causes of the country's most significant CO<sub>2</sub>-related shocks to GDP. On the other hand, Pakistan's less industrialised economy, smaller population, slower rate of urbanisation, growing emphasis on renewable energy, and more recent adoption of efficient technologies account for the country's lower CO<sub>2</sub> emissions per unit of GDP. The GDPs of the two countries are affected differently by CO<sub>2</sub> emissions due to differences in their structures and policies.

**Table 5. Variance decomposition of GDP**

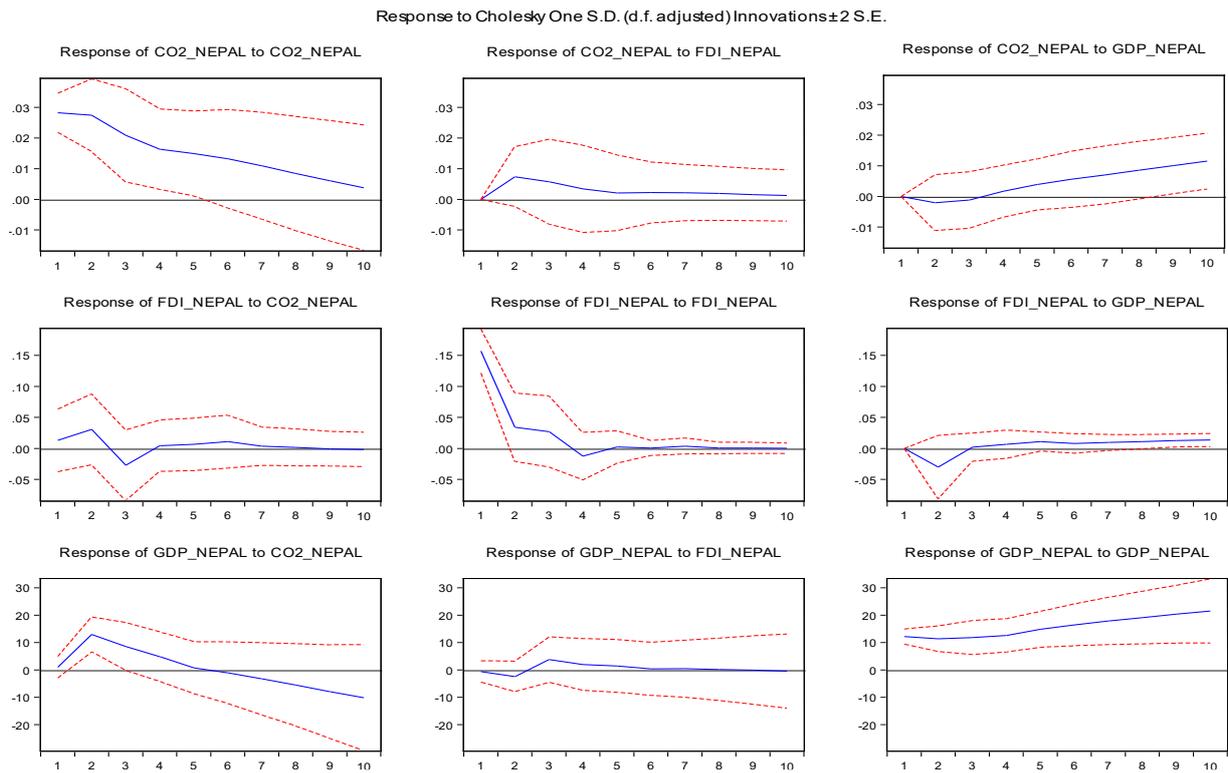
Period	Bangladesh	India	Nepal	Pakistan	Sri Lanka
GDP impact on FDI					
1	0.15	20.66	0.22	0.21	9.25
2	1.49	10.48	1.33	0.08	10.69
3	3.88	5.46	2.97	0.15	9.65
4	6.57	2.58	2.79	0.63	8.36
5	10.54	1.11	2.42	1.49	7.44
GDP impacts on CO <sub>2</sub>					
1	0.19	7.48	0.67	0.18	13.63
2	0.20	19.37	37.40	0.92	9.86
3	1.36	27.19	35.67	1.59	9.64
4	3.96	33.22	30.68	2.12	9.65
5	7.70	37.90	24.46	2.46	9.69

### Impulse Response Function

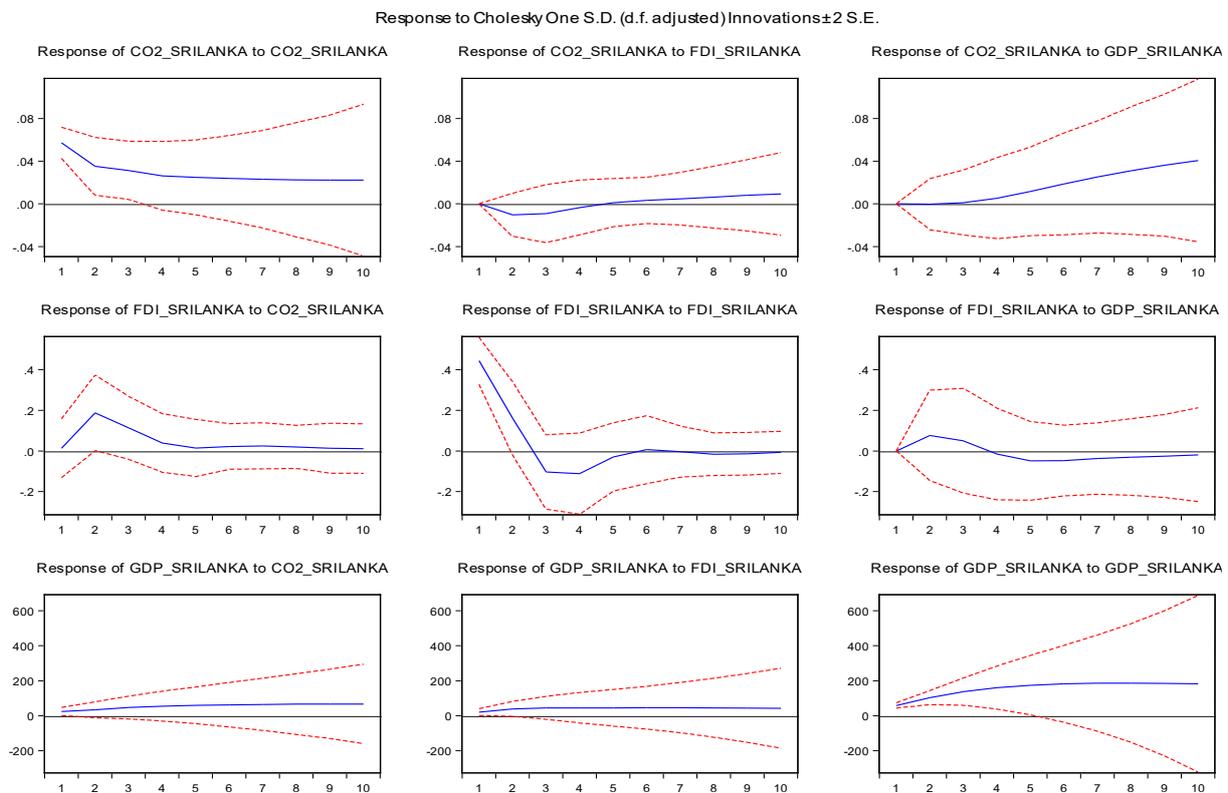
Figures 1-5 show the results of the impulse response functions for the five countries. Here, we present them country-wise. The impulse response of three variables (CO<sub>2</sub> emissions, FDI, and GDP) in India shows that a shock to CO<sub>2</sub> emissions leads to a modest increase in the first period and a cumulative effect in subsequent periods. FDI shows a negative response initially but leads to an immediate increase in GDP. A shock to GDP leads to a significant positive response, boosting economic output. The analysis highlights the dynamic interplay between these variables over time.



**Figure 1.** Impulse response function of India



**Figure 2.** Impulse response function of Nepal



**Figure 3.** Impulse response function of Sri Lanka

The CO2 emissions shock has a cumulative impact on Nepal's CO2 emissions. The FDI shock results in a slight increase in FDI but has no significant impact on CO2 emissions or GDP. The GDP shock significantly increases GDP but negatively affects CO2 emissions and FDI. In Sri Lanka, a shock to CO2 emissions initially increases CO2 emissions itself but has no immediate impact on FDI or GDP. A shock to FDI initially increases FDI but does not significantly affect

CO2 emissions or GDP in the short term. A shock to GDP initially boosts GDP significantly and increases CO2 emissions and FDI, though these effects diminish over time. In the case of Bangladesh, a shock to CO2 emissions initially increases CO2 emissions, while a shock to FDI initially boosts FDI and has a positive impact on GDP over time. A shock to GDP initially reduces CO2 emissions but, over time, increases FDI and GDP. In Pakistan, a shock to CO2 emissions initially increases CO2 emissions, while a shock to FDI initially boosts FDI and positively impacts GDP over time. A shock to GDP initially has a positive impact on FDI and GDP itself, but leads to decreased CO2 emissions over time.

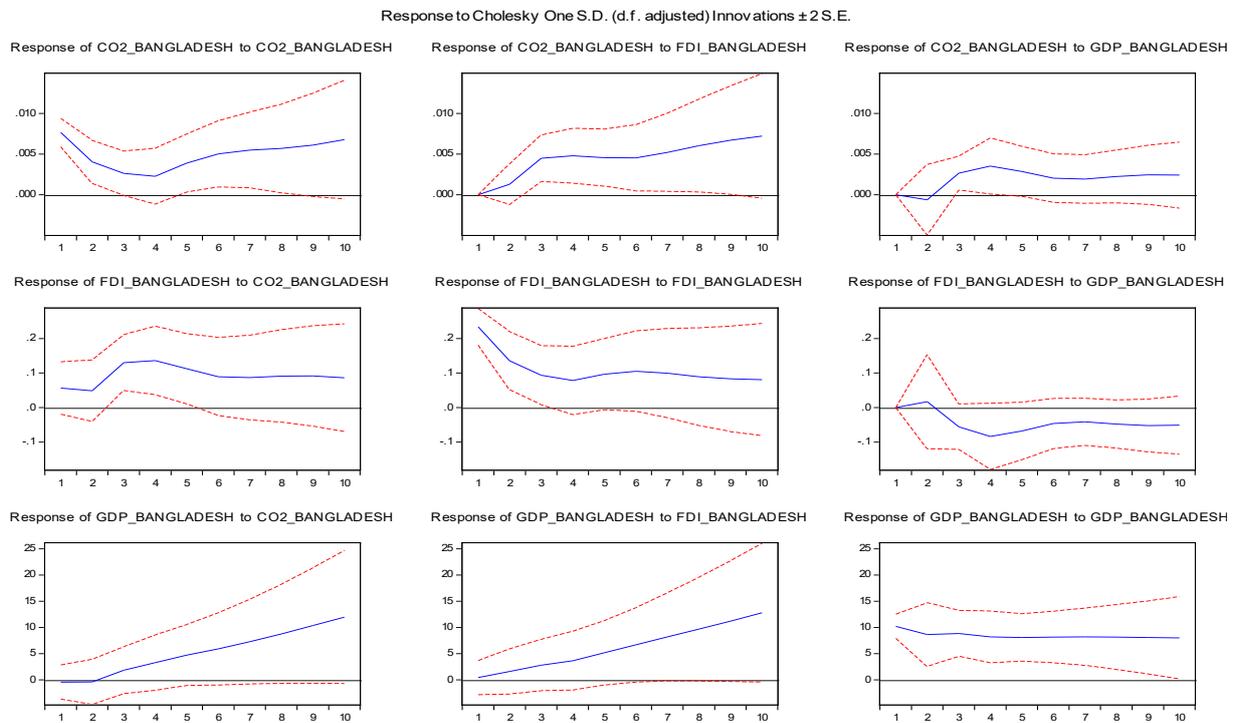


Figure 4. Impulse response function of Bangladesh

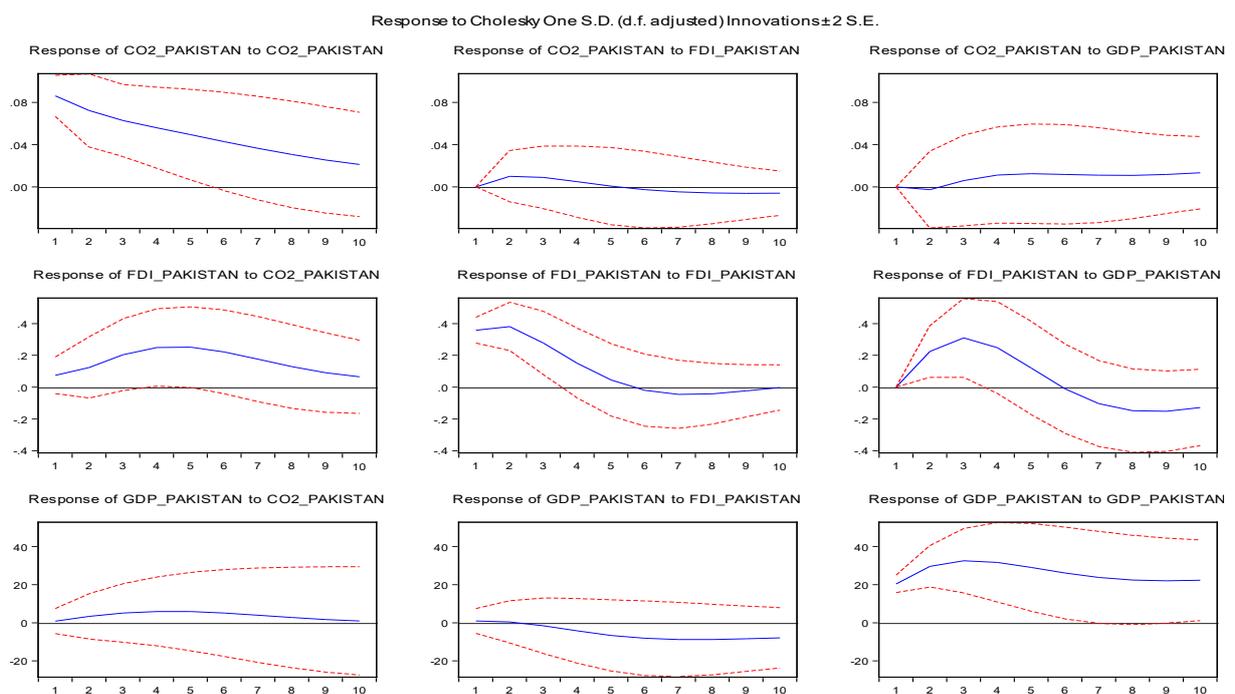


Figure 5. Impulse response function of Pakistan

Many studies have noted that the governance and corruption of the recipient nation may have an impact on how much FDI causes pollution (Ahmed & Long, 2012), (Levinson & Taylor, 2008), (Alfaro et al., 2010; Lai et al., 2020), (Ho et al., 2007) highlighted the possibility that foreign inflow may influence governance, demonstrating an endogenous relationship between the two. Therefore, the available research concluded that foreign direct investment might have a detrimental effect on environmental quality in nations where corruption and weak governance are widespread.

In the South Asian region, foreign direct investment has a wide range of intricate consequences on pollution. More industrial emissions and the relocation of polluting businesses are two outcomes of FDI, even though it can also lead to the transfer of cleaner technologies and more substantial environmental restrictions. The types of industries receiving FDI, the strength and implementation of environmental laws, and the level of economic growth affect the extent to which FDI impacts pollution in South Asia (Acheampong, 2019; Ntow-Gyamfi et al., 2020). Empirical data from many Asian nations reveal inconsistent outcomes. This study examined the impact of foreign direct investment (FDI) on Indonesia's CO<sub>2</sub> emissions from 1975 to 2011. According to their findings, FDI initially increases pollution because it attracts industries that produce more emissions. However, as the economy expands and new technologies are embraced, FDI eventually helps lower pollution levels (Shahbaz et al., 2013). On the other hand, research on India, one of Asia's top receivers of foreign direct investment, suggests a more nuanced link. Mukherjee's (2010) study examined data from 1985 to 2008 and found that although foreign direct investment (FDI) has boosted economic growth, it has also markedly increased carbon dioxide emissions.

The energy-intensive sectors, which account for the majority of FDI in India, are blamed for this rise. However, the report also notes that areas receiving more foreign direct investment tend to enact stronger environmental laws, which ultimately lead to lower pollution levels (Mukherjee, 2010). Cross-country studies are also excellent sources of information on how FDI has affected the environment in newly industrialized countries from 1971 to 2007. According to the report, FDI has significantly increased pollution levels by allowing polluting companies to relocate. However, these consequences are beginning to be lessened with the introduction of more stringent environmental regulations and more environmentally friendly technologies (Hossain, 2011). The diverse empirical data emphasize the intricate relationship between FDI and Asian pollution. It emphasizes that how foreign direct investment (FDI) affects pollution depends on several variables, such as the industries attracting FDI, the state of the host nation's environmental laws, and the host nation's economic progress. Asian policymakers must strike a balance between preserving and enhancing environmental quality and attracting foreign direct investment. To ensure that foreign direct investment (FDI) has a positive impact on sustainable development, it is crucial to strengthen environmental legislation, promote the adoption of clean technologies, and foster green industries.

## Conclusion

Using annual data from 1980 to 2020, this study empirically investigates the effects of foreign direct investment on pollution in Bangladesh, India, Nepal, Pakistan, and Sri Lanka, 5 South Asian nations. Although considerable research has been conducted on the relationship between FDI and pollution in certain developing nations, this study compares data from five South Asian nations to draw plausible conclusions. Using a vector autoregression model based on variance decomposition, it specifically explored how foreign direct investment affects pollution.

As a result, the impact of foreign direct investment on pollution may vary depending on each country's economic situation. A wide range of public policies can impact every country's economic circumstances. Public efforts to enhance capital goods, education, health, and infrastructure are essential for reducing pollution and attracting foreign investment. Additionally, the success of foreign investment and, by extension, economic progress depends on establishing the rule of law and sound administration. All these infrastructural upgrades, a stronger human capital base, a better business climate, and the absence of corruption require the government's cooperation. The markets are one of many ways to solve these problems.

Public policies that encourage public investment in public health and education, promote better governance, establish an efficient tax system, share the tax burden equitably, and foster trust in public institutions are critical. Thus, the correlation between foreign investment and pollution is more evident in countries with efficient public administration. Therefore, improved transparency and governance are essential for a positive relationship between growth and foreign investment. Additionally, it is more effective to promote capital-intensive products rather than consumer goods to attract foreign investment. It is crucial to evaluate the impact of foreign investment inflows on pollution by examining governance and transparency, as well as by using data on the composition of foreign direct investment.

## References

- Acheampong, A. (2019). Modelling for insight: Does financial development improve environmental quality? *Energy Economics*, 83(C), 156–179. <https://EconPapers.repec.org/RePEc:eee:eneeco:v:83:y:2019:i:c:p:156-179>
- Afza, T., & Khan, M. M. S. (2009). Greenfield in Pakistan: Is it really green? An empirical investigation. *American Journal of Scientific Research*, 4(1), 59-71.
- Ahmed, K., & Long, W. (2012). Environmental Kuznets Curve and Pakistan: An Empirical Analysis. *Procedia Economics and Finance*, 1, 4–13. [https://doi.org/https://doi.org/10.1016/S2212-5671\(12\)00003-2](https://doi.org/https://doi.org/10.1016/S2212-5671(12)00003-2)
- Alfaro, L., Chanda, A., Kalemli-Ozcan, S., & Sayek, S. (2020). Does foreign direct investment promote growth? Exploring the role of financial markets on linkages. *Journal of Development Economics*, 91(2), 242–256. <https://EconPapers.repec.org/RePEc:eee:deveco:v:91:y:2010:i:2:p:242-256>
- Behera, S., & Dash, D. (2017). The effect of urbanization, energy consumption, and foreign direct investment on the carbon dioxide emission in the SSEA (South and Southeast Asian) region. *Renewable and Sustainable Energy Reviews*, 70, 96–106. <https://doi.org/10.1016/j.rser.2016.11.201>
- Bernanke, B. S. (1986). Alternative explanations of the money-income correlation. *Carnegie-Rochester Conference Series on Public Policy*, 25, 49–99. [https://doi.org/https://doi.org/10.1016/0167-2231\(86\)90037-0](https://doi.org/https://doi.org/10.1016/0167-2231(86)90037-0)
- Bokpin, G. A. (2017). Foreign direct investment and environmental sustainability in Africa: The role of institutions and governance. *Research in International Business and Finance*, 39(PA), 239–247. <https://EconPapers.repec.org/RePEc:eee:riibaf:v:39:y:2017:i:pa:p:239-247>
- De Gregorio, J., Lee, J.-W., & Borensztein, E. (1998). How Does Foreign Investment Affect Growth? *Journal of International Economics*, 45, 115–135. [https://doi.org/10.1016/S0022-1996\(97\)00033-0](https://doi.org/10.1016/S0022-1996(97)00033-0)
- Demena, B. A., & Afesorgbor, S. (2020). The effect of FDI on environmental emissions: Evidence from a meta-analysis. *Energy Policy*, 138(C), S0301421519307773. <https://EconPapers.repec.org/RePEc:eee:enepol:v:138:y:2020:i:c:s0301421519307773>
- Frutos-Bencze, D., Bukkavesa, K., & Kulvanich, N. (2017). Impact of FDI and trade on environmental quality in the CAFTA-DR region. *Applied Economics Letters*, 1–6. <https://doi.org/10.1080/13504851.2017.1282112>
- Hakro, A. N., & Ghumro, I. (2011). Determinants of foreign direct investment flows to Pakistan. *Journal of Developing Areas*, 44(2), 217–242. <https://EconPapers.repec.org/RePEc:jda:journl:vol.44:year:2011:issue2:pp:217-242>
- Halliru, A., Loganathan, N., Golam Hassan, A. A., Mardani, A., & Kamyab, H. (2020). Re-examining the environmental Kuznets curve hypothesis in the Economic Community of

- West African States: A panel quantile regression approach. *Journal of Cleaner Production, In Press*. <https://doi.org/10.1016/j.jclepro.2020.124247>
- Hines, J., & Rice, E. M. (1994). Fiscal Paradise: Foreign Tax Havens and American Business. *The Quarterly Journal of Economics*, 109(1), 149–182. <https://EconPapers.repec.org/RePEc:oup:qjecon:v:109:y:1994:i:1:p:149-182>.
- Ho, M., Stiroh, K., Jorgenson, D., & Samuels, J. (2007a). The Industry Origins of the American Productivity Resurgence. *Economic Systems Research*, 19, 229–252. <https://doi.org/10.4036/iis.2008.43>
- Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, 12(2), 231–254. [https://doi.org/https://doi.org/10.1016/0165-1889\(88\)90041-3](https://doi.org/https://doi.org/10.1016/0165-1889(88)90041-3)
- Jorgenson, A., Dick, C., & Mahutga, M. (2007). Foreign Investment Dependence and the Environment: An Ecostructural Approach. *Social Problems*, 54, 371–394. <https://doi.org/10.1525/sp.2007.54.3.371>
- Khan, A. H., & Kim, Y.-H. (1999). *Foreign Direct Investment In Pakistan: Policy Issues And Operational Implications*. <https://www.adb.org/sites/default/files/publication/28178/er066.pdf>
- Khan, M., & Samad, G. (2010). Intellectual Property Rights and Foreign Direct Investment: Analysis of 14 South and South East Asian Countries, 1970-2005. *Applied Econometrics and International Development*, 10(1). [https://EconPapers.repec.org/RePEc:eea:aeinde:v:10:y:2010:i:1\\_16](https://EconPapers.repec.org/RePEc:eea:aeinde:v:10:y:2010:i:1_16)
- Kim, M., & Adilov, N. (2011). The Lesser of Two Evils: An Empirical Investigation of FDI-Pollution Tradeoff. *Economics Faculty Presentations*.
- Lai, K. Y., Sarkar, C., Ni, M. Y., Gallacher, J., & Webster, C. (2020). Exposure to light at night (LAN) and risk of obesity: A systematic review and meta-analysis of observational studies. *Environmental Research*, 187, 109637. <https://doi.org/https://doi.org/10.1016/j.envres.2020.109637>
- Levinson, A., & Taylor, M. S. (2008). Unmasking the Pollution Haven Effect. *International Economic Review*, 49(1), 223–254. <https://EconPapers.repec.org/RePEc:ier:iecrev:v:49:y:2008:i:1:p:223-254>
- Mckinnon, A. (2010). Environmental sustainability. *Green logistics: improving the environmental sustainability of logistics*. London.
- Mukherjee, S. (2010). Is There Any Relationship between Environment, Human Development, Political and Governance Regimes? Evidences from a Cross-Country Analysis. *JSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.1536352>
- Ndikumana, L., & Verick, S. (2008). The linkages between FDI and domestic investment: Unravelling the developmental impact of foreign investment in Sub-Saharan Africa. *Development Policy Review*, 26(6), 713-726. <https://doi.org/10.1111/j.1467-7679.2008.00430.x>
- Ntow-Gyamfi, M., Bokpin, G., Aboagye, A., & Ackah, C. (2020). Environmental sustainability and financial development in Africa; does institutional quality play any role? *Development Studies Research*, 7, 93–118. <https://doi.org/10.1080/21665095.2020.1798261>
- Omri, A., & Kahouli, B. (2014). Causal relationships between energy consumption, foreign direct investment and economic growth: Fresh evidence from dynamic simultaneous-equations models. *Energy Policy*, 67(C), 913–922. <https://EconPapers.repec.org/RePEc:eee:enepol:v:67:y:2014:i:c:p:913-922>
- Sbia, R., & Shahbaz, M. (2017). Economic growth, financial development, urbanization and electricity consumption nexus in UAE. *Economic Research-Ekonomska Istraživanja*, 30, 1–23. <https://doi.org/10.1080/1331677X.2017.1305792>

- Shahbaz, M., Hye, Q. M. A., Tiwari, A. K., & Leitão, N. C. (2013). Economic growth, energy consumption, financial development, international trade and CO2 emissions in Indonesia. *Renewable and Sustainable Energy Reviews*, 25, 109–121.  
<https://doi.org/10.1016/j.rser.2013.04.009>
- Hossain, M. S., (2011). Panel estimation for CO2 emissions, energy consumption, economic growth, trade openness and urbanization of newly industrialized countries. *Energy Policy*, 39(11), 6991–6999. <https://doi.org/10.1016/j.enpol.2011.07.042>
- Sims, C. A. (1992). Interpreting the macroeconomic time series facts: The effects of monetary policy. *European Economic Review*, 36(5), 975–1000.  
[https://doi.org/https://doi.org/10.1016/0014-2921\(92\)90041-T](https://doi.org/https://doi.org/10.1016/0014-2921(92)90041-T)
- Singhania, M., & Saini, N. (2021). Demystifying pollution haven hypothesis: Role of FDI. *Journal of Business Research*, 123(C), 516–528.  
<https://EconPapers.repec.org/RePEc:eee:jbrese:v:123:y:2021:i:c:p:516-528>
- Yang, M., Cooc, N., & Sheng, L. (2017). An Investigation of Cross-linguistic Transfer between Chinese and English: A Meta-analysis. *Asian-Pacific Journal of Second and Foreign Language Education*, 2. <https://doi.org/10.1186/s40862-017-0036-9>
- Zheng, J., & Sheng, P. (2017). The Impact of Foreign Direct Investment (FDI) on the Environment: Market Perspectives and Evidence from China. *Economies*, 5(1).  
<https://doi.org/10.3390/economies5010008>
- Zhu, J., Bailly, A., Zwiewka, M., Sovero, V., Di Donato, M., Ge, P., ... & Geisler, M. (2016). TWISTED DWARF1 mediates the action of auxin transport inhibitors on actin cytoskeleton dynamics. *The Plant Cell*, 28(4), 930-948.  
<https://doi.org/10.1105/tpc.15.00726>