



Critically investigate the effect of Institutional Quality, Economic Growth and Carbon Dioxide Emission in Pakistan

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ABSTRACT

This study was designed to have an insight into the literature, both theoretical and empirical, on the relationship of dependent variable Carbon dioxide (CO₂) and independent variables institutional quality (IQ), gross domestic product (GDP), and foreign direct investment (FDI) in the context of developing economies growth from 2000 to 2023. It is an overview of the related published literature about Pakistan. This article is focused using theoretical techniques that explain how and why certain techniques operate and identifies three further dimensions for further research. It's a huge policy challenge to manage CO₂ emissions with advanced technology alone. As per report of (IEA) international energy agency 2020, Pakistan has reallocated the National Clean Fund to compensate for the reforms. The FDI inflows & IQ are pivotal in attaining the sustainable environment. Higher FDI invariably leads to higher emissions, ensuring IQ initiatives both in public and private sector will mitigate this negative impact. Tagging incentive to eco-friendly ambitious technology initiative help environmental sustainability. Variables like degree of industrial development, quality of trained labor force, and overall rate of literacy as factor additional variable that determines the degree/ amount CO₂ production, these are beyond the scope of this study as data is not available, and it shall be the focus of further exploration.

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1. Introduction

Excessive CO₂ production as end product of combustion, the resulting global warming and ultimately culminating in environmental degradation are the main concerns for the future of our earth (Bhatti et al., 2018). British Petroleum released the review of the statistics of global production of CO₂ from Organization of Economic Co-operation and Development (OECD) nations which have successfully reduced CO₂ emissions by 1.00%, while countries outside this group continue to emit 62.4% (Timmer, 2010). Per capital CO₂ emissions is increasing to 8.5, 6.3, 7.6, 8.2 and 5.2% in Pakistan, Malaysia, Indonesia, Ukraine, and Turkey respectively. Environmental degradation has become a major issue for both advanced and emerging nations (Townsend, Ceccacci, Cooke, Constantine, & Gene, 2013). Injudicious usurp of conventional energy sources and unsustainable anthropocentric methods have contributed negatively to human misery and environment catastrophes. Governments are pathetically slow to rise to the challenge of environmental sustainability (Ali, ur Rahman, & Anser, 2020; A. Bakar, 2019; N. A. Bakar, 2019; Seetanah & Fauzel, 2023). Contemporary economic policies embrace the concept of free trade to stimulate massive growth in human resource and material capital in growing economies (Fauzel, Seetanah, & Sannasse, 2015). The capacity to absorb FDI is dependent on the capacity to adopt the advanced technologies and the institutional quality

(IQ). The CO₂ inflows into transitional economies and developing economies is one of the growth indicator linked with manufacturing capacity/activity (Borensztein, De Gregorio, & Lee, 1998; Campos & Kinoshita, 2002; Fauzel et al., 2015; Huang, Rahman, Meo, Ali, & Khan, 2024; Nuseir, Aljumah, & Elrefae, 2023; Song, Anees, Rahman, & Ali, 2024).

Energy hungry low to medium tech manufacturing industries in Pakistan along with promoting growth are contributing to CO₂ imprint (Awan, Rahman, Ali, & Zafar, 2023; Awawdeh, Shahroor, Alajlani, Nuseir, & Aljumah, 2022; Hassan, Sheikh, & Rahman, 2022; Hussain, Arif, & Aslam, 2017; Mukhtar et al., 2023; Nawaz, Rahman, Zafar, & Ghaffar, 2023; Shahzadi, Ali, Ghafoor, & Rahman, 2023; Tabassum, Rahman, Zafar, & Ghaffar, 2023) may be out of proportion due to poor regulations and institutional quality (Nuseir et al., 2023). Our CO₂ inflow is decimated by the neighboring China and India, it is also reflected in comparative figures foreign direct investment, gross domestic product, and institutional quality (Ataullah & Le, 2006). Ineffective economic reforms to end discretionary expenditure and inability to capitalize on human resource development fail to draw in enough CO₂ related foreign direct investment (Chakraborty & Nunnenkamp, 2008). Ours is an exploratory study of the asymmetric association of CO₂ emission with IQ, DFI and GDP for Pakistan. We utilized the available data (1996 to 2018) and current data explores (2000 to 2023) period of economic expansion and population growth which go hand in hand with environmental degradation (Awan et al., 2023; Fatima, Jamshed, Tariq, & Rahman, 2023; Ilyas, Banaras, Javaid, & Rahman, 2023; Nuseira & Aljumahb, 2020; Ridzuan, Ismail, & Che Hamat, 2017). We used the World Bank reports as data source. The dependent variable is CO₂ and domestic products, IQ and FDI are taken as independent variables.

Ahmad, Ahmed, Majeed, and Huang (2021) did ponder on the nexus but did not explicitly account for non-linearity and the linear frameworks adopted by Acemoglu and Johnson (2005); AlShawabkeh, Nuseir, and Aljumah (2021); Dawood, ur Rehman, Majeed, and Idress (2023); Hafiza et al. (2022); Qadri et al. ; Shahzadi et al. (2023); Ullah, ur Rahman, and Rehman (2023); Zahra, Nasir, Rahman, and Idress (2023). It overlook the potential nuanced, non-linear interactions between foreign domestic product, gross domestic product, and institutional quality. This is an endeavour aimed to fill this gap in the understanding of potential asymmetries within these dynamics in Pakistan who is releasing 192.7 million tons per year. We being the 5th vulnerable nation, were victims of the extreme climatic events from 1999 to 2018 draining 2.8 billion dollars from our economy. We shall overcome these issues by enthusiastic adaptive regulations to reduce emissions without compromising the growth.

2. Literature Review

IQ, GDP, FDI and industrially emitted CO₂ are enjoying the limelight and focus of our research. This is a Pakistan focused comprehensive overview of the existing literature from the year 2000 to 2023 We applied advanced approaches for a nuanced understanding of the dynamic relationships with particular attention to the critical role of institutional quality (IQ) defined by governance structures, regulatory frameworks, and the rule of law by Shahid, Muhammed, Abbasi, Gurmani, & Rahman 2022, Qureshi, Zaman, Rahman, Shahzadi 2022. Aslam, 2016 examined the data of Indonesia from 1975 to 2011 to analyze the empirical association between FDI, GDP, IQ and CO₂ emitted and found a positive relationship. Chakraborty and Nunnenkamp 2008, noted a positive relationship between GDP, FDI and IQ on CO₂ for South African in 1965–2008 period. Awunyo-Vitor and Sackey (2018) empirically applied the Generalized Method of Moments (GMM) approach on Pakistani data from 1972 to 2012 and had a similar relationship. Positive impact was seen when they applied co-integration approach on the data of Turkey throughout 1960–2010. When advance approach was applied to the data of China from 1980–2014, a more significant positive shock on carbon emissions. Acemoglu and Johnson (2005) reported positive impact of well-functioning institutional quality, foreign direct investment, gross domestic product on CO₂. Ali et al. (2020); Kamangar et al. (2020); Nawaz et al. (2023); Qadri et al. ; A. U. Shahid et al. (2022); Shahzadi et al. (2023) figured out the variable impact on the different economic conditions which requires nuanced exploration of these relationships using advanced tools. The nexus between institutional quality, foreign investment, and gross domestic product outcomes has garnered increasing attention. S. u. Rahman, Chaudhry, Meo, Sheikh, and Idrees (2022); Sarwar, Ali, Bhatti, and ur Rehman (2021); Shafique, Rahman, Khizar, and Zulfiqar (2021); Younas, Idrees, and Rahman (2021); Zhu, Fang, Rahman, and Khan (2023) explores this nexus roles of directly

influencing environmental performance but did not explicitly tackled the potential of crucial dynamic asymmetries during robust economic up or down turns. For developing economies like Pakistan, exploring these nuances becomes imperative.

The conventional wisdom of GDP and CO₂ emissions being related positively is often referred to as the Environmental Kuznets Curve (EKC). S. Rahman and Idrees (2019); Shahbaz, Balsalobre-Lorente, and Sinha (2019); Tabassum et al. (2023) pointed out the impact of gross domestic product on CO₂ emissions may not be strictly monotonic in economies at different levels of economic development. frameworks capable of grasping these complex dynamics especially for economies like Pakistan with limited availability of time period specific studies with notable interactions between IQ, GDP, FDI and CO₂ emissions (Mohammadi et al., 2019). Research by Ali et al. (2020); Hafiza et al. (2022); Hassan et al. (2022); Y. Khan (2022); Khoula, ur Rehman, and Idrees (2022); Li et al. (2022); Zulfiqar et al. (2022) provides a valuable insights into the Pakistani context but is deficient in addressing potential.

2.1. Association between foreign direct investment and CO₂ emissions

The inconsistencies about role of foreign direct investment on environment led to multiple hypotheses like "Porter's hypothesis", "Pollution Havens hypothesis" and "Pollution Halo hypothesis". The classical view holds that strict implementation of environment regulations will definitely raise the production cost while the advocates of Neo-technology trade promote the view holds that environment friendly guidelines can be favorably coordinated to bridge the technology-gap through trickle-down effect. The Neo-technology perspective by Porter's theory, 1991, modified by Esty and Porter, 1998, links these economic variables and added the strength, weakness and narrowness variables on innovations in regulations. Industries causing massive pollution are shifted to the areas with culture of lax implementation of regulations "The Pollution Havens Hypothesis". Ali, Yusop, Kaliappan, and Chin (2021); Chaudhary, Nasir, ur Rahman, and Sheikh (2023); Ilyas et al. (2023); M. A. Khan, Khan, Abdulahi, Liaqat, and Shah (2019); C. Shahid, Gurmani, Rehman, and Saif (2023); Usman, Rahman, Shafique, Sadiq, and Idrees (2023) looks into it in another way, underdeveloped countries use it to their advantage by deliberately keeping the rule lax and show intentional lack of interest in implementation to attract pollution intensive industries. These countries even agree to allow dumping of hazardous waste and allow extensive exhaustion of their non-renewable resources as a trade of for FDI. Transfer of eco-friendly technology remains elusive.

2.2. Association between gross domestic product and CO₂

Empirical works led to inconsistent conclusions, Ang (2007) employed the ARDL model on the french1960–2000 period, and graphically described the shape of the GDP-CO₂ connection as inverted U. Gozgor,2017, reported similar link in 35 OECD member states through the PMG estimation technique. Gozgor (2017); Nuseira and Aljumahb (2020); Sapountzi, Gracia, Fredriksson, and Niemantsverdriet (2017); Shahbaz et al. (2019) also found similar results. A continually rising curve was recognized by Gill et al, 2018 in their study. Investigations like, Abdul-Rashid, Sakundarini, Ghazilla, and Thurasamy (2017) found an insignificant association between gross domestic product. Very few studies address the nonlinear or in other words asymmetrical relationship between CO₂ emitted as a result of increase in economic activity Hamon et al. (2019) reported asymmetric impact of GDP on CO₂ emissions when applying advance approach on Chinese data from 1970Q1-2015Q4. Insignificant effect was reported by Raggad, 2020, for 1990 to 2014 data and 1971 to 2014 data from of Kingdom of Saudi Arabia. Shahbaz et al, 2020 reported similar insignificant impact of GDP on CO₂ emissions in Pakistan.

3. Methodology

We have applied the principles of systematic literature review Jiang et al. (2023) to analyze several key points from relevant publications and bibliographies about applied theories and the research philosophy (Zhu et al., 2023) on the key findings on the GDP, FDI and emitted CO₂ in studies from different areas from theory and for practices angles. We searched literature since November 2019 to April 2022 from (1) Economics journals listed in the Clarivate analytic (journal citation report 2019 and the Master Journal List (2022)); (2) Comprehensive databases (Business Source Premier by Ebsco and Scopus). (3) Google Scholar; (4) extensive cross-disciplinary bibliography on search word foreign direct investment, gross domestic product, institutional quality and CO₂ emission. We excluded information from book, commentaries, summaries of conference summaries, abstracts, executive abstracts,

editorials and newspaper/magazine articles. After removing duplication almost 700 articles were identified. Author examined abstract, title and, methodology for relevance.

4. Conclusion

There is a definite positive relationship between CO2 emission, FDI & GDP. This shall fill the gap of still undecided nature of relationship of the major contributing elements for future planning. Increasing Carbon emissions though attracts FDI and increases GDP, it does contribute to global warming, IQ shall be the primary factor in mitigating the deleterious effect. We remained focused to synthesize a clear and all-encompassing view of the available literature about contextual approaches and practicalities.

4.1. Future Recommendations for Policy Makers

This study has important policy implications by understanding the dynamic interaction on the significance of studied variables, GDP, FDI and IQ and their proportionate contribution in continuously evolving economy of Pakistan to ensure conducive environment for sustainable development. These policies will ensure our contribution in achieving target of maintaining the temperature of our globe below 28 °C to preserve abundant natural resources and continuous vigilance against upcoming challenges of environmental pollution. Encouraging green energy minimizing toxic waste production through innovative tech-solutions needs a coordinated institutional international consensus and political will for implementation. Policies to encourage eco-friendly foreign investment needs to be encouraged. Cutting-edge technology from developed and industrialized countries shall be allowed to utilize natural resources of less developed economies only after ensuring long-term environmental preservation. Maintaining rule of law and having a robust accountability, well performing bureaucracy without red-tape delaying hurdles and efficient and incorruptible judiciary, and democratic freedoms are the cornerstones of good governance, these play a pivotal role in efficient institutions function.

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