

Musharaf Hanif¹, Khadija Khalid², Saif Ur Raman³, Muhammad Ali⁴**Abstract**

The main aim of this study is investigating the effect of innovation, foreign direct investment, public investment, globalization and carbon intensity on CO₂ in G-11 countries. This paper examines and synthesizes existing theoretical and experiential literature on said question. It first draws the overview of the asymmetric effect of innovation foreign direct investment, public investment, carbon intensity and globalization on CO₂ in G-11 countries. Second, it identifies the literature based on the theoretical and empirical visions from the published literature. In addition, this article put light on theoretical methods that describes how/ why these methods work. Third, this article proposes three fruitful magnitudes for further research. This paper contributes to the area of asymmetric effect of innovation, foreign direct investment, public investment, globalization and carbon intensity on CO₂ in G-11 countries. By critically analyzing and amalgamating existing theory and research on asymmetric effect of innovation, foreign direct investment, public investment, globalization and carbon intensity on CO₂ in G-11 countries.

Keywords: Foreign Direct Investment, Innovation, Carbon dioxide Emission

1. Introduction

The association between government spending and energy policy has already been renowned as a critical component of global efforts. Modern initiatives determine that this relation has reached the peak political level as commitments to meet the Paris Agreement goals at COP21 and to implement the 2030 Agenda for Justifiable Development have been inspected in the public interest. 1 One area of great importance in this context is making financial flows consistent with a “justifiable” pathway to accomplish enduring climate United Nation’s 2030 Itinerary for Sustainable Development speaks the United Nations Structure Bond on Weather Alteration (UNF-CCC) as the major worldwide, geopolitical platform for helping the cooperation of the global reaction to weather alteration. The UNFCCC, started at the Rio Earth Summit in 1992, orders annual climate meetings, the so-called Conference of Parties (COP) and development goals. This is evident in the proposals of António Guterres, the Secretary-General of the United Nations, who suggests that public money should fowl to sustainable businesses that help the climate, implying the end of fossil fuel-oriented practices, (Awan, Rahman et al. 2023) UNDGC 2020. This article aims to add to the literature in many ways. Firstly, relatively than using collective FDI flows to look at the impact of FDI flows on carbon emissions in BRICS countries, we employ disaggregated FDI flows to examine whether there is some maintain for PHH or PHE depending on which OECD country FDI flows to BRICS counties. For illustration,(Chaudhary, Nasir et al. 2023) (Sun, Zhang and Xu 2017) illustrate that China is a contamination haven while the combined FDI flows to China are investigated. Though, it is achievable that the FDI flows from few countries might lead to technological improvements and substantiate PHE. On the other hand, a few further countries may believe BRICS countries as contamination havens and FDI flows as of these countries might enhance CO₂ emissions in BRICS countries. For that reason, we conquer the probable aggregation bias by means of bilateral FDI flows to BRICS countries. Secondly, by means of with disaggregated FDI flows data, we be able to shed light resting on why existing studies may have establish assorted outcome regarding the collision of FDI flows on CO₂ emissions in BRICS countries. Thirdly, a few of the obtainable studies do not undertake the probable endogeneity difficulty. On the other hand, endogeneity is a serious worry as a few studies set up that CO₂ emission in BRICS countries may lead to superior FDI flows ((Dawood, ur Rehman et al. 2023)e.g., Shao et al. 2019). During the twenty-first century, the considerable responsibility of innovation and CO₂ emission has develop into a notable topic of discuss in environmental economics literature (Fatima, Jamshed et al. 2023;Carrión Flores and Innes 2010; Usman, Rahman et al. 2023; Barbieri et al. 2017; Ali & Audi, 2016; Ali et al., 2021; Ali et al., 2021).

At the present time, CO₂ emission has been one of the mainly serious intimidations of environmental worsening in the recent era and several comprehensive global penalty. In exacting, rising countries are disproportionately exaggerated by the threat of typical weather change, shimmering further susceptible events. In brightness of these disparities, the growing consideration on economic improvement is promising as a considerable instrument for CO₂ emissions, particularly for rising countries. In 2009, the United Nations weather Summit recognized a determined objective to allocate US \$100 billion per annum in weather support for rising countries. Regardless of this obligation to climate assist, the objective remained unworkable. The recent Investigation examined the position of innovation on CO₂ emissions. In adding up, the moderating responsibility of financial growth in the connection connecting innovation and CO₂ emissions is examined. The evolution to financial advance reinforces substantial savings and guides economic decisions for the development of innovative actions. Accordingly, financial improvement promotes innovation actions for enhanced environmental superiority and encourages CO₂ emissions. (Shafqat, Idrees et al. 2023)Shahbaz et al. (2015) and Mishkin 2009(Ilyas-Lecturer, Awan et al. 2023)) acknowledged so as to globalization is global observable fact that has been impacting life of individual being approximately the globe publicly economically and politically. Globalization relates the economies of the globe from end to end trade and overseas direct investment (FDI). (Ilyas, Banaras et al. 2023) Shahbaz et al. (2018) exposed so as to globalization has advises for trade ingenuousness, financial growth, economic growth and environmental superiority diagonally the globe; each country wearisome to achieve maximum economic development throughout foreign trade and investment, attaining highest economic growth through industrialization and urbanization causes environmental deprivation that impact the environmental excellence in every country, owing to intensification of conventional power wealth spending for

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economic actions as well as manufacture in industries. (Khan and Saif-ur-Rehman) Navarro (1998) confirmed that globalization is growing; confined economies of the world are at the present included with additional economies as compared to earlier than. Globalization having further optimistically collision as compared to negative impact, mainly with obsequiousness to reducing the poverty and income intolerance in budding nations, other than influence of globalization on environment are motionless discussed in investigators. Because underlined in the COP26 gathering in Glasgow, in 2030 countries should approach onward with determined targets for falling emissions that arrange in a line with accomplishing net nil by the center of the century. During 2015, the United Nations (UN) adopted the 2030 sustainable growth aims (SDGs) to holistically incorporate economic development, social growth, and environmental protection. Sustainable growth aims push sustainable economic development, poverty annihilation, social advancement, hostility favoritism and inequality, environmental shield, and dealing with worldwide weather change. With the objective of scheming worldwide warmth increase to less than 2 °C or flat 1.5 °C, the Paris contract reinforces the alleviation goals of greenhouse gas (GHG) emission reductions at the same time as shielding worldwide environmental sustainability. The Paris contract emphasizes the fundamental relative among weather change's collision and response, reasonable access to sustainable development, and additional purposes. In the closing stages, countries must, for that reason, obtain complete, balanced, and incorporated non-market procedures planned and in an efficient behavior to assistance them in getting their NDC targets where stimulating sustainable development and toxic waste extermination. Monetary program plays a significant role in dropping CO₂ emissions, which are the supreme treacherous environmental contaminants, particularly ascending from financial accomplishments and fast mechanization. Conflicting to this circumstance, various researcher debates that the environment is a extravagance good and that the concentration should be on the environment only after supplementary economic problems have been determined (Mukhtar, Mukhtar et al. 2023) Abbass et al. 2021). Despite entirely this, environmental fortification, weather modification, and global warming have convert problems of apprehension over the previous few periods. Since CO₂ emissions and further greenhouse gases are the foremost reason of global warming that reasons climate change. At this stage, various researchers approve that CO₂ emissions as a significant source of global warming (Nawaz, Rahman et al. 2023) Mallick and Tandi 2015). What is the impact of foreign direct investment and public investment on CO₂ in G-11 countries?

2. Literature

Here are two core economic viewpoints (classical and Keynesian) on government spending (Qadri, Li et al.) Mitchell 2005). The first is the traditional doctrine that government spending has a harmful influence on economic development (Shahid, Gurmani et al. 2023) Roy 2009; (Shahzadi, Ali et al. 2023) Bergh and Karlsson 2010; (Shahzadi, Sheikh et al. 2023; Audi & Ali, 2017; Ali et al., 2022; Audi et al., 2020) Connolly and Li 2016; (Tabassum, Rahman et al. 2023) Afonso and Jalles 2016). Researchers who grasp this opinion claim that the development of government spending has moved to sedentary areas. Furthermore, while government spending is subsidized by taxes or borrowings from the domestic market, elements like subordinate private sector investment and greater interest rates have a bad influence on growth (crowding-out effect). Dependable with opinions demanding that increasing government spending has no negative effects on economic growth, the second view created by (Ullah, ur Rahman and Rehman 2023; Audi & Ali, 2023; Audi & Ali, 2023; Ashiq et al., 2023) Keynes (1936) significances that solidier and further operative government spending will remove market disturbances and motivate economic growth (Usman, Rahman et al. 2023) Karras 1997; (Zahra, Nasir et al. 2023) Wu et al. 2010; (Javaid, Noor et al. 2023) Akpan and Abang 2013; (Zhao, Rahman et al. 2023) Choi and Son 2016). A growth in government spending will have an optimistic multiplier consequence on investment and employment, and a rise in community spending will result in an increase in national welfare. Investigators examine the properties of income and FDI on environmental dilapidation consuming the environmental Kuznets curve (EKC) and pollution haven hypothesis (PHH), correspondingly. Whether these two hypotheses are authorized between countries or groups of countries continues to be generally discussed today.

The foundation of the EKC hypothesis is slightly big than the PHH. (Hassan, Sheikh and Rahman 2022) Kuznets (1955) examined the actuality of an inverted U-shaped connection among per capita income and income inequality. In the literature study, this connection is mentioned to as the Kuznets arc. Green economists, motivated by this arc, recognized the EKC hypothesis, which observes the connection among pollution and income. The EKC hypothesis created through studies by (Khan 2022) Grossman and Krueger (1991, 1995) (Rehman, Ali et al. 2022), and various studies have been conducted in this zone in the literature (Rehman, Ali et al. 2022) Stern et al. 1996; (Li, Bai et al. 2022) Isik et al. (Bilal, Shah et al. 2022) 2020; Pata and Hizarci 2022). The existing literature has comprehensively discovered green product innovation from an environmental sustainability standpoint (Khoula, ur Rehman and Idrees 2022) Luttrupp and Lagerstedt 2006; (Zulfiqar, Ansar et al. 2022) Dangelico 2016). (Hafiza, Manzoor et al. 2022) Mensah et al. (2019) used the ARDL method to observe the effect of innovation on CO₂ emissions in OECD countries, and originate that green innovation condensed CO₂ emissions to a certain extent and held the response hypothesis. Though, (Shahid, Muhammed et al. 2022) Liu et al. (2022a, b) argue that the emission decline consequence of green innovation (environmental innovation) is only significant at greater stages of carbon emissions. (mWaheed Muhammad Waheed 2022) You and Lv (2018) examined the effect of globalization on CO₂ emissions from 1985 to 2013 for eighty-five countries.

The observed outcomes showed that indirectly economic globalization harmfully effects the CO₂ emissions but when the effect if straight observed so the economic globalization positively effects the environmental degradations. (Shahid, Ghaffar et al. 2022) Saint Akadiri et al. (2019) studied effects of globalization on environment Kuznets in fifteen countries from 1995 to 2014. The studied outcomes designated that tourism and real income harmfully and significantly effects the CO₂ emissions, although globalization and energy consumption positively and significantly effects the CO₂ emissions. (Sarwar, Ali et al. 2021) Feridun et al. (2006) and Wijen and van Tulder (2011) (Rahman, Chaudhry et al. 2022) stated that globalization support to recover the economy's growth in emerging countries that terminate the natural properties for mechanization which unfavorably effects the environment. (Zhu, Fang et al. 2023) Doytch and Uctum (2016) deliberate the effects of globalization on environmental dilapidations for the period of 1984–2011. The studied outcomes showed that globalization of financial development rise the inflow of investment that unfavorably effects the environment and reasons dilapidations of environment. (Younas, Idrees and

Rahman 2021) Dreher (2006) stated that globalization has conveyed connection of emerging with established economies; the author stated that with globalization encouraging the established economies to invest in green equipment around the world. (Shafique, Rahman et al. 2021) Jor Givens (2014) (Ali, ur Rahman and Anser 2020) Li et al. (2015) scrutinized the suggestion of globalization with CO2 emissions. Trade openness was applied to measure globalization. The examined results indicated that globalization harmfully effect the CO2 emissions. (Bakar 2019) Shahbaz et al. (2019) scrutinized relationship of globalization with CO2 emissions in eighty-seven economies. The studied outcomes designated that globalization in high and central income economies will reduction CO2 emissions in forthcoming although in small income economies globalizations have positively influence the environmental dilapidations.

3. Methodology

This investigation study comprises of organized examine of the literature or meta-analysis (Henderson, 2015) and (Bakar 2019) to accumulate and analytically analyze the related literature. For the complete and critical investigation, author build a critical examine form to investigate numerous main points of the earlier studies namely attention of the paper, bibliographic details, theory applied (where related), investigation philosophy (Rahman and Idrees 2019) (Zikmund, Babin, Carr) (Griffin, 20 13), main conclusions, methodology, meaning of innovation, foreign direct investment, public investment, globalization and carbon intensity on CO2 emission in G-20 countries, theoretical and applied investigation, and additional conclusion and described boundaries. For the critical examination of this investigation, author examined literature since 2016 to 2022. In direction to recognize the supreme related papers on innovation, foreign direct investment, public investment, globalization, carbon intensity and CO2 emissions, the investigator conducted a comprehensive search. This study includes estimating papers achieved from two prime ways: (1) Economics journals listed in the clarivate analytics, specially. The Master Journal List 2017 and JCR report 2016; and (2) Comprehensive databases, namely Business Source Premier by Ebsco and Scopus. (3) Google Scholar; (4) extensive cross-disciplinary bibliography on innovation, foreign direct investment, public investment, globalization and carbon intensity CO2 emission (consisting of several references), published in the different journals. In this literature study, the author has recognized particular conditions for choosing significant literature. The criteria comprise concentrating on matters connected to innovation, foreign direct investment, public investment, globalization and carbon intensity on CO2 emissions. Furthermore, the author has except non-empirical or non-conceptual bases like books, explanations, editorials, summaries of conference summaries, abstracts and keywords, exclusive abstracts, magazine articles, literature study, newspaper and literature study. Upon comprehensive investigation, the author was capable to pinpoint nearly 600 articles after the procedure of replication was occupied into account. In direction to create the significance of every paper, the author prudently examine its abstract, title, and methodology when supposed obligatory.

4. Conclusion

Upon accompanying a complete investigation of the prevailing literature, it has been strong-minded that here exists an apparent association between innovation, foreign direct investment, public investment, globalization and carbon intensity and CO2 emissions in G-11 countries. The conclusions of this study designate that both negative and positive possessions are experimental in this favor. It is fascinating to detect that both conclusions unconventionally address the gap in the obtainable literature. The influence of innovation, foreign direct investment, public investment, globalization and carbon intensity on CO2 emissions in G-11 countries is a matter that remains to be the subject of continuing conversation and investigation. Various studies have been accompanied to observe the effect of foreign investment on the generally economy. Subsequently the critical study of the literature, it is determined that, as associate to total value of FDI, both the negative and the positive effects are revealed. It is very much interesting to see both the conclusions are independently fill the gap in the literature. Thus, the consequence of FDI on the manufacturing growth is still under conversation and numerous studies have been accompanied to examine the effect of foreign investment on the general economy.

5. Future Recommendations

This study of the literature calls for more investigation on three diverse grounds. First, supreme of the studies conductance to examine the FDI are used the RDL model, OLS regression and GMM approach. It is experiential that through the literature study, a dynamic vector mistake alteration model (VCEM) is applied only limited studies to convey out the examination. This VCEM process supports to ensure the period series dynamics that are under reflection is correctly taken, throughout endogeneity problems and connection problems are carrying out instantaneously. Furthermore, some indirect belongings and response that might be happens also be taken with the VECM process. Second, many of the FDI studies are accompanied in the previous typically connected to host country GDP and the economic growth, single few studies have been observed in the background of manufacturing growth, so it is recommended that additional examination obligatory to disclose the appropriate execution of the manufacturing growth although FDI inflows are essential in the host country. Third, the studies are showed in the previous, examined in the context of south east Asian countries, for instance, Malaysia and US economy with the investment and development in manufacturing sector in France, Japan, UK and Germany as well, as associate to under established states. However restricted examination has been done in south Asia such as Pakistan.

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