THE REPUBLIC OF TURKEY
ERCIYES UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
DEPARTMENT OF ECONOMICS

EVALUATING THE ENVIRONMENTAL EFFECTS OF GLOBALIZATION: EVIDENCE FROM SELECTED ASIAN COUNTRIES

By
Jannatul FARDUS

Supervisor
Prof. Dr. Faik BİLGİLİ

PhD Thesis

September 2022, KAYSERİ

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ACCEPTANCE AND APPROVAL

This thesis entitled "*Evaluating the Environmental Effects of Globalization: Evidence from Selected Asian Countries"*, written by Jannatul FARDUS under the supervision of Prof. Dr. Faik BİLGİLİ has been accepted by our jury as a Ph.D. dissertation in the Department of Economics, Institute of Social Sciences, Erciyes University.

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EVALUATING THE ENVIRONMENTAL EFFECTS OF GLOBALIZATION: EVIDENCE FROM SELECTED ASIAN COUNTRIES

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ABSTRACT

The main focus of this dissertation is to evaluate the impact of globalization on the environment by employing panel data for selected twenty-two Asian countries from 2000 to 2017. The environmental degradation is assessed by using carbon footprint and CO_2 emissions as indicators, and the KOF index is employed to measure the multi-dimensions of globalization, including general globalization, economic globalization, trade globalization, financial globalization, social globalization, interpersonal globalization, and political globalization, which could thoroughly explore the broader impact of globalization on environmental quality. Additionally, it uses panel quantile regression to examine the effects of various dimensions of globalization on environmental quality by controlling economic growth, human capital, and current healthcare expenditure. The results of this study show that political globalization is the only variable that has no significant effect on carbon footprint. However, economic, social, and political globalizations are more responsible for raising the pollution level. The effects of general, trade, financial, and interpersonal globalization, in contrast, significantly decrease environmental degradation in the selected Asian countries. Moreover, human capital (education) and current health expenditure are also crucial factors that improve the performance of the environmental condition in Asia. The inverted U-shaped confirming the Environmental Kuznets Curve (EKC) hypothesis for Asian countries is also supported by the empirical findings of this research. Additionally, this research provides important policy recommendations for stakeholders, policy-makers, and governments in achieving environmental sustainability.

Keywords: Multi-dimensions of globalization, Environmental Kuznets Curve, Carbon footprint and CO_2, Human capital and Health expenditure, Panel quantile regression.

KÜRESELLEŞMENIN ÇEVRESEL ETKILERININ DEĞERLENDIRILMESI: SEÇILMIŞ ASYA ÜLKELERINDEN KANITLAR

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ÖZET

Bu tezin ana odak noktası, 2000’den 2017'ye kadar seçilen yirmi iki Asya ülkesi için panel verilerini kullanarak küreselleşmenin çevre üzerindeki etkisini değerlendirmektir. Bu amaçla çevresel bozulma, karbon ayak izi ve CO_2 emisyonları gösterge olarak değerlendirilmektedir. KOF endeksi, küreselleşmenin çevre üzerindeki daha geniş etkisini kapsamlı bir şekilde araştırabilecek genel küreselleşme, ekonomik küreselleşme, ticaret küreselleşmesi, finansal küreselleşme, sosyal küreselleşme, kişilerarası küreselleşme ve politik küreselleşme dahil olmak üzere küreselleşmenin çok boyutlu boyutlarını ölçmek için kullanılmaktadır. Ek olarak, küreselleşmenin çeşitli boyutlarının ekonomik büyümeyi, beşeri sermayeyi ve mevcut sağlık harcamalarını kontrol ederek çevresel kalite üzerindeki etkilerini incelemek için panel kantil regresyonundan faydalanılmaktadır. Bu çalışmanın sonuçları, siyasi küreselleşmenin karbon ayak izi üzerinde önemli bir etkisi olmayan tek değişken olduğunu göstermektedir. Bununla birlikte, ekonomik, sosyal ve politik küreselleşmeler kirlilik seviyesinin yükseltilmesinden daha fazla sorumludur. Aksine, seçilen Asya ülkeleri için genel, ticaret, finansal ve kişilerarası küreselleşme, önemli ölçüde çevresel bozulmayı azaltıcı yönde etki etmektedir. Ayrıca, beşeri sermayesi (eğitim) ve mevcut sağlık harcamaları da Asya'daki çevresel durumun performansını geliştiren çok önemli faktörlerdir. Asya ülkeleri için Çevresel Kuznets Eğrisi (EKC) hipotezini doğrulayan ters U şeklindeki yaklaşım, bu araştırmanın ampirik bulgularıyla da desteklenmektedir. Ek olarak, bu araştırma paydaşlar, politika yapıcılar ve hükümetler için çevresel sürdürülebilirliğin sağlanmasında önemli politika önerileri sunmaktadır.

Anahtar Kelimeler: Küreselleşmenin çoklu boyutları, Çevresel Kuznets Eğrisi, Karbon ayak izi ve CO_2, Beşeri sermaye ve sağlık harcamaları, Panel kantil regresyonu.

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APEC	Asia Pacific Economic Cooperation
ARDL	Auto Regressive Distributive Lag
ASEAN	Association of the Southeast Asian Nation
BRI	Belt and Road Initiative
CADF	Cross-Sectionally Augmented DF
CCEMG	Common Correlated Effects Means Group estimator
CD	Cross-section Dependence Test
CFP	Carbon Footprint
CFR	Carbon Footprint Reduction
CHE	Current Health Expenditure
CIPS	Cross-Sectionally Augmented IPS
CO2e	Carbon Dioxide Equivalent
ECF	Ecological Carbon Footprint
EGI	Economic Globalization Index
EKC	Environmental Kuznets curve
EMT	Environmental Monitoring Technology
EPA	Environmental Protection Agency
FDI	Foreign Direct Investment
FGI	Financial Globalization Index
GDP	Gross Domestic Product
GFN	Global Footprint Network
GGI	General Globalization Index
GHGs	Greenhouse Gases
HC	Human Capital
IGI	Interpersonal Globalization Index
IMF	International Monetary Fund
IPS	Im, Pesaran, and Shin

JB	Jarque-Bera probability test
LLC	Levin, Lin, and Chu
LM	Lagrange Multiplier
LTS	Long-Term Strategy
NFA	National Footprint Accounts
NGO	Non-governmental Organization
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
PGI	Political Globalization Index
PMG	Pooled Mean Group
PPM	Parts Per Million
PPP	Purchasing Power Parity
QARDL	Quantile Autoregressive Distributed Lag
QREG	Quantile Regression
QQR	Quantile-on-Quantile Regression
SAARC	South Asian Association for Regional Cooperation
SDGs	Sustainable Development Goals
SGI	Social Globalization Index
SHA	System of Health Accounts
SoC	State of the Climate
TGI	Trade Globalization Index
UHC	Universal Health Coverage
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
WDI	World Development Indicators
WHO	World Health Organization
WTO	World Trade Organization

CHAPTER 1

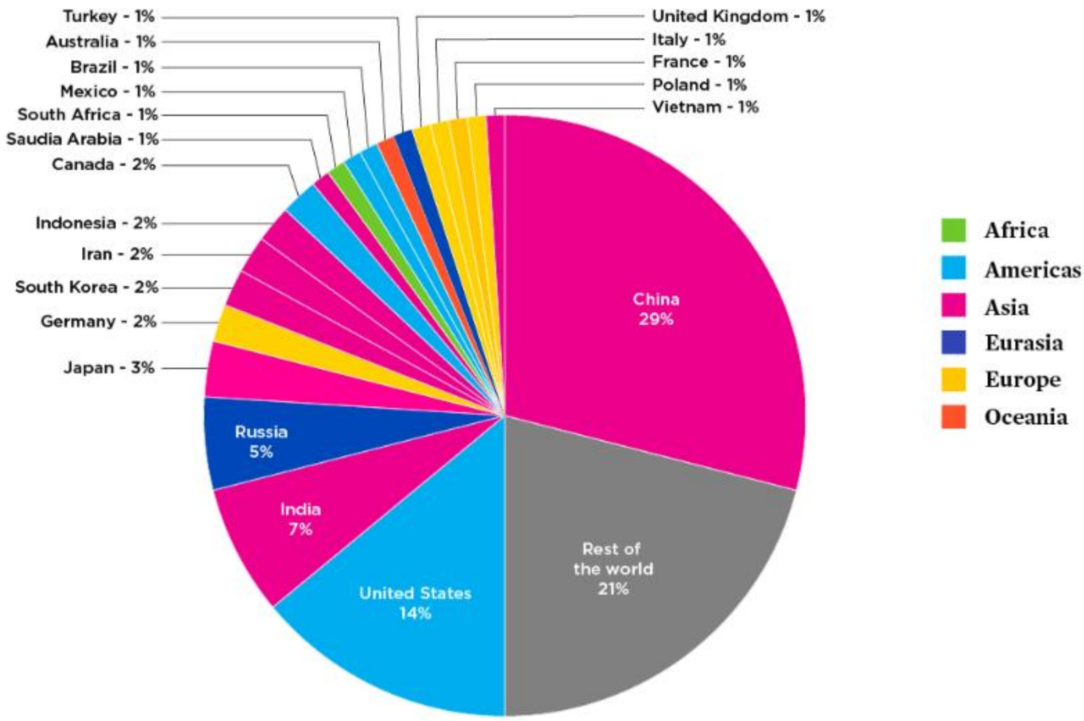
INTRODUCTION

1.1. Background of the Study

One of the prime universal concerns for upcoming generations that have been gradually more threatening and responsible for global warming is air pollution. In the modern world, problems with air pollution and greenhouse gases are frequent. The rapidly expanding economy is contributing to a rise in air pollution that impacts individuals of all ages and geographical locations. The Health Effects Institute (2019) ranked air pollution as the fifth major global danger to health and disability. The region where the WHO's least stringent air quality objectives are not met is the place of residence for around 50% of the world's population. In addition, 90% of individuals live below the WHO standard for healthy air (Sharma, 2014).

Asia is one of the world's most endangered areas in terms of climate change and health risks. This region is home to around 59.66% of the world's population, according to UNFPA (2019a). More people directly correlate to more productivity, which also implies more pollution. One of the five most polluted nations in the world in 2017 was China, followed by India and Japan (SCMP, 2019). In discussions on current pollution, India, Bangladesh, Indonesia, and other Asian nations are also included. Asia has long held the position of the region with the fastest growth rate, as per UNEP (2018a). Additionally, the majority of South Asian and South-East Asian nations are developing nations and put their regulatory standards at a low level in order to draw a large amount of foreign direct investment. Furthermore, industrialization has significantly increased urban pollution in South Asia and the South-East Asian area during the past few decades (Biswas et al., 2008). As a result, the level of pollution varies throughout the nations in this area depending on their geographic position and financial condition. Sea levels have been increasing in recent decades, and Asia would be the zone worst impacted by climate change. Researchers foresee that low-lying and overcrowded coastline communities would be submerged by the sea, leaving hundreds of thousands of individuals—especially in South and Southeast Asia—vulnerable and forcing them to relocate to other areas (IUCN, 2019). As a result, policymakers and stakeholders should pay attention to the analysis of the link between development and the environment, and the formulation of development strategies in Asian countries. Figure 1.1 demonstrates that the maximum proportion of environmental pollution is observed in Asian countries. For example, China causes around 29% of overall environmental pollution and 7% by India. Other Asian countries causing environmental pollution are Indonesia, South Korea, Japan, Saudi Arabia, Turkey, Vietnam, and Iran. According to the Figure 1.1, it is understandable that Asian countries cause the highest environmental pollution in the world.

Figure 1.1 Top annual CO_2 emitting countries, 2019



Source: (UCS, 2019)

A scheme to avoid adverse effects on the environment is being developed by organizations including the Association of Southeast Asian Nations (ASEAN), the Asia

Pacific Economic Cooperation (APEC), and the Free Trade Area. In the context of trade and liberalization in a globalized economy, Asian countries are attempting to integrate environmentally friendly technologies. There are now a number of regional centers dedicated to environmental issues. For instance, the SAARC Meteorological Research Center is located in Bangladesh, while the SAARC Disaster Management Center is located in India and deals with a variety of climate change and environmental disaster-related issues. The participating countries are committed to reducing emissions by increasing the efficacy of energy usage in the manufacturing industries and by increasing forest cover (UNEP, 2014).

The Asian territory is particularly vulnerable to climate change due to a variety of factors, including its topography, demographics, and widespread poverty. Farmers and coastal communities would be negatively impacted by environmental deterioration. Nepal created a sustainable development strategy that prioritizes environmental issues. The strategy produced a clean, renewable energy project together with community forest initiatives and enhanced the nation's weather forecasting infrastructure. Singapore declared that its goal was to control emissions such that they would peak around 2030, while lowering emissions intensity by 36% from 2005 levels by that time (MFAS, 2020). The Philippines has fulfilled its national commitment to reducing and avoiding GHG emissions by 75% by 2030 in the areas of waste management, industry, agriculture, transportation, and energy. Japan announced its Strategic Energy Plan in 2018, with targets outlined for 2030. The objective of the initiative was to cut coal consumption in half, from 32% to 26% (Wikipedia, 2022a). In October 2021, China formally published its long-term strategy (LTS) to the UNFCCC, pledging to achieve "carbon neutrality before 2060" (CAT, 2021). Recently, Pakistan has upgraded its Climate Action Plan for another 5 years, and its government is working on its nationwide climate change strategy. The strategy places a strong emphasis on the production of water resources, the protection of cattle, the preservation of the forest, and an efficient disaster management system. To confront serious environmental challenges, the Sri Lankan government started comprehensive environmental programs. The state has made efforts to promote cleaner manufacturing methods, and emphasis has been placed on biodiversity preservation. Considerable government attention is paid to the creation of technologies that can eliminate greenhouse emissions. East Asia needs to make serious attempts to align its growth strategy with inclusive, climate-aware principles. As development initiatives to balance off the impacts of climate change are already in operation, the consequences of climate change on poverty in Central Asia are very small. In the majority of its sub-regions, Asia has failed on Sustainable Development Goal 13 (Climate Action). In order to meet goal 13 on environmental conservation and adaptation capability, it is stated that South-East Asia, North and Central Asia, and East and North-East Asia must alter the existing trends (WMO, 2021).

The current investigation employs panel data for selected Asian countries to explore the correlation between globalization and environmental deterioration in light of how urgent the situation is with respect to the environment. The biggest portion of pollution released, according to Bacon and Bhattacharya (2007), comes in the form of greenhouse gas emissions. It is important to implement ecosystem-based acclimatization everywhere in the world sustainably. Incorporating ecological balance into the process of economic development will allow Asia's impoverished inhabitants, which are more than 3.5 billion people.

Additionally, the process of globalization is intricate and multifaceted, involving politics, culture, economics, social issues, and environmental concerns (Victoria Flores, 2016). Moreover, globalization is a crucial aspect of environmental quality since it likely alters economic processes, energy consumption, and technology due to its scale, composition, and technological effects (Copeland & Taylor, 2013). Growing concerns have been expressed about how the current trend of globalizing international markets may endanger the sustainability of the environment. Since individuals are ready to face greater environmental deterioration in return for increased consumption, environmental degradation tends to increase at low-income levels. People are, meanwhile, caring more and more about the environment as they upgrade their standard of living. As a result, it is pretty clear that the current trend of globalizing international markets and environmental deterioration are interrelated over the long term. Market globalization resulted in the globalization of environmental concerns as well. The global environmental deterioration that originated and became worse as a result of globalization includes the weakening of the ozone layer, global warming, extensive deforestation, natural resource depletion, desertification, and biodiversity loss.

Considering this concept, several researchers have attempted to research how globalization has affected environmental quality; nevertheless, there are some issues yet, which need to be addressed, and the findings are not convincing (Bilgili et al., 2020; Zafar, Saud, et al., 2019). There are notably some competing ideas of how globalization affects environmental sustainability. The one is that the environment is suffering as a result of globalization (Pata, 2021). According to other investigations, globalization improves environmental quality. With regard to CO_2 emissions, several experts endorse this idea (Ling et al., 2015; Muhammad Shahbaz, Khan, et al., 2017). According to some other researchers, the impacts of globalization on environmental condition differ within various countries (Hao, 2016; Rudolph & Figge, 2017). Additionally, there are several issues with the empirical studies that have already been published, such as the reliance on only a few countries' data (Saint Akadiri, Alkawfi, et al., 2019; Muhammad Shahbaz, Lahiani, et al., 2018) or the use of CO_2 emissions only to demonstrate environmental degradation (Gill et al., 2019). Another issue is the focus on just one aspect of globalization, like foreign direct investment or trade openness (Muhammad Shahbaz, Mahalik, et al., 2019a; Zafar, Saud, et al., 2019).

According to an analysis of relevant literature, most of the existing research concludes that globalization has a detrimental impact on the environment, despite the fact that a significant proportion of it emphasizes the correlation between globalization and environmental quality. Yet, a significant amount of research confirms the claim that globalization is beneficial to the environmental quality; as a result, the verdict is contradictory, and this issue requires more exploration. It is reasonable to conclude that there are certain gaps in the available research based on the analyses stated above. As most investigations typically estimate the environmental pollution simply by CO_2 emissions, for example, very little research has studied the influence of globalization on CFP and CO_2 emissions jointly as environmental deterioration.

Additionally, although the majority of research primarily examined particular aspects of globalization, such as economics or trade, only a small number of studies thoroughly investigated the effect of globalization on environmental quality from the standpoint of political and social globalization. The environment has been impacted both negatively and positively by the remarkable economic, political, and social interconnectedness of countries during the last few decades. Through the channels of trade and foreign direct investment, the economic implications of globalization could affect the environmental quality. For example, foreign investors could use advanced technologies while launching or growing new commercial enterprises, which would enhance environmental cleanliness by lowering energy usage. However, if multinational companies continue to use outdated or traditional technologies, the environment will continue to suffer (Muhammad Shahbaz, Mallick, et al., 2016). Through global tourism, interpersonal connections, and engagement with international media, the social implications of globalization let individuals from different backgrounds communicate. Environmental awareness is brought about through having access to worldwide news, the Internet, as well as other channels. Global environmental awareness might encourage environmentally friendly activities like water conservation, recycling, and the usage of renewable energy sources. Political globalization also enhances national participation in international environmental treaties and commitments. As countries must lower emissions to comply with international regulations, environmental quality is being improved. This study includes seven variables to assess the multi-dimensions of globalization, including general globalization, economic globalization, trade globalization, financial globalization, social globalization, interpersonal globalization, and political globalization, which can extensively explore the broader impact of globalization on environmental quality, unlike the available published studies. To offer additional comprehensive explanation of how globalization affects environmental quality, this study also considers whether globalization is slowing down or speeding up.

The Paris Agreement (2015) highlights the importance of developing human capital in tackling climate change since education raises people's environmental consciousness. Therefore, while governments work toward a low-carbon economy, nations must invest in human capital. Human capital and environmental control are closely intertwined. Human capital is defined as the skills and information a person acquires to increase his performance. It is dependent on years of education and returning from schooling (Danish et al., 2019). The preceding research does not devote much attention to the connection between human capital and the environment, yet education might have a variety of environmental impacts. Climate change is connected to human activity, according to articles from the United Nations Educational, Scientific, and Cultural

Organization (UNESCO) (Hüfner, 2000). Education may aid in identifying the sources and implications of climate change as well as their prevention. A person may better grasp new and complicated environmental concerns owing to education, which enhances access to numerous information sources. According to Zen, Noor, and Yusuf (2014), those with high income and high education levels engage in recycling more frequently than those with low incomes and poor educational backgrounds.

Education tends to make individuals more ecologically conscious, which ultimately benefits the environment. Furthermore, quality education facilitates people's accessibility to knowledge, which also encourages individuals to purchase more ecologically friendlier items. However, the development of human capital in terms of education may result in higher earnings, productivity gains, and consumption rates, which may increase pollution. Higher levels of education typically result in high degrees of spending ability among citizens. Since most of the individuals in these nations belong to the philosophy that "consuming more to be happier," they naturally want to live a decent life despite caring about the environment.

The main causes of rising environmental degradation are human activities like the combustion of non-renewable fossil fuels to operate vehicles, industry, and energy generation. Various natural or human-related processes that emit potentially harmful atmospheric compounds or pollutants into the environment might enhance the negative impact on public health (Shahadin et al., 2018). Authorities could thus spend their finite resources on the installation of environmentally hazardous waste reduction. Additionally, while making decisions on how to allocate funds for healthcare, it is important to establish a balance between the development of human capital and technological advancement. It is clear that advances in people's health may contribute to economic expansion and, in turn, enhance demographic betterment. The linkages are diverse, and they might have both positive and negative impacts. For instance, respiratory diseases brought on by air pollution raise the cost of healthcare. Additionally, particularly for developing nations, higher healthcare costs may lead to a longer-term rise in the consumption of natural resources and environmental degradation. Increased health spending is a sign that society is more concerned with personal and societal health, as well as a significant level of manufacturing output that could result in chemical contamination, poor air quality, and carcinogenic nutrition (Gerdtham & Jönsson, 2000). Investigation of the linkages between environmental quality, healthcare expenditures, and economic expansion is therefore increasingly important. The connection of healthcare expenditures, economic growth, and environmental degradation has drawn increasing attention in the prior studies for both developing and developed countries. Several investigations aim to examine the influence of healthcare expenditures on carbon emissions, while the majority of studies examined the influence of carbon dioxide emissions on healthcare expenditures. Human capital and healthcare expenditures are also considered in this research as a control variable in addition to the previously mentioned variables to better understand the consequences of pollution in Asian countries.

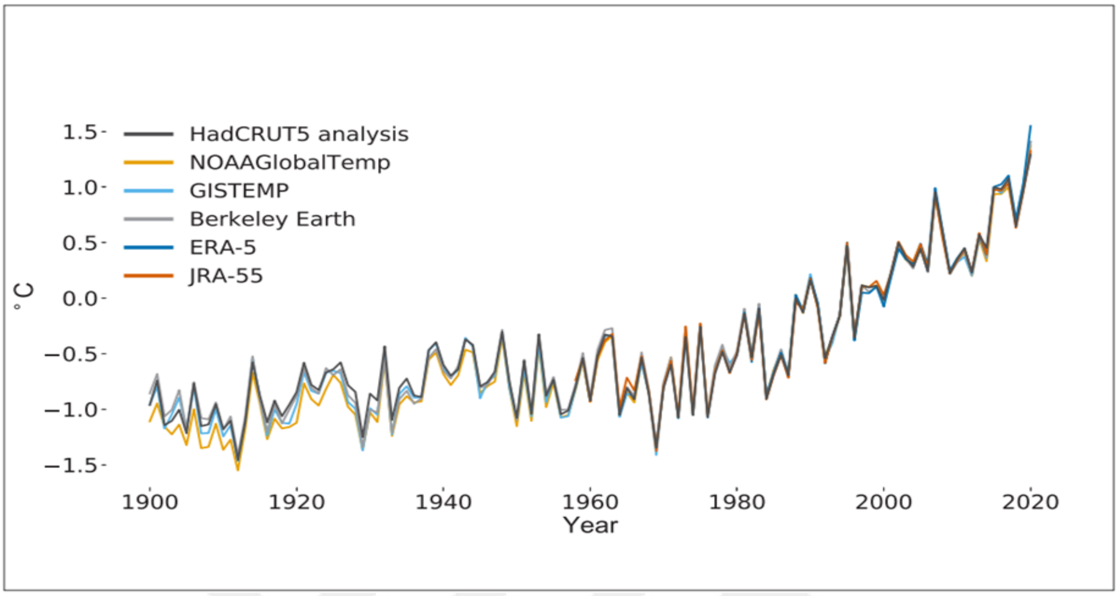
The environmental Kuznets curve (EKC) theory is also examined in this research to determine whether it remains true for all the dimensions and sub-dimensions of globalization and carbon footprint as well as CO_2 emission in Asian nations. An inverted U-shaped connection of environmental degradation and economic growth is suggested by the renowned EKC curve (Dasgupta et al., 2002). Numerous research have been performed with the intention of investigating the EKC correlation of economic growth and environmental degradation throughout multiple nations because of the significance of the economic and environmental regulatory consequences of this EKC theory. The importance of how globalization affects environmental quality has also been researched in environmental economics studies. When viewed collectively, the investigations on the relationships among globalization, income level, and carbon emissions have produced a range of conflicting findings. This research examines that Asian nations' carbon footprint and CO_2 emissions are driven by globalization using a panel quantile regression approach. To the best of our knowledge, this investigation is the first to try to evaluate the effect of all-encompassing index of globalization in influencing the evolution of carbon footprint and CO_2 emissions, controlling economic growth, human capital and healthcare expenditures, as well as relating it to selected Asian nations.

1.2. Problem Statement of the Study

According to the 2030 Agenda of the United Nations, everyone in community, particularly the poor people, should have better living standards as a result of economic growth, human capital investment, and healthcare expenditures in a way that is more environmentally friendly. One of the major concerns of the present time is climate change (Pearse, 2019). The UN predicted that by 2050, there would be approximately one billion climate refugees in this respect if the challenges of climate change and global warming were not tackled (Pearse, 2019). Additionally, the majority of researchers agree that a catastrophic disruption in the climate will occur if the worldwide temperature rise is not controlled to less than 2 °C. This would result in further climate change, poverty, warfare, and significant GDP losses (Ranganathan & Bali Swain, 2018). According to Figure 1.2, the average temperature in Asia in 2020 was 1.39 °C higher than the average between 1981 and 2010, making it the warmest year ever recorded across all data sets (WMO, 2021). Scientific information on the condition of the climatic change in Asia and how it relates to the region's sustainable economic development is presented by the State of the Climate in Asia 2020. It addresses marine and terrestrial temperatures, rising sea levels, as well as notable events that affected the region in 2020, and illustrates the key patterns in climate change using indicators that are widely accepted.

In different Asian countries, seasonal changes and climatic hazards, particularly flood, storm, and drought, have had a substantial consequence on food safety. These also leads to increased migration and insecurity of refugees, migrants, and internal and external homeless people, worsened health hazards, complicated environmental problems, and destroyed ecosystems. Altogether, these effects have a considerable negative influence on long-term sustainable growth, specifically the advancement of the UN Agenda 2030 and the Sustainable Development Goals.

Figure 1.2. Annual mean temperature anomalies 1900–2020 (°C) averaged over Asia, relative to the 1981–2010, for six global temperature data sets as indicated in the legend



Source: (WMO, 2021)

Environmental sustainability and green growth present a tough challenge for Asian countries. In conclusion, green growth is an important initiative to simplify the sequence of implementing economic changes, with an emphasis on green taxes in specific. In the last ten years, the economies of Asia have grown tremendously. Global interconnection has encouraged economic progress, which has consequently helped to alleviate poverty in the Asian regions. The unsettling development is that the excluded population's financial uplifting and Asia's fast economic progress have come at a significant environmental cost. Loss of forest land, unbalanced urbanization, and an increase in greenhouse gas emissions are indicators of environmental degradation. As a result of comprehending the possible drawbacks of such environmental devastation, several Asian countries are attempting to embrace clean-tech initiatives in order to continue their economic development. To stop global warming, it is important to take effective measures to limit environmental degradation. Additionally, there is a great deal of worry regarding Asian nations' environmental policy. Most Asian nations have inadequate emissions rules, and as a result, such nations tend to draw increasingly polluting companies from developed countries (Eskeland & Harrison, 2003).

However, the administrations of Asian nations have recently undertaken a number of attempts to use globalization, economic growth, human capital, and healthcare expenses to achieve environmental sustainability. However, there is still disagreement over whether these constructions have any effect on the environmental condition in Asian nations. Being worldwide phenomena, globalization has an impact on every individual's political, social, and economic dimensions of life. Globalization often links many countries through commerce in products and services as well as foreign direct investment, and its consequences are widespread. A number of studies have sought to demonstrate how increased trading contributes to environmental deterioration both directly and indirectly, as well as how globalization's social, political, and economic aspects have an impact. Internationalization, interconnectedness, and integration all develop as a result of globalization. Carbon emissions and environmental deterioration are of particular significance to the geographies, social organizations, and industries that suffer from the effects of international trade. In addition to the CO_2 emissions, we use the carbon footprint as an additional environmental proxy to investigate a more in-depth relationship between globalization and the environmental pollution since carbon footprint is an integral component of the ecological footprint.

The governments have employed a variety of approaches to reduce carbon dioxide emissions over the past few decades, including the introduction of alternative energy sources, investments in clean coal equipments, and various methods for reducing CO_2 emissions at the municipal, state, and national levels. This study uses the KOF Index of Globalization to specifically link the effects of globalization on CFP and CO_2 emissions. Dreher (2006) designed the KOF Index of Globalization taking into account the three aspects of globalization— economical, social, and political separately. Comparatively to the other openness factors, it is thought that this index is appropriate for assessing the consequences of globalization in emerging economies. Foreign direct investment, trade barriers, taxes on trade, actual trade flows, tariff rates, capital utilizing hidden import restrictions, and portfolio investment are all hindered by economic globalization. Two sub-dimensions, trade globalization and financial globalization, are also assessed in this research to understand better how economic globalization is determined. The exchange of concepts, cultures, knowledge, web users, radio listeners, and the tourism industry are all examples of social globalization. Interpersonal globalization, one of social globalization's sub-dimensions, is also covered in this research. Political globalization is measured by the embassy numbers, international corporations, and United Nations peacekeeping missions that a nation has participated in. The environment has been impacted both negatively and positively by the exceptional levels of economic, social, and political integration and its sub-dimensions across countries in recent decades.

Together with physical capital and technology, human capital is a key driver of economic growth in Asian countries. A major factor in accelerating the pace of technological advancement and innovation in Asian countries is human capital, which is based on education and labor force skills. One of the crucial inputs in the process of reducing carbon emissions is human capital (Layard, 2009). Natural resources such as forests, farmlands, fishing sites, cultivated areas, and grazing ground reduce emissions brought on by human activity (Global Footprint Network, 2018). Nevertheless, human capital has to be qualified and knowledgeable in order for resource utilization to be sustainable. Climate change is connected to human activity, according to articles from UNESCO, and education may aid in identifying the reasons and effects of climate change and their prevention (UNESCO, 2010). A person can better understand unusual and complicated environmental concerns owing to education, which enhances access to numerous information sources. According to Zen, Noor, and Yusuf (2014), those with high incomes and higher educational backgrounds engage in recycling more frequently than those with lower incomes and poor educational backgrounds. Environmental degradation and water pollution could result from inappropriate waste management procedures. The ability of countries to embrace environmentally friendly technology will be boosted by human capital (Zafar, Zaidi, et al., 2019). This supports the argument behind the model's inclusion of human capital.

Under the goal of accelerated production progress, many emerging and industrialized nations overlook environmental quality and a cleaner ecosystem. As the environmental and atmospheric conditions worsen, additional funds are needed for healthcare in order to maintain a healthy lifestyle (Alimi et al., 2020). Nine out of ten individuals breathe contaminated air, and air pollution was the greatest ecological danger in 2019, in accordance with research from the WHO. Global warming and polluted air can increase the occurrence of a number of diseases, including strokes, lung cancer, heart, and respiratory diseases, as well as other diseases. In the time range between 2030 and 2050, it is anticipated that 250 million people will die each year because of increased temperatures, diarrhea, malaria, and starvation as a result of climate change, which are greatly influenced by the ecological footprint and other GHGs emissions, including (WHO, 2019a). These statistics demonstrate how seriously air pollution affects human health. Healthcare expenses are closely related to changes in socioeconomic structures and growing demands for human healthcare.

One of the key components of economic growth is health expenditure, and analyses have demonstrated a correlation between the two that is positive. Healthcare expenses could contribute to increased economic growth and enhanced environmental sustainability as strong economic growth results in higher investments in human capital (Solomon Prince Nathaniel et al., 2021). Various Asian countries are susceptible to the growing load brought on by substandard healthcare systems. A challenging instance to address is that of Asia's continent, which is characterized by weak infrastructure, a scarcity of political willingness to spend on welfare schemes, climatic risks, and a massive number of people. In order to offer appropriate policy implications, it is crucial to study how healthcare spending affects carbon emissions in Asian nations. The unexpected outbreak has put a strain on public healthcare facilities. The 2019 COVID-19 epidemic is a disaster since it has seriously affected both the economy and public health. This outbreak is a clear example of persisting inequality in the health sector.

Considering the immense resource possibilities that these countries are endowed with, the fundamental challenge of this research is to provide an explanation for the missing economic growth and environmental sustainability in Asia. The objective of this research is to deepen the understanding of how the globalization process affects environmental sustainability, and to clarify the theoretical and practical relationship between all components of globalizations, economic growth, human capital, health expenditure and environmental quality. This study also investigates the role of globalization index, growth-emission correlation with other selected controlling variables for their importance in policymaking and environmental sustainability across the Asian countries. Additionally, this research comprises seven variables to assess the aspects of globalization that can thoroughly analyze the broader impact of globalization on environmental quality. These variables are general globalization, economic globalization, trade globalization, financial globalization, social globalization, interpersonal globalization, and political globalization. In order to demonstrate more specific evidence of how globalization affects carbon footprint and CO_2 emissions, this study also focuses on whether globalization is slowing down or speeding up. According to the principles of the EKC hypothesis, this research attempts to determine the relationship between economic growth and environmental degradation in selected Asian countries. By utilizing the EKC framework and certain credible variables, this study's primary contribution is to fill the gap in more contemporary investigations. The latest data, latest econometric techniques, and a consistent model were employed in this study to address this gap in the research evidence. The research objective is specifically centered on environmental sustainability initiatives.

1.3. Research Questions of the Study

In particular, globalization is a multidimensional phenomenon consisting of general globalization and the three fundamental aspects, namely economic, social, and political globalization, as well as associated sub-dimensions, including trade, financial, and interpersonal globalization. Since each dimension and sub-dimension has a notable influence on CFP and CO_2 emissions, it is not realistic to conclude that their effects are all the same. The generalization of the phenomena arises from the fact that the existing research only employed an overall index of globalization to evaluate its influence on carbon emissions. Since each of the dimensions and sub-dimensions has a different influence on the CFP and CO_2 emissions, it is mentionable that they are not all equivalent. It is crucial for the design of effective policy to understand how each of globalization's dimensions and sub-dimensions affects CFP and CO_2 emissions. To provide a comprehensive understanding of the globalization and environmental relationships for efficient policy making, the present research contributes to the literature by examining the effects of dimensions of globalization and each of their sub-dimensions on CFP and CO_2 emissions.

The ultimate goal of this investigation is to present an empirical analysis of the effects of various dimensions and sub-dimensions of globalization on the environmental quality in Asian nations controlling economic growth, human capital, and healthcare expenditures. This research also intends to explore the positive and negative impacts of all globalization-related indices and sub-indices as well as control variables on environmental deterioration in Asian countries. Furthermore, several questions are also raised in light of the fact that the economic, social, political, and other sub-dimensions of these viewpoints are used to study the environmental implications of globalization.

In this study, hypotheses were developed to examine how multi-dimensions of globalization, economic growth, human capital, and health expenditure affect the environment. The seven fundamental hypotheses concerning the above-mentioned factors are examined in the present research to achieve this goal. The following is a summary of how these hypotheses have been developed.

The first issue is related to general globalization, and the hypothesis is presented in the following way:

Hypothesis 1: General globalization has a significant impact on the carbon footprint and CO_2 emissions in Asian countries.

The second research concern pertains to the consequences of globalization's economic dimension and its sub-dimensions, including trade and financial globalization, on environmental quality. How do actual trade flow, trade volume, and foreign direct investment impact the environmental quality in Asia? Another concern is how does the economy impact the environmental quality in Asian nations by means of GDP and GDP per capita? This leads to the testable hypotheses as follows:

Hypothesis 2: Economic, trade, and financial globalization significantly impact the carbon footprint and CO_2 emissions in Asian countries.

Hypothesis 3: Environmental Kuznets Curve (EKC) exists in the case of Asian economies.

The social impacts of globalization and its sub-dimension-interpersonal globalization are the subjects of the fourth research concern. Are the exchange of ideas and technological advancements of the environment within Asian countries being influenced by the inflow of ideas, cultures, information, internet users, telephones, and tourist? Here, the hypothesis is:

Hypothesis 4: Social and interpersonal globalization have a significant impact on the carbon footprint and CO_2 emissions in Asian countries.

The fifth research concern is how the political influences of globalization affect environmental performance. When countries establish international organizations and regulations to address environmental challenges, the political factors of globalization are on show. To what extent have Asian nations participated in multinational organizations and accords, and in what ways have they influenced on environmental deterioration? The fifth testable hypothesis is as follows:

Hypothesis 5: Political globalization has significant impacts on the carbon footprint and CO_2 emissions in Asian nations.

The sixth issue is related to human capital, and the hypothesis is presented in the following way:

Hypothesis 6: Human capital improves environmental quality in Asian countries.

The seventh research concern is related to health expenditures. To suggest appropriate policy implications, it is crucial to look at how healthcare spending affects CFP and CO_2 emissions throughout Asian nations. The unexpected outbreak has put a strain on public healthcare systems. The COVID-19 pandemic is a disaster since it has seriously affected both the economy and public health. This outbreak is a perfect example of ongoing inequality in the healthcare system. So, the seventh research hypothesis is:

Hypothesis 7: Current health expenditure has a beneficial impact on environmental conditions in Asian nations.

1.4. Objectives of the Study

Global issues include unstable economic viewpoints, environmental deterioration, resource scarcity, shortage of freshwater, and biodiversity loss, rendering the planet progressively insecure and unhealthy for upcoming generations. The globalization, economic (GDP), social (education), health, and environmental (pollution) aspects of sustainability must be integrated and balanced in order to tackle these troublesome challenges on a long-term basis. The precise objectives of this study are as follows-

1. To investigate the relationship between globalization, economic growth, human capital, current health expenditures, and environmental pollution in selected Asian countries.

2. To evaluate how the dimensions and sub-dimensions of globalization play role in environmental degradation within Asian countries.

3. To assess the presence of the Environmental Kuznets Curve (EKC) hypothesis for Asian countries.

4. To explore the impact of human capital and current health expenditure on the environmental conditions of Asian countries.

5. To provide some policy suggestions that might assist with achieving environmental sustainability as well as economic development in Asian countries.

With a particular emphasis on Asian countries, this research contributes to the continuing arguments regarding the important factors that affect the quality of the environment in developing and developed nations.

1.5. Scope of the Study

The ultimate objective of this study is to assess how all of the components of globalization have affected selected Asian nations' environmental sustainability. This study includes additional factors, including economic growth, human capital, and healthcare expenditures, as control variables since the inclusion of more pertinent factors, might enrich the findings. The representative sample size is modest and consists of a panel of twenty-two selected Asian nations. The relevance and reliability of the outcomes could be questionable due to the modest sample size and the panel data. In order to fix the issue, this study used tests that are more model-compatible with these issues. These tests include the cross-section dependence tests, homogeneity tests, and panel quantile regression estimation. The annual data is collected from the World

Development Indicators, the KOF Globalization Index, the Global Footprint Network, and the Penn World Table Version 10.0, and it covers the years 2000 to 2017. The integrating characteristics of the variables were examined in this study using both the first and second-generation unit root tests.

1.6. Organization of the Study

This dissertation comprises a total of seven chapters. Chapter one focuses on the introduction. This chapter presents the background of the study, problem statement, research questions, and scope of the study. Chapter two presents the meaning of globalization and explains the environmental effects of globalization. Chapter three presents the development summary and environmental pollution of Asian countries. Chapter four discusses the literature review encompassing the most appropriate and worthwhile literature in this range. The methodology is explained in chapter five. The explanations of the variables, the model specification, and finally, the demonstrations of the different estimation methods are covered. The empirical findings and explanations of the different tests are covered in chapter six. The results, policy recommendations, and research limitations are covered in the last part.

CHAPTER 2
GLOBALIZATION AND ITS IMPACTS ON ENVIRONMENT

2.1. Globalization

Globalization is the term that describes the increasing interconnectedness of the world's financial systems, traditions, and communities brought about through multinational trade in goods and services, technological innovations, investment flows, and knowledge. Globalization has gained increasing attention over the past decade in the intellectual, governmental, and corporate sectors simultaneously, evoking a variety of linkages, connotations, and accompanying myths. Globalization is broad in extent and diversified in nature, and it is becoming more and more important in the public press in addition to in academia and politics. The degree to which the deregulation, economic liberalization, and ongoing development of information technology have created a situation where products, labor, and investment are perfectly mobile is a topic of controversy among economists. In a similar manner, political economists examine the level that such economic trends cause the state to wither even more quickly than Marx had predicted. It is suggested that enhanced capital mobility and the financial markets' punitive discipline undermine the government's authority in the areas of fiscal and monetary affairs, resulting in an impervious trend of convergence, "institutional isomorphism," and state contraction. Experts of international relations, political analysts, and normative political thinkers debate whether global governance, a universal political system, and an emerging post-national "cosmopolis" are desirable and, in some cases, whether they actually exist (Hoffman, 1995; Luard, 2016; Zolo, 1997).

As the world has become increasingly unified by political conflict and mobilization patterns that exceed national boundaries as a result of American cultural imperialism, Westernization, Coca-Colonization, and McDonaldization, sociologists also argue for the idea of a homogeneous universal civil society (Albrow, 1996; Latouche, 1996; Shaw, 1994; Tomlinson, 1991). Globalization is not yet explicitly defined, despite the fact that these writings emphasize the flows of information, labor, capital, culture, technology, and globalization. The concept of "globalization" in broad and, more particularly, if the phenomena even occur at all, appear to be open to different perspectives. The study of globalization frequently reveals not only a variety of conceptions of the term but also many opinions relating to the nature of the phenomena, such as the claim that it is essentially the continuity of a process that is already going on for centuries rather than a new set of procedures. Globalization encompasses features of the widely held belief that there is an extending, deepening, and accelerating of interconnectivity on a global scale in all spheres of life, from the culture to the crime, the monetary to the ecological.

The effects of social, political, cultural, economic, religious, geographical, racial, historical, and environmental factors individually and together on globalization are the key points of contention. There are many articles that discuss specific facets of globalization. But as complication has intensified, so has the interconnectedness of all nations. Global economic and political issues that recur frequently necessitate novel solutions. The global economic turmoil has only served to highlight the necessity of finding global responses to common challenges while also developing domestic resolutions in a universal environment.

In order to effectively respond to urgent global concerns, new strategies are needed that reflect an understanding of the "local" in specific political, economic, social, cultural, and geographic aspects. Sheffield, Korotayev, and Grinin (2013) reveal insight into the structure of global processes and the factors driving growing integration into the past of globalization. They suggest a timeline of globalization based on a distinctive approach and a world-system perspective that examines the growth of geographical linkages over seven historical eras, beginning with the Agrarian Revolution. William Thompson makes a contribution to the study of the significance of international events and the chronology of political and economic globalization (Gills & Thompson, 2012; Thompson & Black, 2002). He contends that the historical scripts, which differ greatly, are what determine how we interpret global politics and an instance of rapid globalization. Employing a geopolitical assessment of major globalization episodes from the past, present, and future, Randall (2010) provides an explanation. The survival of the country has relied on its armed force, which changes in degree of legitimacy, monopolization, and size of the country governed, as historical sociologists in the spirit of Weber have recorded.

2.1.1. When did Globalization Begin?

Since the early 1960s, intellectuals have been referring to globalization. The term was first used academically in the early 1980s, but it is now used more often across a range of fields. One to three articles on the topic of globalization were released annually beginning in the first half of the 1908s (Busch, 2000). The term first frequently appeared in the mainstream media in the late 1980s, initially as a comparison to the growing free economy but in recent times, together with more political and cultural links. It has especially started to appear in comparison to particular incidents, including the protests against the World Trade Organization (WTO) in Seattle and the passage of the North American Free Trade Agreement (NAFTA).

When we discuss globalization, we're talking about a world where, after accounting for exchange rate and default risk, there can only be one global interest rate (Brittan, 1996). It relates to a number of interconnections and linkages that exist between the governments and societies that make up the contemporary global order. It explains the mechanism through which actions taken in one area of the world may have a major impact on people and communities located in geographically far areas (McGrew, 1992). People, organizations, and nation-states are now able to travel across the world further, quicker, deeper, and cheaper than before because of globalization, which is the inevitable convergence of marketplaces, nation-states, and technology to an extent never before seen (Friedman, 2000). Although by no means exhaustive, this compilation of views shows that various individuals have varied ideas about what globalization entails. Some believe it to be primarily an economic phenomenon, while others argue that it is a global hegemonic structure.

The concept of globalization has captured much of the attention of the community throughout the last decade. Globalization has replaced modernization as the dominant conceptual force in the social sciences in the 1960s in discussions of economics, politics, religion, and culture. The ultimate definition of globalization is still up for debate, as is the case with most fundamental principles in the social sciences. It has been conceptualized as operation at a range (indicating that social agents' activities in one place could have substantial effects on "distant others"); time-space compression (relates to how immediate electronic communication lessens the restrictions of time and distance on social engagement and association); and intensifying interdependence (introduced as the growing relationship between domestic economic systems and communities so that the incidents in one place can have a major effect on those in another location); a shrinking universe (the dissolution of national and geographic limits); as well as several other conceptions, such as global integration, awareness of the state of the world, and strengthening inter-regional connectivity (Albrow, 1996; Giddens, 1990; Held et al., 2000).

2.1.2. The Concept of Globalization

The word "globalization" derives from the noun "global," which means "pertaining to or encompassing the entire world" (Oxford English Dictionary). Globalization, as an idea, describes both the "narrowing" of the planet and the rise in global consciousness. This is the concept that is used to characterize the alterations that cross-border commerce, investment, and cultural exchange have brought about in communities and the global economy. The term "globalization" refers to the strengthening of international social linkages connecting far-flung locales in such a way that local events are influenced by those taking place far away and vice versa (Giddens, 1990). In one study, Scholte (2002) categorized the globalization concept into five general categories as follows-

- ✓ **Globalization as internationalization**

Globalization is seen as "just another word to represent cross-border connections within countries," according to this perspective. It deals with the rise in global trade and interdependence.

- ✓ **Globalization as liberalization**

Abolishing the constraints that governments have enacted on international travel within countries.

- ✓ **Globalization as universalization**

The process of disseminating thoughts and experiences to individuals on every part of the world in order to unify ambitions and life experiences.

- ✓ **Globalization as westernization or modernization**

Capitalism, industrialism, and other contemporary social processes are widespread throughout the world, obliterating cultures and local self-determination in the end.

- ✓ **Globalization as deterritorialization**

"Reconfiguration of geography" is the phenomenon of "no longer completely mapping social space by means of territorial locales, territorial ranges, and territorial boundaries".

2.2.Environment and Globalization: Understanding the Linkages

The understanding that ecological phenomena frequently disregard regional borders and those environmental issues can have effects beyond boundaries, sometimes worldwide, led to a rise in global environmental interests. The idea that humans' capacity for global action and thought also introduces a new level of universal obligation—not only to the world's assets but also to its fairness—was related to this. These concepts were crucial to both the rhetoric that defined contemporary environmentalism in the 1960s and 1970s (Lovelock, 2016; Meadows et al., 1972; Ward & Dubos, 1972) and the creation of the idea of sustainable development in the 1980s and 1990s (Chasek et al., 2006; Raskin et al., 2002).

The contemporary globalization debate has dissociated from its environmental surroundings and foundations. It is important to revisit and acknowledge these connections between globalization and the environment. Ignoring these connections results in a misunderstanding of the scope and character of globalization as well as a loss of chances to address some of the most severe environmental issues facing humanity. The Global Ministerial Environment Forum (GMEF) of the United Nations Environment Program (UNEP) has chosen globalization and the environment as one of its topics of concentration for its sessions in February 2007 (Najam et al., 2016).

The current globalization argument has been acrimonious, but it was not always effective. There is no denying that several extremely important global procedures, including social, political, cultural, economic, and environmental—are in progress and that they have an impact on almost everybody and everything. However, there is no consensus on how to define "globalization," nor is there an accord on whether aspects of it are beneficial or harmful and for whom. The public's perception of globalization, its benefits, and drawbacks, is mostly divided into two sides. It has frequently been portrayed as either the solution to all of the world's problems or as their main source. Similar expectations and concerns about the relationships between these two fields have affected the discussion on the connections between globalization and the environment.

2.2.1. Contemporary Globalization

There are different aspects that contemporary globalization reveals itself, but three of them, as mentioned below, are particularly important to lawmakers because they present both substantial environmental possibilities and challenges.

2.2.1.1. Globalization of the Economy

The globalization of the economy emerges as national economies merge with the global economy through commerce, short-term capital flows, human migration, international labor migration, foreign direct investment, technological flow, and foreign direct investment (Bhagwati, 2004; IMF, 2002). Many people now have new chances owing to this, but not everyone. Additionally, it has put a strain on the ability of the ecosystem to survive itself and on environmental assets, revealing our dependency on our environment (Nicholas, 1971). Global externalities and increased inequality can both be the results of a globalized economy (Bauman, 1998; Shiva, 2005). Regional environmental and economic choices can support universal development, but they can also externalize the environmental and economic consequences of our activities to distant regions and populations that appear to be invisible.

2.2.1.2. Globalization of Knowledge

The practices of knowledge integration and the strengthening of non-market relationships, comprising information flows, technology, ideology, and culture, grow more popular as economies open up (Held, 2003; Jelin, 2000). In addition to creating new issues, modern technology can also address existing ones. Environmental extraction technology can go across borders more quickly than environmental care technologies. When transnational social movements and outsourcing take off, for example, information flows potentially link workers and people across borders and coasts, but they might also put domestic social and economic networks in danger. Mass consumption has also become really global, just like environmentalism as a trend.

4.1.1.3 . Globalization of Governance

With the narrowing of space and time, the growing influence of non-state actors, and the complexity of inter-state relations, globalization further strains the already precarious forms of global governance (UNSG, 2000). Due to the need for global environmental governance, a transnational network of organizations and intergovernmental treaties has developed and is still expanding (Roch & Perrez, 2005). However, many of the current environmental issues in the world have surpassed the governing structures put in place to address them (Najam et al., 2004, 2006). The fact that many of these organizations are restricted by institutional design principles left over from a previous, more state-centric era causes them to suffer as they attempt to address an ever-growing list of global concerns.

2.2.2. Environment & Globalization: Some Examples

Despite being frequently disregarded, the connection between the environment and globalization is crucial for both disciplines (Speth, 2003; Wijen et al., 2005). A single common atmosphere protects our planet's temperature and shields us from harmful UV radiation, and life-sustaining ecosystems and waterways often traverse international borders. Air pollution also frequently transcends whole continents and seas. Organized global or regional governance is typically required for environmental monitoring and response. Furthermore, the environment is inextricably tied to economic growth because it provides the ecosystem facilities that support both life and livelihoods, as well as the natural resources that drive growth. The economy is, in fact, said to be the ecology's wholly-owned subsidiary by analysts (Nelson et al., 2002).

In addition to the effects of globalization on the environment, it is critical to emphasize how these aspects affect the rapidity, scope, and excellence of globalization. This is due, at the very least, to the fact that ecological assets stimulate economic globalization, as well as the fact that the setting in which globalization takes place is constrained and influenced by our social and governmental approaches to global environmental concerns. For instance, this occurs as a result of the governance frameworks we develop and the arrangement and interests of stakeholders that shape important policy dialogues. Additionally, it occurs as a result of the dissemination of social standards, goals, and concepts that crisscross the world to create existing and emerging social movements, such as global environmentalism.

In other words, not only are globalization and the environment intimately connected, but they are also very closely intertwined that we cannot even begin to recognize the global environmental issues we face without first being able to comprehend and utilize the trends of globalization that shape them. In the same way, individuals who want to take advantage of globalization's prospects would not be ready to do so except if they are prepared to comprehend and deal with the major environmental issues of our day, which seem to be a part of the environment in which globalization occurs. Table 2.1 represents some examples of the interaction between the environment and globalization.

The prospect of increased economic potential has tended to be emphasized in the prevailing debate on globalization. However, there is a concurrent worldwide conversation on environmental sustainability. It is necessary to build a more comprehensive insight that aims to take advantage of the worldwide opportunities presented by globalization while also upholding justice and meeting ecological obligations on a global scale.

Table 4.1 Few examples of how the environment and globalization interact

What impact does globalization have on the environment?	Influencing approaches	What impact does the environment have on globalization?
- As consumption rises, the extent and nature of economic activity shift, enabling more broadly diffused externalities. - As income goes up, more resources have become available for environmental sustainability.	Economy	- Demand and supply factors in global markets are sparked by natural resource shortage or richness, which drives globalization. - The demand for environmental improvement could drain resources from development priorities and add expenses to the economy.
- Interactions on a global scale promote the exchange of environmental best practices and information. - The establishment of international environmental alliances and civil society initiatives has increased environmental awareness. - Globalization helps present technologies expand and new ones arise, frequently replacing older ones with more exploitative substitutes. Greener technologies could also be encouraged.	Knowledge	- In the compacted world, environmental stress signals spread quickly, and environmentally damaged and unstable regions are excluded from commerce, investment, and so on. - Environmental pressure can lead to the emergence of alternate technological routes, such as dematerialization and alternative energy sources, which may not have otherwise occurred. - Environmental awareness spreads around the world.
- As a result of globalization, it is become harder for nations to protect the welfare of their residents and the environment alone through national regulations. - The engagement of a widening range of stakeholders and their alliances in tackling environmental problems, such as commercial and civil society actors, is made possible by globalization.	Governance	- Due to the structure of environmental concerns, other fields, including commerce, investment, labor, and health, must include environmental governance. - Stakeholder engagement in international environmental administration, particularly the involvement of NGOs and civil society, has emerged as a paradigm for other spheres of international policy-making.

Source: (Tonby et al., 2019)

2.2.3. The Globalization of Environmental Policy

Environmental governance has been spreading around the world for almost thirty years. The industrialized countries established organizations and regulations for environmental conservation in the 1970s and 1980s. Environmental policy has become more globalized since the end of the 1980s. An essential reality of today is the global proliferation of environmental policy entities in states of all segments.

The following strategies are the foremost crucial in the globalization of environmental regulation (Jänicke, 1996).

1) At the global platform, the importance of governmental and non-governmental entities and organizations pursuing environmental conservation aims is expanding, and the propensity for already-existing international agencies and organizations to "ecologize."

2) On the domestic platform, the establishment of regional environmental policy entities in other nations and their growing global interconnectedness.

3) The transmission of new environmental policy ideas through these global organizations and networks, both directly ('horizontally') and indirectly ('vertically').

CHAPTER 3

ENVIRONMENTAL POLLUTION AND DEVELOPMENT IN ASIAN COUNTRIES

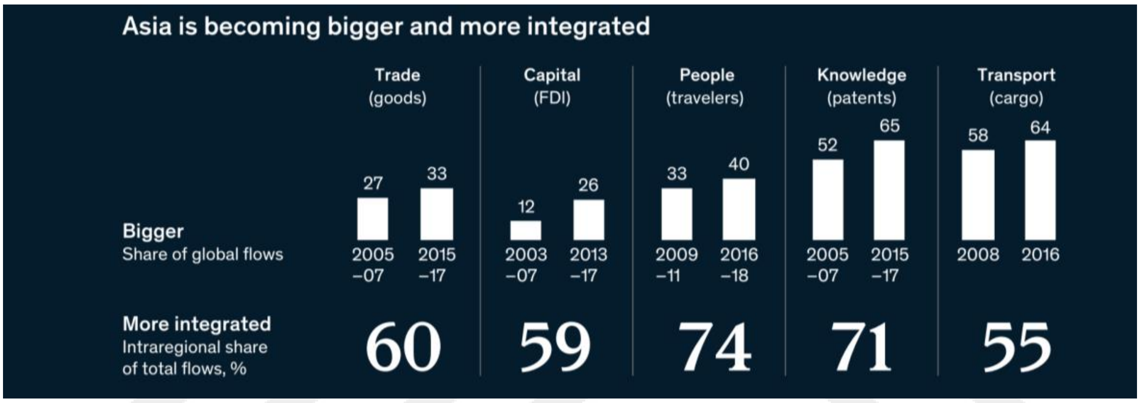
3.1. Asian Flows and Networks: Defining Globalization

As the constituent economies interact more intimately with each other in trade, technology, culture, and population flows, Asia, the biggest regional economy in the world, is likely to gain increasing influence. In what could be considered the Asian Century, Asia will drive and determine the subsequent stage of globalization (Tonby et al., 2019). Asia is progressively taking on the role of the global hub. In purchasing power parity terms, its proportion of the world's real GDP increased from 32 to 42% between 2000 and 2017, from 23 to 28% in terms of consumption, and from 23 to 40% in terms of the world's middle class. These three scale indicators are anticipated to rise even further by 2040, reaching 52, 39, and 54%, correspondingly. Despite issues like rising financial system vulnerabilities, inequality, and environmental pressure, Asia's forecast for medium- to long-term growth seems positive. Seven out of the eight global flow axes—trade, capital, population, knowledge, transportation, culture, resources, and environment—are moving toward Asia. Waste (environment) is the only flow that has diminished. Asia's contribution to the world's trade in goods increased from 27 to 33% between 2007 and 2017, as did its proportion of capital flows from 13 to 23%, global patents from 52 to 65%, and transshipment (transportation) from 59 to 62% (Tonby et al., 2019) (See Figure 3.2).

As intra-regional movements increase, Asia is becoming more and more Asian. 60% of products traded by Asian nations, 74% of Asian airline passengers, 59% of foreign direct investment, and 71% of Asian financing to entrepreneurs are shifting within the territory (See Figure 3.1). Depending on the scale, economic growth, co-operation inside Asia, and connectivity to the rest of the world, Asia is distinct yet complimentary.

These groups' complementary natures can increase Asia's prosperity and resilience. Strong networks are being created by the integration and intra-regional flows within several Asian countries, with the emergence of new metropolitan hubs and spokes developing quickly. Despite the risks and difficulties that Asia still faces, policymakers must be ready to succeed in the Asian Century. To be pertinent to Asia, they must join Asian flows and connections and provide what Asia requires. They must also protect against and prepare for consequences by reacting to environmental challenges, filling skills shortfalls, and strengthening organizational abilities.

Figure 5.1 Asian flows and networks: defining globalization



Source: (Tonby et al., 2019)

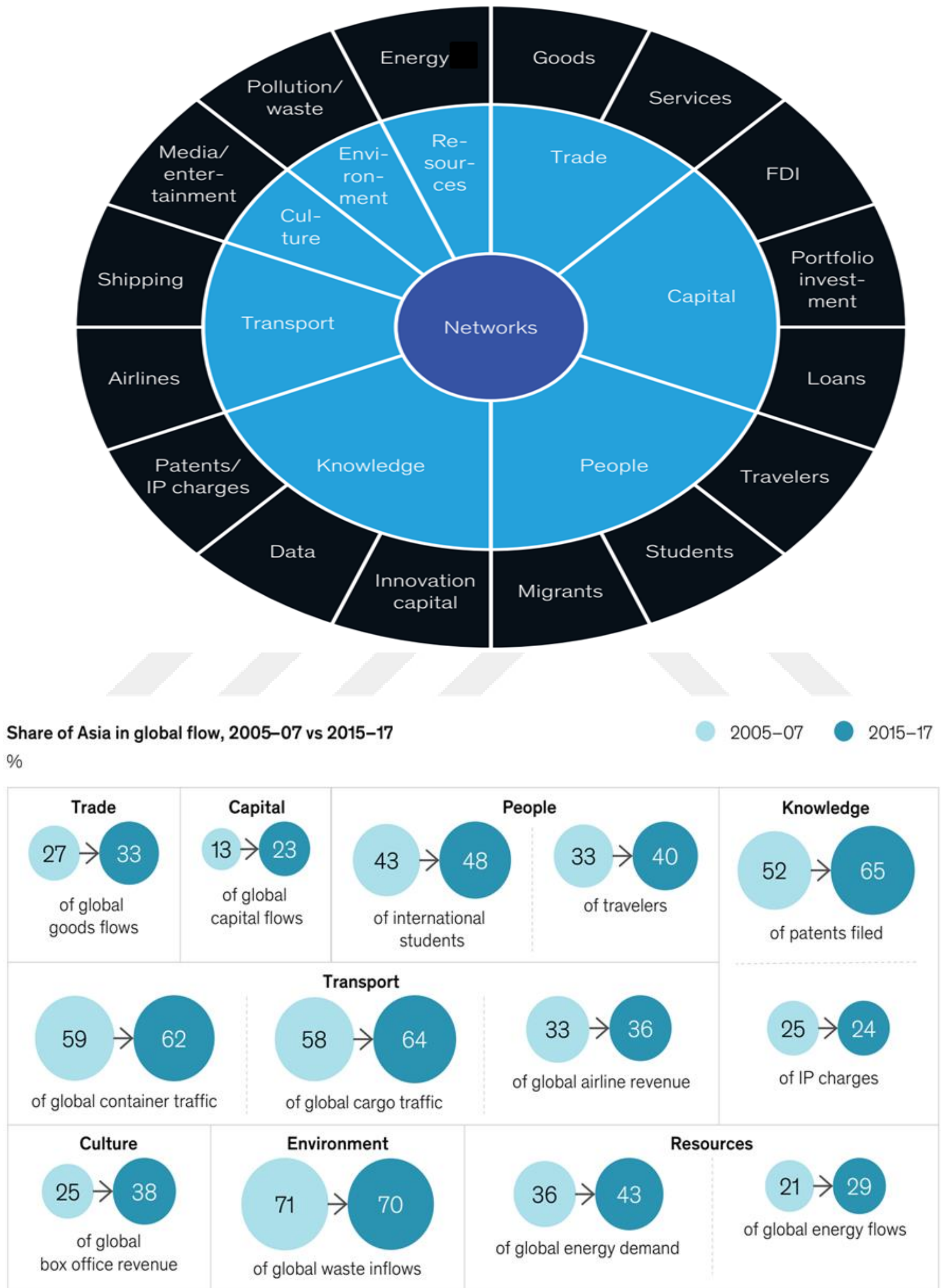
3.2. Asia—the World's Largest Regional Economy

It is now the Asian Century. Asia is the biggest regional economy and is the driving force behind global growth. The extent of the area has reached a threshold where it is of international pertinence; currently, the majority of cross-border flows around the world are moving toward Asia, and intra-Asian flows are increasing. Vibrant interconnections of business, technology, and people are now starting to carry enormous weight, driving broad-based growth throughout the region as Asia's distinct economies connect with one another. Asia is leading the way in a brand-new era of globalization. Internationally, cross-border commerce in goods is becoming less intensive, less dependent on comparing labor costs across nations, but increasingly experience, understanding, and more geographically focused. In every way, Asia is experiencing these changes more quickly.

The growth of Asia is remarkable, and the region's potential for sustained progress over the medium to long run presents promising opportunities for businesses everywhere. There would be uncertainties and difficulties in both business and politics, such as the possibility of rising trade disputes (MGI, 2019). According to the latest McKinsey analysis, a storm is brewing in Asia's financial sector as a means of declining margins and increasing expenses brought on by more vulnerability, nonperforming debts, and macroeconomic concerns (M&C, 2019). Challenges to Asia's economy stem from geopolitical linkages, trade disputes, inequality, and climate change that might significantly disrupt global flows and societal stability. Understanding the structure and trends of Asia's rise in various aspects is crucial considering these possible concerns.

In this investigation, the twenty-two biggest, fastest-growing, and most interlinked nations, which are essentially major international hubs, were found to be located in Asia. Bangladesh, India, Pakistan, Sri Lanka, Nepal, Malaysia, Philippines, Thailand, Singapore, Japan, China, Indonesia, Turkey, Brunei Darussalam, Jordan, the Republic of Korea (South Korea), the United Arab Emirates, Mongolia, Vietnam, Saudi Arabia, Kazakhstan, and Armenia are among them. These nations can likely mobilize substantial political and economic capabilities. They have recognizable brands since they are big and commonly have a rich history. They are expanding swiftly, driving up GDP and population growth. Because of their extensive financial and travel connections, they have built world-class cities for inhabitants around the world. Asia is not only growing in scale but also assimilating quickly, possibly establishing the trend for a subsequent phase of globalization. Internationally, the intra-regional proportion of global goods trade in products is now increasing after years of decrease.

Figure 5.2 Asia has gained scale on seven of eight types of flows over the past decade



Source: (IMF; UNCTAD; WTO; OECD; McKinsey FDI Atlas Database; McKinsey Global Institute analysis)

3.3. Environmental Pollution and Health Hazards in Asia

Researchers have been interested in Asia since the 1970s because of its rapid economic growth and severe environmental contamination. Asia has long held the title of area with the fastest growth rate, according to UNEP (2018b). This region is home to the nations with the fastest economic growth ratios. Since some of these nations are among the world's smallest, most populous, poorest, or also richest, there are some disparities among them. About 59.66% of the world's population, as of UNFPA (2019b), resides in this area. Even though the majority of the impoverished reside here, the region has made great progress in the global fight against poverty. For example, in this territory, low-income residents decreased to less than 2%, and high-income residents increased to 96.2% in 2015, compared to 91% who lived at the low-income level and 9% at the high-income level, according to estimates from Estrada et al. (2018).

It is interesting that the Asia Pacific region has 7 out of the 10 nations that are highly endangered by the consequences of climate change (UNEP, 2018b). As a result of the rise in greenhouse gases (GHGs) during the past few decades, sea levels have been rising, and scientists and experts predict that Asia will be among the regions most severely affected by climate change. Millions of people, especially in South and Southeast Asia, are most at risk, and the majority of low-lying and crowded seashore cities would be submerged (IUCN, 2019).

Asia's developing nations are dealing with two concerns. First of all, the fastest-expanding economies like China, Indonesia, and India are burning coal and oil, associated with deforestation, causing them to produce a significant level of GHGs and air pollutants over an extended period of time. Now, South and South-East Asian nations are also experiencing an increase in harmful emissions as a result of the expansion of coal-based power plants. As an illustration, Bangladesh has approved 13 massive coal-based power schemes in association with other Asian nations like Japan, Singapore, Malaysia, China, South Korea, and India. The anticipated annual coal consumption for these projects is around 4.12 million tons, with plans to acquire all coal from Australia, China, and Indonesia (ICSC, 2019). Qatar, Saudi Arabia, and Iran, in particular, control a large portion of the world's oil and gas supply. As a result, all sorts of pollutants, particularly CO_2 and CH4 release, rise dramatically in this area. However, Crippa et al. (2018) demonstrated that, in comparison to developed nations, assumed emission factors (EFs) are significant for developing countries. They claim that China and India have been major emitting regions for the past ten years but that things are now fast changing in comparison to Europe or the USA.

3.4. Significance of Asia

The influence of the Asia zone has grown as the hierarchy of the sub-geographic areas and nations in Asia has changed. A major challenge in this area at the moment is the consequence of greenhouse gas releases and climate change. Over the last few decades, there has been an enormous and rapid increase in greenhouse gas emissions and a dearth of reduction. In this area, the effects of climate change are currently being noticed with concern. The most polluted territory within those is undoubtedly South and South-East Asia. There has lately been wide-scale media coverage of India's schools being closed due to the terrible environmental pollution. PM and smoke cause the air to become hazy (Sastry, 2002; Yamamoto et al., 2014). The 50 urban areas with the poorest air quality in the world are located in India, Pakistan, China, and Bangladesh (Child, 2019). Because of industrialization and contemporary technologies as a result of globalization, GHG emissions are escalating. The exogenous growth model places a strong emphasis on capital-intensive production using advanced technologies and productivity growth.

First and foremost, all nations and policymakers should be compelled to adopt strict regulations for domestic and international pollutants. Local regulations could easily reduce direct and regional pollution in a country. Some air pollutants, such as suspended particulate matter (SPM), are identified as local pollutants with transient effects and turning points that are observed in areas with lower per capita income. However, some pollutants, such as carbon dioxide, have a long-term effect on the entire world and reach a tipping point at high per capita income levels, where they may even increase uniformly with income (Cole et al., 1997). Therefore, it is highly challenging to reduce emissions of global pollutants—also known as undetectable and trans-boundary pollutants—through local regulations alone. In this context, global entities and stockholders need to acknowledge all contaminants for what they are (Yeşilçayir, 2016).

It is important to remember that worldwide pollution is responsible for the problem of global warming and climate change, which impacts not only the original source nation but also all other nations and regions. Additionally, not all nations are equally to blame for pollution, yet they are all adversely influenced by it. For example, Carvalho and Almeida (2011) showed that only sixty countries, the majority of which are in Asia and Europe, are responsible for producing nearly 75% of the world's CO_2 emissions. Hence, in order to minimize and control emissions internationally, we should adopt a consistent global environmental strategy with appropriate participation from all parties. Assistance with sustainable and contemporary technologies from developed countries to developing countries and the establishment of a climate change budget are among the measures that are crucial to the effectiveness of environmental policy itself.

CHAPTER 4
GENERAL INFORMATION AND LITERATURE STUDY

The point raised in the literature is that it is pretty unclear how globalization will influence environmental quality. Its impact on the extent of degradation depends on different modes of globalization, and it is greatly influenced by regional factors, including environmental laws, economic structure, and public awareness of the environment. This chapter addresses earlier investigations that evaluated the relationship between globalization, human capital, economic development, present health care expenditure, and environmental quality.

4.1. Globalization and Environment

Over the past couple of decades, globalization has changed the world, and the states are now interconnected on an economic, social, and political scale. Globalization has been swiftly and dramatically influencing the earth with the advancement of science and technology, trade freedom, international finance, and transnational enterprises of multinational businesses (Garrett, 2000). Many academics have explored its effects on poverty, inequality, and other aspects, including economic growth (Dreher et al., 2008; Gurgul & Lach, 2014; Ravallion, 2003). Although the effects of globalization on environmental quality have intensified throughout the last couple of decades, very few researchers give importance to how it affects the environment. Global environmental issues, including ozone deterioration, excessive consumption of resources, deforestation, and desertification, were brought on by the globalization process (M. T. I. Khan et al., 2018). While globalization could increase global CO_2 emissions as it fosters economic activity, it can also contribute to enhancing environmental quality by bringing forth ecologically sustainable technology (Haseeb et al., 2018). To be more precise, prior research mainly concentrated on the economic impacts of globalization by employing international commerce, foreign direct investments (FDIs) (Koçak &

Şarkgüneşi, 2018; Ling et al., 2015; Pata, 2018b, 2019), and trade openness (Acheampong et al., 2019; Kim et al., 2019; Muhammad Shahbaz, Nasreen, et al., 2017) as proxies. Abdouli, Kamoun, and Hamdi (2018) demonstrated that the BRICS states' CO_2 emissions increased as a result of globalization as measured by FDI.

Grossman and Krueger (1991) presented a noteworthy explanation of the conceptual relationship of globalization with environmental degradation, arguing that trade openness, a crucial aspect of globalization, has both beneficial and adverse consequences on the environment. The favorable correlation is due to the increased economic activity brought about by global commerce, which spreads hazardous carbon emissions and, therefore, has a detrimental impact on the environment (Cole et al., 2006; Jena & Grote, 2008). As a result, empirical research into the causal relationships between globalization and the environment is replete with both favorable and unfavorable assertions (Antweiler et al., 2001; Liddle, 2001). Consequently, they lack the coherence in figuring out the precise relationship within the variables, leaving the opportunity to look into the linkage by employing more accurate measurements and advanced econometrics. Since trade openness and capital inflows help to acquire more cutting-edge, eco-friendly technologies, the impact of globalization leads to a refinement in environmental quality (Godil, Sharif, Agha, et al., 2020; Muhammad Shahbaz, Lahiani, et al., 2018).

Additionally, the comparative availability of factor endowment in every economy influences trade. Hence, depending on trade and environmental policies in the economy, a competitive benefit of trade affects the quality of the environment (Copeland & Taylor, 2004). Le et al. (2016) categorized the panel into a category of low-income, middle-income, and high-income nations based on trade openness and harmful emissions. The investigation's outcomes indicate that while trade liberalization tends to have negative impacts on the environments of low-income and middle-income nations, it has beneficial impacts on the environments of high-income nations. The majority of contemporary research has discovered that by decreasing CO_2 emissions in the APEC, ASEAN, and OECD states, globalization and financial growth improve environmental quality (Phong, 2019; Zafar, Saud, et al., 2019; S. A. H. Zaidi et al., 2019).

In contrast, Zhang et al. (2017) demonstrated in a panel of the best ten newly globalized economies that trade openness, a measure of globalization, is adversely connected to harmful gas emissions in the nations. In the published literature, it is acknowledged that trade openness has adverse effects on environmental degradation unless the nation adopts greener technologies for the production of goods and services or is attributable to new technology transfer to emerging economies once restrictions on foreign investment are eased (Liddle, 2015). The effect of trade openness on environmental destruction was investigated by Managi, Hibiki, and Tsurumi (2008) for a number of developed and developing countries. They demonstrated that in these regions, increased trade openness contributes to environmental degradation. Some other research confirmed the negative environmental effects of globalization by means of trade (Frankel, 2003; Muhammad Shahbaz, Ozturk, et al., 2013; Muhammad Shahbaz, Tiwari, et al., 2013). Kohler (2013) also discovered that expanding trade openness increases CO_2 emissions in South Africa. Meng et al. (2018) demonstrated that globalization, as evaluated by trade openness, increases CO_2 emissions by employing panel data for 101 countries. Additionally, Acheampong, Adams, and Boateng (2019)'s study revealed that 46 nations in sub-Saharan Africa have higher CO_2 emissions as a result of increased trade openness.

Following the survey of the aforementioned literature, it is clearly understood that many researchers focus on the effects of globalization on the environmental condition of developed and developing countries while utilizing trade openness as a proxy for this phenomenon. The negative environmental impact of trade openness is unquestionable. Nevertheless, it fails to capture all of the consequences of globalization. To be more specific, trade openness can just reflect one facet of globalization—international trade and not others, such as information flows, capital flows, social dimensions, or political engagement. It bears considerable limits in such situations. As a result, it generates contradictory findings. Narrowly focused trade liberalization is unlikely to generate the dynamic characteristics of environmental degradation occurring in both developed and developing nations. Therefore, results might be skewed when studying the effects of globalization on the environment, considering trade liberalization and trade openness. Dreher (2006) established the KOF globalization index to get around this problem. In order to design sustainable economic growth and development, Dreher-based globalization is a key factor. As a result, it influences CO_2 emissions, which has an impact on environmental quality. According to Dreher (2006), globalization has impacted the interaction between developed and developing countries. The researcher mentioned that this had encouraged developed countries to make investments in green technology on a worldwide scale. In particular, as was stated in the context, globalization is a multifaceted phenomenon made up of three distinct elements, namely, social, political, and economic globalization. Since each aspect is distinct, it is unrealistic to assume that their effects on CO_2 emissions are all the same. Yet, the prevailing investigation only employed a generalized index of globalization to analyze its effects on the environment resulting in a simplification of the phenomena. Hence, it can be said that every aspect has a different effect on CO_2 emissions. Knowing how each aspect of globalization affects CO_2 emissions is crucial for the development of pragmatic policy. In light of this, the present investigation would also upgrade the literature by examining the relationship between globalization and CO_2 emissions from all angles, taking into account all of its manifestations. This will enable the development of comprehensive policies that address the relationship between globalization and CO_2 emissions.

The most commonly employed indicator of globalization is the KOF index (Potrafke, 2015). The KOF index includes 203 nations and areas from 1970 to 2017 in its final form (Zürich, 2020). One of the early researches performed by Dreher, Gaston, and Martens (2008) investigates the impact of globalization on environmental indices. The researchers investigated the relationship of globalization with environmental degradation utilizing yearly data of 100 countries in the time range from 1970 to 2000. The usage of wood products, biochemical oxygen, and sulfur dioxide has all increased as a result of the rise of globalization. According to the dominant global perspective and related fields, some other researchers also describe and investigate the origins and impacts of globalization in a number of distinct approaches (Dreher & Gaston, 2008; Jones, 2010).

According to Feridun et al. (2006) and Wijen and van Tulder (2011), globalization boosts economic growth in developing nations even while industrialization uses up natural resources and has a negative impact on the environment. Globalization has improved economic growth and had a significant influence on many facets of human life, including socio-economics, politics, environment, and so on. The global economy is becoming increasingly integrated and interdependent as a result of the move from isolated national and self-differences (Hill, 2008). Researchers and environmentalists have recently expressed interest in the link between globalization and the environment (Abid, 2016; Apergis & Payne, 2009; Destek & Ozsoy, 2015; Pao & Tsai, 2010; Muhammad Shahbaz, Mallick, et al., 2015). They have investigated the signs of globalization, economic growth, and environmental degradation. Despite their claims that economic growth causes environmental degradation, the globalization and economic growth index shows a decline in CO_2 emissions. Doytch and Uctum (2016) conducted research on the effects of globalization on environmental degradation in the time range between 1984 and 2011. The results of the analysis showed that global financial development has increased investment inflows that are deleterious to the environment and result in environmental degradation. The relationship between globalization and CO_2 emissions was examined by Jorgenson and Givens (2014) and Li et al. (2015). The findings of the analysis showed that globalization has an adverse impact on CO_2 emissions. The relationship between globalization and CO_2 emissions in 87 countries was thoroughly investigated by Muhammad Shahbaz (2019b). According to the outcomes of the analysis, globalization will reduce CO_2 emissions in middle and high-income countries in the near future, though it has a significant impact on environmental degradation in low-income countries. Khan et al. (2019) utilized the KOF index to determine how Pakistan's CO_2 emissions were influenced by globalization, the usage of fossil fuels, and other economic factors. The KOF index was utilized in other published investigations (Saint Akadiri, Alola, et al., 2019; Shujah-ur-Rahman et al., 2019; S. A. H. Zaidi et al., 2019). Recent research by Zafar et al. (2019) and Zaidi et al. (2019) concluded that globalization and financial development could contribute to improving the quality of the environment by lowering emissions; however, Muhammad Shahbaz, Mallick, et al. (2015) revealed that continuous globalization process degrades the environmental quality by generating excessive emissions. While some studies have demonstrated a favorable association between globalization and the environment (Phong, 2019; Saraç & Yaglikara, 2019), others have reported a negative (Destek & Sarkodie, 2019; Olowu et al., 2018; M Shahbaz et al., 2018) or negligible inter-connection (Haseeb et al., 2018; Z. Xu et al., 2018). The globalization-trade-environment relationship has been studied empirically by Lamla (2009), Muhammad Shahbaz (2018), and Paramati et al. (2017) who came to differing outcomes.

According to some published analyses in the literature, globalization has an adverse impact on the environment in terms of pollution (Bu et al., 2016; Etokakpan et al., 2020; H. P. Le & Ozturk, 2020; Sabir & Gorus, 2019). However, several other studies show that as globalization rises, environmental quality actually improves (Destek & Ozsoy, 2015; Z. Ş. Ulucak et al., 2020; Zafar, Saud, et al., 2019). Globalization's effects on CO_2 emissions in the People's Republic of China were studied by Muhammad Shahbaz, Khan, et al. (2017). To measure globalization, they used KOF globalization indices, and they reported that China's carbon dioxide emissions are falling overall as a result of globalization. Their research also supported the hump-shaped relationship of economic growth with CO_2 emissions. Kalaycı and Hayaloğlu (2019) explore the correlation between globalization and carbon emissions in the context of NAFTA member states. According to their findings, the rise in carbon emissions caused by economic globalization has a detrimental impact on the environment. The globalization-emission relationship investigation by Le and Ozturk (2020) reveals the positive globalization effects on emissions. Akadiri et al. (2019) researched the effects of globalization on the environment Kuznets in 15 different nations in the time period between 1995 and 2014. The findings showed that real income has a negative and substantial impact on CO_2 emissions, whereas globalization has a favorable and substantial impact. Globalization and economic development are reportedly favorably correlated with the ecological footprint. It has been confirmed that there is a two-way causal correlation within globalization, real incomes, and ecological footprint (Ibrahiem & Hanafy, 2020; Ike et al., 2020). Increased trade has a significant beneficial impact on CO_2 emissions, according to studies for G20 member countries. Saint Akadiri et al. (2019) investigated the correlation between income, tourism, and globalization in ecological sustainability in Turkey for the duration between 1970 and 2014 using the ARDL bounds test and VECM Granger causality technique.

The published literature provides sufficient evidence for the long-term relationship between globalization and the environment, although the impact's orientation is still up for debate. This is because the utilization of renewable energy sources, business practices, innovation levels, and the natural resource capacity of individual nations all play a significant role in the linkage between globalization and environmental degradation (Sharif et al., 2019). However, the controversial argument over whether the expansion of global corporate linkages is associated with better environmental quality or if it has contributed to environmental degradation makes the subject deserving of thorough research. Twenty-five developed nations' CO_2 emissions are influenced by globalization, according to Muhammad Shahbaz (2018). The idea that globalization raises CO_2 emissions has been backed up by several more research (H. P. Le & Ozturk, 2020; Suki et al., 2020; Yilanci & Gorus, 2020). Numerous studies on globalization have shown both beneficial and detrimental consequences. Despite the fact that globalization is regarded as a crucial aspect in fostering links between many nations on a social, political, and economic level, it can have negative effects on a country's atmosphere and ecology owing to technology transfer and trade flows. Muhammad Shahbaz et al. (2017) assert that globalization is the technology transfer from developed to developing countries and imports, simultaneously fostering the labor division and boosting nations' relative competitiveness. Nevertheless, it has been noted that in addition to accelerating economic growth under various forms of globalization, the environment is also significantly impacted.

Some other research identified the detrimental effects of globalization on the environment as evidence (Frankel, 2003; Muhammad Shahbaz, Solarin, et al., 2013). Lv and Xu (2018) found that globalization and carbon dioxide emissions were inversely correlated in fifteen of the nations they studied. Experts notably have reported contrasting outcomes on the impact of globalization on CO_2 emission after further researching the literature (Doytch & Uctum, 2016; Martens & Raza, 2010; Salahuddin et al., 2019). Depending on the nations' global viewpoint, the conclusions differ. Investments have a demonstrable impact on the growth of the financial system in resource-rich nations like Canada, the USA, Australia, China, etc. (Ma et al., 2021).

The empirical research indicates that there are some uncertainties on how globalization affects environmental degradation. On the one hand, observational findings from investigations by Ibrahiem et al. (2020) for Egypt, Ansari et al. (2021) for 22 nations, Zafar et al. (2019) for 27 OECD nations, and Muhammad Shahbaz et al. (2016) for

African nations presented proof of the beneficial effects of globalization on environmental quality. However, studies by Usman et al. (2020) for the USA, Le and Ozturk (2020) for 47 developing countries, Etokakpan et al. (2020) for Turkey, and Sabir and Gorus (2019) for South Asian nations have shown that growth in globalization levels affects the environmental issues.

Along with the investigations mentioned above, Haseeb et al. (2018) explored the linkage between the degree of globalization and CO_2 emissions in the BRICS nations between 1995 and 2014 by utilizing the Westerlund panel cointegration test. While it is projected to be unfavorable in South Africa, China, and Brazil, they discovered that its coefficient is positive for India and Russia. Furthermore, using the Quantile ARDL approach, Godil, Sharif, Rafique, et al. (2020) discovered that only the greater measurements of the Turkish economy between 1986 and 2018 were negatively impacted by globalization. Depending on the globalization indicators, environmental pollution measures, sub-components, countries/country groups, and analytical methodologies, different conclusions have been drawn on the impacts of globalization on environmental quality in the published research articles. The responsible state authorities have employed a variety of approaches to reduce CO_2 emissions over the past few decades, including the introduction of alternative energy sources, investments in clean coal equipment, and many other methods for reducing CO_2 emissions at the state, local, and national levels.

The KOF Index of Globalization comes to attention when it is thought about the major emphasis of this research, which is to connect globalization's effects on CO_2 emissions and carbon footprint. The influence of globalization on the environment has been documented in the literature using different assessment approaches. Furthermore, the concept of globalization is lacking even in earlier research that focused on how it affects the environment. In order to overcome this problem, Dreher (2006) established the KOF Index of Globalization, which takes into account each of the three aspects of globalization—economic, social, and political—individually. In comparison to other openness indicators, this index is more appropriate for identifying the consequences of globalization in Asian countries. Trade flows of products, services, and capital are impeded by economic globalization. Two variables are assessed to determine the extent of economic globalization. Actual trade flows, portfolio investment, and foreign direct investment are included in the first indicator. The second indicator consists of tariff rates, taxes on trade, capital-based trade restrictions, etc. Political globalization takes into account factors such as the presence of multinational corporations, the number of embassies in a nation, and the number of United Nations peacekeeping missions in which a nation has participated. Social globalization includes international tourism, culture, the flow of ideas, numbers of radios, internet users, etc. The natural environment is influenced by these social, political, and economic factors, although the interconnection between globalization and the environment has not received enough emphasis in earlier studies. The study presents a summary of the experimental evidence on the effects of its elements, including trade-related, social, political, and financial, on environmental quality in this subsection. Even though the earlier research did not place much emphasis on the relationship between globalization and the environment, the social, political, and economic factors have a considerable consequence on the environment (Kirikkaleli et al., 2021). Dreher, Gaston, and Martens (2008) investigated how globalization contributed in the time range between 1970 and 2000 to increased environmental deterioration in a group of thirty OECD nations. The oxygen demand, sulfur dioxide, round wood supply, and carbon dioxide are a few of the ecological pressures that the investigators explored by employing the KOF index to determine how globalization impacted them. The findings of panel regression indicate a reduction in sulfur dioxide levels and oxygen demand as a result of globalization; however, they could not reveal any connections between the globalization index and CO_2 emissions or round wood production. Importantly, the outcomes revealed somewhat diverse evidence once the globalization index was divided into its component parts—social, political, and economical. Round wood production is shown to be only marginally positively impacted by economic globalization, while CO_2 emissions rise as social globalization levels rise.

Rudolph and Figge (2017) investigated how globalization affected 146 nations' ecological footprints between 1981 and 2009, employing a comparable measure of globalization. The outcome of the research, in contrast to Dreher et al. (2008), demonstrated that globalization as a whole significantly improves ecological footprints. The results also show how social globalization has a detrimental impact on productivity and consumption, whereas having a favorable impact on export and import of ecological footprint. Furthermore, the general ecological consumption, import, export, and production tend to be driven by economic globalization. Yet, the investigation was unable to identify any role of political globalization in shaping ecological footprints among the nations. Environmental quality is impacted by political globalization, which also helps to forge strong relationships between developing and developed countries. Political globalization offers governments a stage to disseminate policies, such as those promoting energy efficiency or technological advancements in environmental protection. According to Fredriksson and Mani (2004), strict environmental laws could be formulated from trade integration and political stability. Political globalization has been proven to be effective in reducing carbon dioxide emissions throughout the OECD, G20, and EU countries, according to the survey of Paramati, Apergis, and Ummalla (2017). However, political globalization has strengthened international collaboration and connection, which promotes trade liberalization and associated issues. If all of the products and services manufactured in society are actively or passively associated with the usage of energy and power, there must have a significant impact on the environment since it raises emissions to a comparable scale. According to investigations by Muhammad Shahbaz et al. (2012) and Halicioglu (2009), global trade causes a drop in environmental quality by increasing resource usage and depleting natural resources. According to Muhammad Shahbaz, Mallick, et al. (2015), although social and political globalization increased pollution emissions, economic globalization enabled the efficient management of CO_2 emissions.

Furthermore, Wen et al. (2016) presented experimental proof of the bidirectional causal relationship between GDP and globalization. It showed that in the 92 sample states, increased political globalization was shown to hamper GDP growth. In-depth, a variation in the extent of globalization has a substantial impact on the nations' production volumes as trade globalization simultaneously impacts its import and export quantities. An upsurge in trade activity affects nature if, somehow, the economy's structure is dominated by polluting industries. On the other hand, if it includes industries that have implemented environmentally friendly technology, it could have a favorable impact on the environment (Grossman & Krueger, 1991; Tsurumi & Managi, 2010). If the countries' environmental laws are weak, growth in financial globalization might have a detrimental impact on the environmental quality of those nations owing to an increase in output in filthy industries (Cole, 2004). In the published journals, it is referred to as the pollution haven hypothesis. Nevertheless, if environmental regulations are stringent and national companies can profit from the organizational skills and cleaner technology of global corporations, the outcome could be favorable (Zarsky, 1999). In the literature on environmental economics, this concept is referred to as the pollution halo. With the increase in cultural commodities, student migration, and touristic events, social globalization might alter peoples' lifestyles or improve residents' consciousness about the environment. The level of pollution in the nation grows as a result of alterations in people's lifestyles and spending habits that may lead them to use the goods and services that are more energy-intensive. In contrast, a healthier environment can result from an increased environmental consciousness among people (Bu et al., 2016). It is clear from the evidence as a whole that social globalization has mixed effects on the environment. Uncertainty exists on how political globalization will affect the quality of the environment. Environmental issues could be more readily resolved if political collaboration within nations improves (Ahmed et al., 2019). The efficiency of political action, however, is the only thing that matters in this scenario. For example, political inefficiency may cause countries to fall short of their emission or energy-saving goals. Additionally, as mentioned by Bu, Lin, and Zhang (2016), the nations, particularly emerging economies, which become participants to multinational accords often do not have legally enforceable agreements. As a result, it could be claimed that a higher level of political globalization may not always result in reduced environmental degradation.

The published literature includes a number of panel data analyses. According to the study, Kalayci and Hayaloğlu's (2019) findings validated the NAFTA nations' environmental pollution as a result of economic globalization. Furthermore, Bu, Lin, and Zhang (2016) concluded that for 166 nations spanning the years between 1990 and 2009, all types of globalization had a favorable effect on environmental degradation. Additionally, 124 nations from the years 1981 to 2009 were included in Rudolph and Figge's (2017) Extreme Bounds Analysis. They discovered that growing levels of social and economic globalization have favorable and unfavorable effects on ecological footprint intake, respectively. Taking Eastern and Central European nations into account, Destek and Sinha (2020) assessed that the effects of social, political, and economic globalization on carbon dioxide emissions were statistically negligible, negative, and positive, respectively. While the consequences of globalization on OECD and non-OECD nations varied significantly, Bu, Lin, and Zhang (2016) found that it has a significant impact on environmental deterioration. Muhammad Shahbaz, Mallick, et al. (2016), Muhammad Shahbaz, Shahzad, et al. (2016), and Muhammad Shahbaz, Solarin, and Ozturk (2016) employed Pooled Mean Group (PMG), and Auto Regressive Distributive Lag (ARDL) approaches to analyze the impact of globalization on CO_2 emissions in African nations. Their findings showed that globalization lowers the emission rate of carbon dioxide, although findings varied by nation. In a different research, Muhammad Shahbaz, Mallick, et al. (2015) investigated a similar relationship for India and discovered that globalization, including its manifestations, has a detrimental effect on the environment. Conversely, employing panel data spanning 171 nations, Figge, Oebels, and Offermans (2017) investigate the connection between globalization and the ecological footprint. The scholars assert that the social, political, and economic aspects of globalization have different consequences on environmental quality. The findings imply that while social globalization lessens the ecological footprint of consumption, economic globalization increases it.

Utilizing the information in the time span between 1971 and 2016 and using the ARDL technique, Xu et al. (2018) explored the impact of globalization, encompassing all of its components, on CO_2 emissions in Saudi Arabia. Additionally, D. Khan and Ullah (2019) discovered that increased carbon dioxide emissions are a consequence of social, political, and economic globalization in Pakistan. Economic globalization aids in economic growth but has negative effects on environmental quality (Patricia Hipolito Leal & Marques, 2019; Rahman, 2020; Muhammad Shahbaz, Shahzad, Mahalik, & Hammoudeh, 2018).

The effect of globalization on carbon dioxide emissions is theoretically unpredictable from the beginning. The correlation between economic globalization and carbon dioxide emission is, therefore the subject of a controversial theoretical dispute. For example, proponents of the pollution-haven theory contend that because of the strict environmental regulatory laws in developed nations, developing nations have become the host of industries that pollute the environment. Environmentally unfriendly industries must pay a significant penalty for the stringent environmental regulations in developed nations. These environmentally harmful companies shift to developing nations with poor environmental regulations in order to remain competitive (Wheeler, 2001). In contrast, proponents of the pollution-halo theory contend that globalization lowers carbon dioxide emissions by ensuring the transmission and dissemination of eco-friendly technology, information, and sustainable environment management approaches in the host nations (Acheampong et al., 2019; Doytch & Uctum, 2016; Pao & Tsai, 2011).

Similar to this, Krugman, Obstfeld, and Melitz (2017) assert that as countries become wealthier, globalization can help them alter the production and consumption mix, consequently reducing carbon dioxide emissions. The overall outcomes are still contradictory and unclear due to the contrasting theoretical viewpoints. The topic of the aspects of globalization has attracted a significant number of researchers in recent times. Destek and Ozsoy (2015) concluded that, amongst the time series analyses, Turkey's carbon dioxide emissions dropped from 1970 to 2010 as economic globalization increased. For example, although several researches found that globalization had a favorable impact on carbon dioxide emission (Abdouli et al., 2018; Meng et al., 2018; Muhammad Shahbaz, Nasir, et al., 2018), others found that it had a detrimental impact (Y. Liu et al., 2017; Shujah-ur-Rahman et al., 2019).

Additionally, several empirical investigations have found no negative impact of globalization on carbon dioxide emission (Dogan & Turkekul, 2016; Z. Xu et al., 2018). Despite the fact that recent investigations have sought to investigate the environmental effects of globalization on carbon dioxide emission, You and Lv (2018) claim that the environmental influence of globalization needs more investigation owing to the shortcomings of the previous research. For example, previous experimental evidence has addressed the impact of economic globalization on carbon dioxide emission using foreign direct investment or trade openness as proxies (Ning & Wang, 2018; Sarkodie & Strezov, 2019). In contrast, none of foreign direct investment or trade openness is a suitable indicator of economic globalization as they do not account for other aspects of this phenomenon, including capital controls, technology transfer, and knowledge crossing national boundaries (Lv & Xu, 2018).

The impact of economic globalization on carbon dioxide emission is considered to be substantially underestimated if these aspects of economic globalization are disregarded (Lv & Xu, 2018; You & Lv, 2018). Their findings revealed that while other aspects of globalization do not affect carbon dioxide emissions, economic globalization does. To investigate the interconnections between urbanization, globalization, and environmental quality, Salahuddin et al. (2019) examined the nations of Sub-Saharan Africa. The findings of their panel technique revealed that there was no apparent impact of globalization on environmental degradation. Additionally, previous empirical research on the connection between globalization and the emission of carbon dioxide has only used traditional parametric econometric methodologies (Adebayo, Rjoub, et al., 2022; Kihombo et al., 2021; Muhammad Shahbaz et al., 2020; Sharif, Mishra, et al., 2020). Nevertheless, parametric estimators may fail to take into consideration slope heterogeneity and are not resilient to outliers (Dzator & Acheampong, 2020). As a result, determining how economic globalization affects carbon dioxide emission involves a cutting-edge, unique econometric technique that is robust to outliers and may take slope heterogeneity into consideration. Yet, it is still uncommon in the published literature to analyze the effect of economic globalization on carbon dioxide emission using a non-parametric econometric estimator like the quantile-on-quantile (QQ) method. This research uses the QQ technique to explore the impact of economic globalization on carbon dioxide emission in Australia for the time range between 1970 and 2018 whilst limiting coal usage and economic growth in an effort to bridge these shortcomings.

According to Langnel and Amegavi (2020), when the political globalization index of Ghana rises, the environmental condition of the country improves. Additionally, the analytical results of Suki et al. (2020) demonstrated that although social globalization and political globalization contribute to environmental healing greatly, a rise in economic globalization and overall globalization affects the environmental quality. Z. Ş. Ulucak et al. (2020) have hypothesized that financial globalization contributes to improving the quality of the environment in developing nations. Destek (2020) employs the AMG technique for the long run to examine the impact of social, political, and economic globalization on CO_2 emission in the time range between 1995 and 2015 in Central and Eastern European Countries (CEECs). He discovered that although political globalization lowers carbon dioxide emission, globalization and economic globalization boosts emissions. One investigation covering all aspects of globalization's impact on environmental quality was found in the literature. As demonstrated by Bilgili et al. (2020), trade, political, and financial globalization have a favorable impact on the environment. In Turkey, however, it was observed that social and economic globalization had a negative impact on the environment.

There are a good number of published articles on the relationship of the environment with globalization and also with the three dimensions of globalization, including social, political, and economic globalization. However, except for the investigation by Bilgili et al. (2020), there is no more study found that covers all the dimensions of globalization, such as social, political, economic, financial, trade, and interpersonal globalization. In this research, all of the dimensions of globalization are considered to relate to environmental quality.

A number of studies conducted over the past ten years have explored the relationship between globalization and carbon dioxide emission from the viewpoint of a particular country or set of countries in the panel. The Australian economy benefits from globalization, according to Muhammad Shahbaz, Mallick, et al. (2015). However, Muhammad Shahbaz, Bhattacharya, and Ahmed (2015) did not observe any positive environmental impacts on the Indian economy. In Pakistan, both M. K. Khan et al. (2019) and M. T. I. Khan, Yaseen, and Ali (2019) have demonstrated a similar trend for globalization. They concluded that when Pakistan's ties with other nations improve, developed nations are driven to invest in Pakistan, which causes pollution to grow by transferring their pollution-generating companies there.

There are a few investigations that examine the relationship between economic globalization and carbon dioxide emission, although they reveal contradictory empirical results. By employing the ARDL bounds test using Chinese datasets for the time range between 1970 and 2012, and Muhammad Shahbaz, Bhattacharya, and Ahmed (2017) investigate the relationship between globalization and carbon dioxide emission. They discover that by reducing carbon dioxide emissions, globalization enhances the environmental condition in China. For instance, take globalization into account as a positive aspect of China's better environmental quality. According to their outcomes, the scholars assert that improving the environmental quality of China would only be possible through the proper application of environmental quality rules. According to Z. Xu et al. (2018), Saudi Arabia's CO_2 emission is not significantly impacted by globalization.

Muhammad Shahbaz, Mallick, et al. (2015) also emphasized that India's CO_2 emissions are increasing as a result of globalization. Additionally, globalization has been demonstrated by Saint Akadiri et al. (2019) to exacerbate carbon dioxide emissions in Italy. Globalization causes increased carbon dioxide emissions in Japan, according to research by Muhammad Shahbaz, Shahzad, Mahalik, and Hammoudeh (2018). Similarly, Ibrahiem and Hanafy (2020) revealed that, in the context of Egypt's economy, globalization has significantly enhanced the quality of the environment. Additionally, Saint Akadiri et al. (2020) used time series data from Turkey to support their claim that globalization has no effect on environmental deterioration.

From the standpoint of a group of nations in the panel set, few other scholars have investigated the relationship between globalization and the environment. They revealed contradictory conclusions, like Salahuddin et al. (2019)'s research on Sub-Saharan African nations, which suggested that there is no significant environmental impact from globalization. Yet, environmental quality is worsened by urbanization. Muhammad Shahbaz et al. (2019b) showed that middle and high-income states promote both local and international investments for higher production at the cost of their environmental sustainability. This was done from the viewpoints of the high, middle, and low-income countries. For a panel of eighty-three nations, You and Lv (2018) propose a negative correlation between globalization and carbon dioxide emission. It was interesting to discover that economic globalization had indirect effects on carbon dioxide emissions. The consequences of economic globalization on the surrounding countries are considered indirect effects. The carbon dioxide emission in the local area grows in conjunction with the economic development of the neighboring countries. Muhammad Shahbaz, Khan, et al. (2017) asserted that social and environmental sustainability serves as prerequisites for globalization. Another possibility is industrial growth, which raises energy consumption and eventually leads to increased emissions as a result of globalization (Muhammad Shahbaz, Dube, et al., 2015). S. A. H. Zaidi et al. (2019) discovered an unfavorable correlation between globalization and carbon dioxide emission in nations participating in the Asia Pacific Economic Cooperation. Significant global linkages that allow for the importation of green technology in accordance with current environmental protection laws and regulations are responsible for the unfavorable relationship. A similar conclusion was reported for the G7 member states by M. Liu et al. (2020).

To evaluate the effect of globalization on carbon dioxide emission, several contemporary panel studies have used data from the KOF index (Jorgenson & Givens, 2014; T.-H. Le et al., 2016; Lim et al., 2015). The results of these investigations, however, do not yet support a consensus on such impact.

Utilizing data from the Next-11 nations, Muhammad Shahbaz and Sinha (2019) investigate if the environmental Kuznets curve between globalization and CO_2 emission exists. According to the empirical findings, different nations have different amounts of U or inverted U-shaped CO_2 emissions associated with globalization. S. A. H. Zaidi et al. (2019) employ the CUP-BC and CUP-FM models to examine the correlation between globalization and CO_2 emission while taking into account different other determinants of environmental deterioration in the instance of the Asia Pacific Economic Cooperation nations. Their experimental research demonstrates that globalization promotes environmental deterioration and has a detrimental impact on CO_2 emissions. Using data from 18 Latin American nations, Koengkan, Fuinhas, and Santiago (2020) utilize panel ARDL to evaluate the asymmetric correlation between economic globalization and carbon dioxide emission. According to their investigation, economic globalization enhances environmental quality by reducing CO_2 emissions. Many academics have investigated the connections between globalization and environmental deterioration and concluded with different findings. For instance, Yang, Jahanger, and Khan (2020) found that globalization has greatly slowed down environmental deterioration from the perspective of ninety-three different nations. In addition, they asserted that environmentally friendly technology used by globalization promotes the technique effect channel and boosts GDP growth while producing reduced emissions. In a similar manner, Saud, Chen, and Haseeb (2020) reported that One Belt One Road (OBOR) nations' environmental degradation was decreased as a result of globalization. Additionally, developing countries are experiencing a similar impact of globalization on environmental conditions (R. Ulucak et al., 2019). The environment, however, has been negatively impacted by globalization, according to various empirical investigations.

For instance, Yang et al. (2021) validated the scale effect channel by observing a substantial correlation between globalization and environmental degradation for Gulf Cooperation Council (GCC) member states through snowballing fossil fuel use. They claimed that globalization and economic expansion increase carbon dioxide emissions. Likewise, Muhammad Shahbaz, Balsalobre, and Shahzad (2019) have previously employed the generalized method of moments (GMM) approach on data covering the time period between 1980 and 2014 for the G7 member states. According to their findings, trade and institutional factors decrease pollution while globalization boosts carbon dioxide emissions. Although the survey was accomplished for the nations of sub-Saharan Africa (SSA), Acheampong, Adams, and Boateng (2019) reached a similar conclusion to that of M. Liu et al. (2020), J.-L. Liu et al. (2020) and Muhammad Shahbaz, Balsalobre, and Shahzad (2019).

The GMM method was used by Twerefou, Danso-Mensah, and Bokpin (2017) to analyze how globalization and economic growth influenced carbon dioxide emissions in thirty-six SSA nations between 1990 and 2013. Similar to the observations of J. Zhao et al. (2020), Dong, Dong, and Jiang (2020), and Qiao et al. (2019), they demonstrated that economic growth raises carbon dioxide emissions whereas globalization has a greater detrimental effect on the environment. Muhammad Shahbaz, Shahzad, Mahalik, and Sadorsky (2018) investigated whether the hypothesis that globalization is responsible for increased carbon dioxide emission is valid in twenty-five developed nations between 1970 and 2014. The relationship between globalization and environmental deterioration has received significant consideration in academia, with varying conclusions. For example, J.-L. Liu et al. (2020) and M. Liu et al. (2020) explored at the potential environmental degradation caused by globalization in the G7 member states between

1970 and 2015. Similar to this, S. A. H. Zaidi et al. (2019) investigated the relationship between globalization and carbon dioxide emission in Asia Pacific Economic Cooperation (APEC) in the time span between 1990 and 2016. Their observations indicated that these factors enhance the quality of the environment in APEC nations. Rafindadi and Usman (2019) have confirmed identical outcomes for South Africa. By implementing panel estimation approaches that are robust to heterogeneity and cross-sectional dependency, Lv & Xu (2018) reveal an unfavorable correlation between economic globalization and carbon dioxide emission for a panel of fifteen nations in the time range between 1970 and 2012. On the other hand, Twerefou, Danso-Mensah, and Bokpin (2017) utilize the GMM approach to evaluate the relationship between globalization and carbon dioxide emission for a panel of 36 African nations. The researchers of this survey concluded that globalization has an adverse impact on the environmental quality in several African nations. Similarly, Muhammad Shahbaz, Shahzad, and Mahalik (2018) explores how globalization has affected a panel of twenty five developed nations' carbon dioxide emission. Remarkably, the results show that globalization has a beneficial effect on emission in developed countries.

Several other researchers that studied the same issue in the panel data set came up with conflicting findings. Employing panel estimation approaches, Salahuddin et al. (2019) investigate the effects of globalization on carbon dioxide emission for forty-four Sub-Saharan African nations. The results show that urbanization has a beneficial impact on carbon dioxide emissions and that globalization has a negligible impact. The globalization index is both short-run and long-run, positive or negative but statistically insignificant.

A panel study that investigated the impact of globalization on the ASEAN-5 countries' environmental quality between 1971 and 2014 reached the identical supposition: globalization is expected to accelerate environmental deterioration in the ASEAN countries by increasing carbon dioxide emission (Phong, 2019; Muhammad Shahbaz, Mallick, et al., 2015). The survey also confirmed the validity of the EKC hypothesis, which postulates in certain ASEAN countries, development and environmental degradation are inversely correlated (inverted U-shaped correlation). Utilizing panel data and the validity of the EKC negative correlation for both linear and quadratic forms, Kalaycı and Hayaloğlu (2019) investigated the impact of economic globalization on carbon dioxide emissions in NAFTA member states. They discovered that increasing economic globalization results in higher levels of carbon dioxide emission (Akadiri et al., 2019). According to K.-H. Lee and Min (2014), commonly described globalization as one of the main aspects influencing both developing and developed nations' environmental quality.

Additionally, a few researchers have examined the connection between globalization and carbon dioxide emission using time series data. For instance, Muhammad Shahbaz, Mallick, et al. (2015) indicate that India's carbon dioxide emissions have decreased as a result of globalization. Additionally, carbon dioxide emissions rise as a result of financial and economic development. Similar to this, Muhammad Shahbaz, Shahzad, and Mahalik (2018) affirm that Japan's carbon dioxide emissions have been positively impacted by globalization and economic progress. Muhammad Shahbaz, Solarin, and Ozturk (2016), however, demonstrate that the impact of globalization varies in nineteen African nations. The data provide conflicting information about how globalization has affected carbon dioxide emissions and the presence of EKC. According to Z. Xu et al. (2018), Saudi Arabia's carbon dioxide emissions are not significantly impacted by globalization. Muhammad Shahbaz, Mallick, et al. (2015) focused on the time series analysis to investigate the relationship between globalization and CO_2 emissions in India between 1970 and 2012. Employing the total KOF index of globalization, the outcomes of the research show that globalization has a strong beneficial influence on deteriorating environmental quality. The findings of economic globalization, however, showed an unfavorable correlation between the country's CO_2 emissions and the individual impacts of the globalization index. Muhammad Shahbaz, Van Hoang, et al. (2017) assessed the interrelationship between globalization and CO_2 emission using the ARDL bounds testing method and the Bayer and Hanck combined cointegration method, using identical measures for China. The outcomes of the investigation support the existence of a prolonged correlation between globalization and environmental deterioration, indicating that globalization has a deleterious impact on CO_2 emissions in the Chinese economy at all KOF index levels. Additionally, the findings of causality demonstrated a uni-directional causal relationship between globalization and national CO_2 emission. Similar to this, Solarin, Al-Mulali, and Sahu (2017) analyzed globalization using the Trans-Pacific Partnership (TPP) agreement and investigated its effects on environmental conditions utilizing data from Malaysia in the time range between 1970 and 2014. Globalization increases the rate of carbon dioxide emission, according to their ARDL and FMOLS analyses.

Asymmetric cointegration was validated by the N-ARDL technique in an empirical analysis of this correlation by Muhammad Shahbaz, Khan, et al. (2017), Muhammad Shahbaz, Van Hoang, et al. (2017) and Muhammad Shahbaz, Shahzad, and Mahalik (2018), which spanned the time range between 1970 and 2014 for Japan. They reached the conclusion that globalization and carbon dioxide emission, whether growing or dropping, are directly proportional to each other. However, while Leitão (2014) explores the linkage between globalization and carbon dioxide emission, Portugal's causal assertions vary from those stated by Muhammad Shahbaz, Van Hoang, et al. (2017). The survey employs data spanning forty-one years, between 1970 and 2010, and the findings of Granger causality demonstrate that there is unidirectional causation within the variables, indicating that the Portuguese economy's CO_2 emissions are causally linked to globalization.

In order to evaluate the time span between 1970 and 2010 in Turkey, Muhammad Shahbaz, Ozturk, et al. (2013) utilized a JJ cointegration method with a VECM and the KOF Globalization Index. They observed that carbon dioxide emissions are negatively impacted as a result of globalization. Muhammad Shahbaz, Mallick, et al. (2015) employed a VECM, ARDL bounds testing, and a Bayer-Hanck cointegration method to investigate Indian data for the time range between 1970 and 2012. They showed that the effects of economic, social, and political globalization led to higher carbon dioxide emissions. Applying the ARDL bounds test and an ECM for the time range between 1970 and 2012 in Australia, Muhammad Shahbaz, Bhattacharya, and Ahmed (2017) reached the conclusion that globalization elevates carbon dioxide emissions. The DH causality approach and ARDL bounds test were utilized by Paramati, Apergis, and Ummalla (2017) to investigate several states. They suggested that carbon dioxide emissions were negatively impacted by political globalization.

By utilizing a DH causality test, FMOLS estimators, panel dynamic unrelated regression, and a panel Westerlund cointegration on BRICS member states for the time span between 1995 and 2014, Haseeb et al. (2018) explore the relationships between globalization, carbon dioxide emission, urbanization, GDP, and the EKC hypothesis. Cross-sectional dependency was evaluated using the Dynamic Seemingly Unrelated Regression (DSUR) method, which demonstrated that there is no interconnection between globalization and carbon dioxide emission. The time series outcomes revealed, however, that globalization and carbon dioxide emission had an unfavorable and substantial linkage in South Africa, China, and Brazil while having a favorable correlation in India and Russia. P. A. Leal and Cardoso Marques (2019) used a Driscolle Kraay estimator and ARDL bounds test to analyze data from twenty-eight OECD member states from 1990 to 2015. The investigators came to the conclusion that globalization causes carbon dioxide emissions to rise in certain states while declining in others. You and Lv (2018) suggested that economic globalization had a detrimental effect on carbon dioxide emissions by utilizing spatial regression.

The globalization-emissions correlation was also examined by Muhammad Shahbaz, Lahiani, Abosedra, and Hammoudeh (2018) and Muhammad Shahbaz, Nasir, and Roubaud (2018) utilizing Common Correlated Effects Means Group estimator (CCEMG) and the AMG methods to manage heterogeneity in cross-section panel data in the time range between 1970 and 2014 for 25 developed nations. The hypothesis is truly supported by the CCEMG and AMG estimates. M. K. Khan et al. (2019) and Muhammad Shahbaz, Shahzad, and Mahalik (2018) confirmed that economic growth and globalization had a negative impact on Pakistan and Japan's environmental conditions. Some other investigators use comparative analyses or linear models to assess the effects of globalization on environmental quality (Charfeddine, 2017; Hakimi & Hamdi, 2016; Hao, 2016; Saint Akadiri, Alkawfi, et al., 2019).

Koenker and Bassett Jr (1978) developed the panel quantile regression model, and it has since developed into a detailed approach for statistical analysis of nonlinear and linear models in a variety of disciplines, including environmental, social, and economic (Andrews & Phillips, 1987; Koenker & Hallock, 2001). Compared to OLS, this model offers a more reliable and accurate coefficient estimate (Marasinghe, 2014; B. Xu & Lin, 2018). Experts in the areas of agriculture (Balducci et al., 2018), environment (R. Xu et al., 2017), economics (H. Zhu et al., 2016), climate (Paltasingh & Goyari, 2018), and soil resource management (Steers et al., 2011) have all employed the panel quantile regression approach. In summary, researchers have examined how globalization has affected various environmental indicators, with varying degrees of success. Social, political, and economic dimensions of globalization have both beneficial and harmful consequences. In order to assess the impacts of human capital, health expenditures, economic growth, and globalization on the environment in Asian nations, the panel quantile regression method is employed in this research.

In the research evidence, a number of environmental condition variables, such as deforestation, spores, SO_2, and CO_2 are used as proxies. However, recently ecological footprint and its components have been frequently employed as an indicator of environmental degradation. For this reason, the published works for this investigation were researched to determine how globalization and other environmental degradation indicators are interrelated.

Additionally, utilizing data from 1990 to 2016, Kassouri and Altıntaş (2020) demonstrate that there is a favorable relationship between globalization and ecological footprint in oil exporting nations. However, there is no proof of the correlation between these factors in a MENA country that does not export oil. Additionally, Saud, Chen, and Haseeb (2020) explore the effects of globalization on carbon dioxide emission, carbon footprints, and ecological footprints in the time range from 1990 to 2014 for forty-nine nations. The results show that the increased level of globalization improves the environmental condition. Additionally, there is proof that globalization and environmental degradation indicators are linked with feedback causality. Apaydin (2020) investigates the relationship between ecological footprint and globalization in Turkey from 1980 to 2014. Empirical studies indicate that these parameters are changing simultaneously throughout time. Additionally, growth in ecological footprint use is noticed as a result of the increase in the globalization index. This suggests that growing globalization results in decline in environmental quality. The findings of Bilgili et al. (2020) undoubtedly imply that increasing economic globalization enhances environmental quality. Ahmed et al. (2019) used annual data from 1971 to 2014 to investigate the relationship between globalization and ecological footprint in Malaysia. The researchers used the Hanck cointegration test as a robustness check and the ARDL bounds test to demonstrate this interrelation. According to research evidence, the ecological carbon footprint is increased by globalization. Growth in the GDP and energy consumption also has a favorable effect on ecological and carbon footprints. The ecological footprint does not, however, substantially correlate with globalization. Patrícia Hipólito Leal, Marques, and Shahbaz (2021) explored the relationship between globalization and environmental quality in developing and developed countries utilizing data spanning the years between 1995 and 2017. Yilanci and Gorus (2020) utilized annual data from 1981 to 2016 to analyze the forecasting ability of globalization on the MENA countries' ecological footprint as a practical example. The panel causality test was conducted in the research, and the results showed that the ecological footprint Granger drives trade, economic, and financial globalization. Additionally, it has been shown that MENA countries' financial globalization has the potential to foresee the levels of environmental degradation. Utilizing data in the time range spanning between 1984 and 2016, Mahmood Ahmad et al. (2020) investigated the effects of technology advancements, natural resource depletion, and economic growth on the ecological footprint in developing countries. Rudolph and Figge (2017) have explored the interrelation between the ecological footprint and globalization, whereas Dreher and Gaston (2008) investigated the same relationship with various environmental concerns, including water pollution, sulfur, carbon dioxide emission, and the manufacturing of round wood. Yet, the outcomes of the research were noticed to be unclear and inconsistent. The correlation between ecological footprint and various aspects of globalization, such as the KOF index, trade liberalization, and foreign direct investment, was studied in another research by Sabir and Gorus (2019). The study comes to the conclusion that South Asian nations' unsustainable economic expansion is a direct consequence of globalization, which has accelerated environmental deterioration. Furthermore, neither the political nor the overall aspects of globalization have any noticeable influence on the ecological footprints of consumption. Similar to this, Figge, Oebels, and Offermans (2017) utilize an alternate proxy (MGI index) to explore how globalization has affected the ecological footprints of a panel of 171 nations. The investigators employed multivariate regression, and the results show that higher consumption and imports with an ecological footprint are caused by economic globalization. Additionally, a disaggregated analysis shows that all dimensions of globalization affect the environmental quality, with the exception of the political aspect, which slows it down. In addition to this, few researches have also investigated at the association between globalization and other factors of the environment (Dreher & Gaston, 2008). According to the findings of the panel regression model, the KOF globalization index reduces SO2 and water contamination, although it has no effect on the production of round wood or carbon dioxide emission. According to the results of a disaggregated analysis, social globalization has a beneficial effect on the level of emissions, political globalization has a detrimental consequence on water contamination, and economic globalization has a favorable influence on the production of round wood. Overall, the findings are quite unclear and imprecise. According to earlier research, global CO_2 emissions in 2014 were 42 percent more than they were in 1990. This indicates that there has been a significant rise in the amount of CO_2 emission released into the environment on a global scale (Aung et al., 2017).

Over the last decades, the proportion of CO_2 emissions has been substantially rising in conjunction with economic growth and advancement. Consequently, a significant portion of global CO_2 emissions is generated by emerging economies. Globalization is crucial for a country's economic growth since it has been established to be essential for a country to be able to extract the utmost value from its resources. Maximizing these resources typically results in a country's economy progressing more favorably. The topic of how globalization is affecting the environment, therefore, is presently the subject of a contentious discussion. Whether globalization boosts earnings and subsequently promotes economic growth is a key point of contention in the argument. Poverty is expected to rise, the environment is expected to change, and domestic and international migration is supposed to accelerate as a result of globalization (Patrícia Hipólito Leal et al., 2021). Environmental issues have arisen as a result of clear comprehension of globalization, alterations in energy usage, and enhanced productivity. This opened the door for international organizations to coordinate global projects like the Paris Agreement and the Kyoto Protocol (Kirikkaleli et al., 2021). Published analyses have claimed that environmental deterioration has been caused by difficulties with climate change and global warming over the past few decades. A number of studies, such as those by Abas and Khan (2014), Fereidouni (2013), D. Li and Yang (2016), and Ramachandra, Aithal, and Sreejith (2015), imply that global greenhouse gas

(GHG) emission is to be responsible for these problems. GHGs are made up of CO_2, nitrous oxide, water vapor, methane, and ozone, according to empirical investigations. Nonetheless, it is believed that the amount of CO_2 emission is the primary GHG and the main factor causing global warming and climate change (A. Ullah et al., 2018). Large-scale resource usage and waste disposal are major reasons for global greenhouse gas emissions, as well as for a nation's ecological footprint (EF), and carbon footprint (CF) (Kaltenegger et al., 2017). In addition to the regular lifestyle of humans, the uncontrolled usage of fossil fuels contributes to environmental pollution and climate change, both of which create risks to environmental sustainability.

Environmental protection is a moral and ethical responsibility for upcoming generations, asserts the Intergeneration Equity Theory (Demirel et al., 2016). In order to fulfill these responsibilities, this is first necessary to use a thorough ecological measure rather than only CO_2 emissions to assess the overall condition of the environment since CO_2 emissions only represent a single part of the overall deterioration. Yet, carbon dioxide emissions have mostly been utilized as a stand-in for environmental measures in contemporary empirical research (Saraç & Yaglikara, 2019; M Shahbaz et al., 2018; Zafar, Saud, et al., 2019; S. A. H. Zaidi et al., 2019). As was already stated, since carbon dioxide emissions are strongly associated with sustainability issues (Gokmenoglu & Taspinar, 2018), CO_2 emission is the most frequently utilized dependent variable for evaluating environmental deterioration (Pata, 2018c), whereas a limited number of analyses pay attention to both the carbon and ecological footprints. Carbon dioxide emissions, however, do not account for concerns with the soil, water, or other aspects of the environment. The prevention of water pollution, deforestation, desertification, and other issues is crucial for sustainable progress. The primary driving force behind this research is the gaps of literature that addresses the subject matter of these assessments. Surprisingly, investigations on the correlation between globalization and ecological footprint have been conducted in academia. For the past several years, this connection has been viewed as a more trustworthy environmental indicator (Charfeddine, 2017; Destek, 2020; Destek et al., 2018; Figge et al., 2017; Rudolph & Figge, 2017). The ecological footprint is a thorough environmental indicator that Wackernagel and Rees (1998) first introduced. The ecological footprint indicator, according to Galli et al. (2011), assesses the buying pressure that people place on the environment and correlates it to the planet's potential for regenerative activity. In order to produce resources and assimilate waste, the technique defines human need by means of global hectares, such as biologically productive hectares having world-average productivity. The five bio-capacity aspects, including grazing land, forestland, built-up land, fishing grounds, and cropland, are used by the ecological footprint to quantify the demand that humans place on nature. The ecology is in grave danger since human demand has outpaced the capacity of natural resources to continue providing foodstuff. This supply-demand imbalance reduces the ability of our world to produce resources, increases the development of trash and greenhouse gases, and wreaks havoc on our world's ecology (Ewing et al., 2010).

Different investigators have researched the ecological footprint, which indicates the deterioration of the environment brought on by human activity with the biosphere's capacity for regeneration (Rashid et al., 2018; Solarin & Bello, 2018; R. Ulucak & Lin, 2017). Carbon dioxide emission, however, has mostly been considered in panel studies as a measure of environmental deterioration (Awad & Abugamos, 2017; Baek, 2015; Saud et al., 2019). The forest land areas necessary to absorb anthropogenic CO_2 emission, which is a component of the ecological footprint, are referred to as the carbon footprint (Lazarus et al., 2014). This analysis offers two specified environmental indexes, including carbon footprint and carbon dioxide emission as dependent variables for comparative purposes. This attempts to present a complete insight into the relationship between globalization and environmental condition in the designated Asian nations and to support the relevant governments in making the right strategic decisions.

4.2. EKC and the Nexus Between Globalization and Environment

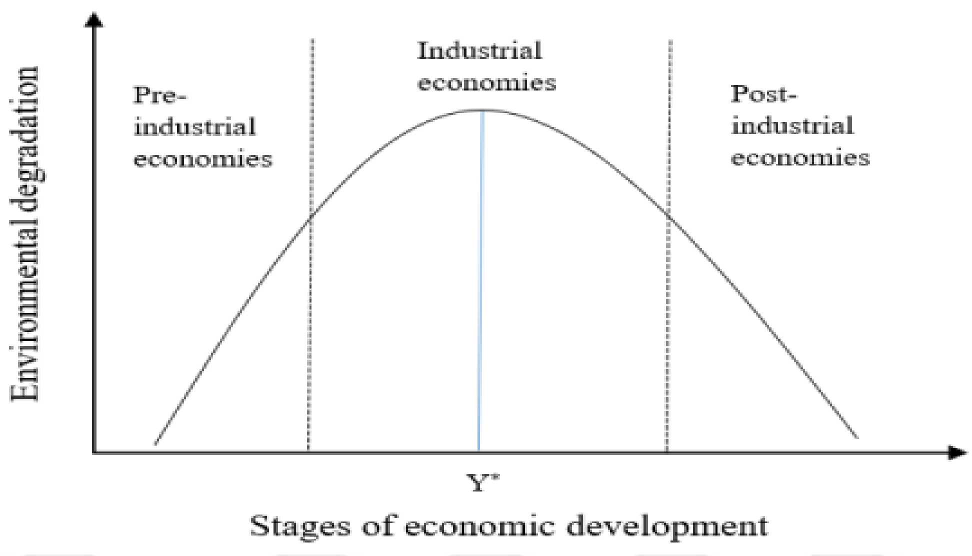
The Environmental Kuznets Curve (EKC) theory first appeared in the early 1990s to investigate the relationship between income and environmental deterioration (Gill et al., 2018). However, Simon Kuznets was the one who first proposed the idea of EKC. Kuznets (1955) uncovered the fundamental concept of EKC. In 1954, at the 67th American Economic Association annual meeting, Kuznets presented the idea of "Economic Growth and Income Inequality." He contends that while income inequality rises during the early stages of economic growth, it eventually declines as a result of faster economic development. Income inequality also increases along with growing income until reaching the peak and thereafter dropping. This changing correlation resembles a bell shape or the renowned Kuznets Curve, which is an inverted U-shape. In 1971, Simon Kuznets was awarded the Nobel Prize in economics for this significant contribution. The bell-shaped EKC demonstrates that discrimination is most prominent at low levels of per capita income when the income distribution is also biased. Although as income rises, the skewness of the curve becomes less pronounced. As real income increases with time, income disparity therefore decreases (Yandle et al., 2002). Since Kuznets established his hypothesis on the observations of a small sample number of nations, several other investigations dispute his findings. At the end of the twentieth century, the theory of development and income inequality revealed a novel approach to the improvement of environmental conditions. The EKC is the outcome of a comparable Kuznets hypothesis that was adopted in the 1990s to describe the association between real per capita income and environmental degradation. In a very potential lecture on economic development and income inequality, Simon Kuznets made the argument that while per capita income goes up, income inequality initially rises and thereafter declines after it reaches a certain level (Kuznets, 2019).

Grossman and Krueger (1991, 1995) conducted two experimental assessments based on Kuznets' theory. They investigated the correlation between economic growth and CO_2 emission, which has a pattern of inverted U shape. The EKC hypothesis is being used to describe this inverted U-shaped correlation. Additionally, numerous analyses that investigated (Grossman & Krueger, 1991) the environmental effects of the North Atlantic Free Trade Agreement acknowledged Kuznets' work that originally linked his name to the curve (Vogel, 1999). Afterward, Shafik and Bandyopadhyay (1992) conducted an investigation on the World Bank Report of 1992 (World Bank, 1992), which rendered the EKC renowned to the following generation of scholars (Ota, 2017). Eventually, a comprehensive analysis with many sample countries and diverse datasets of the environment was carried out by Cole, Rayner, and Bates (1997). Comparing environmental degradation and real per capita income, they observed the hypothesized inverted U shape correlation. The EKC provides a framework for analysis to evaluate the ways economies respond to environmental issues (Taguchi, 2012). According to the EKC theory, at low levels of real per capita income, environmental deterioration grows as income goes up. EKC seems to be inversely U-shaped since it starts dropping after per capita income reaches a certain threshold and income keeps going up. According to Panayotou (1993), levels of pollution in newly industrialised areas like Mexico, Bangkok, or Seoul are higher than they were 20 to 30 years ago. Nevertheless, industrialized nations, including Western Europe, the USA, and Japan, have cleaner cities today than they had 20 to 30 years ago.

An essential aspect of the research is applying the EKC theory to analyze the globalization indicators (Bu et al., 2016; D. Khan & Ullah, 2019; Koçak & Şarkgüneşi, 2018; Rudolph & Figge, 2017; N. Wang et al., 2018). The experimental evidence on the environmental Kuznets curve illustrates how a certain income level leads to a change in a country's environmental condition. Selden and Song (1994) investigated and validated the presence of a favorable correlation between economic development and environmental degradation in the early phases of economic expansion; however, this relationship changes to a detrimental one after income reaches a certain threshold. The inverted U-shaped relationship between economic development and environmental degradation over the country's economic advancement has been studied by a number of authors, including Galeotti, Lanza, and Pauli (2006), Heil and Selden (2001), Suri and Chapman (1998), and Vollebergh and Kemfert (2005). Moreover, according to Junyi (2006), the environmental Kuznets curve theory stands valid for the Chinese economy between 1993 and 2002. In China, the inverted U-shaped correlation between environmental degradation and economic development was investigated by S. Tao, Zheng, and Lianjun (2008). The environmental Kuznets curve theory is valid in Romania, according to Muhammad Shahbaz, Mutascu, and Azim’s (2013) research examining the relationship between economic development and CO_2 emission. The inverted U-shaped association between both economic development and environmental degradation is suggested by the EKC theory (Dasgupta et al., 2002). To put it another way, this curve demonstrates the connection between economic growth and environmental equity (Al Sayed & Sek, 2013).

Accordingly, Tiwari, Shahbaz, and Hye (2013) obtained outcomes for the Indian economy that were consistent with the research stated above. Time series analysis was utilized by Choi, Heshmati, and Cho (2010) to explore the correlation within economic development, trade openness, and CO_2 emission in Japan, Korea, and China. The analysis found a negative correlation between trade openness and carbon dioxide emission for China; however, a positive correlation between Korea and Japan. According to the study, the EKC evolved in various forms based on the attributes and peculiarities of the various nations. The EKC theory was explained by Panayotou (1993). As seen in Figure 4.1 below, there is a nonlinear correlation within these variables (Panayotou, 2003).

Figure 6.1. The Environmental Kuznets Curve



Source: (Panayotou, 2003)

Figure 4.1 shows that at the early stages of economic growth, environmental deterioration develops as income goes up. The pollution level subsequently grows as income levels go up until the threshold income level (Y*) is achieved. Afterward, it continues to deteriorate as a result of the altered economic landscape. Environmental quality improves as income level goes up in the last stage (Panayotou, 1993). This EKC theory also anticipates that resource utilization will be wasteful during the early phases of economic growth and that environmental degradation will emerge concurrently with contaminated industrial operations. As governments prioritize economic development, increased GHG emissions and unsustainable use of natural resources are overlooked. As a result, there is now no concern about environmental contamination and no technological facility to control it. It is anticipated that as societal awareness starts to spread, pressure for a cleaner environment will rise along with it. In order to lessen environmental pollution, eco-friendly green technologies would be implemented.

In the published analyses on the EKC hypothesis, carbon dioxide has been employed as an indication of environmental contamination (Baek, 2015; Bilgili et al., 2016; Dogan & Turkekul, 2016; Pata, 2018b, 2018c; Solarin, Al-Mulali, Musah, et al., 2017). Moreover, researchers have explored how these variables relate to one another linearly (Al-Mulali, 2011; Al-Mulali & Sab, 2012; Bloch et al., 2012; Gorus & Aydin, 2019). According to M. Liu et al. (2020), who established the environmental Kuznets curve hypothesis for the G7 nations, globalization supports environmental condition improvement by facilitating more market transparency and the emergence of new trading partners. The literature survey reveals the gap in research examining how globalization, renewable energy, and natural resources affect evaluating the environmental Kuznets curve in the MINT panel. To establish solutions for emissions reduction and economic growth, it is essential to clarify carbon dioxide emissions with a comprehensive depiction of natural resources and the role of globalization. This relationship must be taken into account when coming up with plans to maintain equilibrium between economic development and environmental stability. The EKC hypothesis for the NAFTA nations was substantiated by Kalaycı and Hayaloğlu (2019). The impact of globalization and economic development on carbon dioxide emission in Turkey for the time span between 1970 and 2014 was examined by Saint Akadiri et al. (2020).

According to Apergis and Payne (2009), economic development slows down environmental deterioration. According to Hassan et al. (2019), the environmental Kuznets curve hypothesis remained consistent for Pakistan over the long run between 1970 and 2014. Due to the advancement in all sectors during the last few decades, the earth has experienced significant economic growth (Dong et al., 2018; Scherer et al., 2018). According to the World Bank, for the time span between 1990 and 2014, the global GDP increased by two times, from USD 37.88 trillion to USD 73.73 trillion (constant 2010 USD) (British Petroleum, 2018). The overall CO_2 emission worldwide in 2018 increased to 33,890.80 million tons, which is approximately 1.37 times the amount recorded in 1970. At the present time, economists and environmental experts focus largely on these issues. Together with infrastructural breakdowns and the loss of natural resources, such emissions have a detrimental impact on the environmental quality and cause major health risks to people.

According to earlier research, globalization has a considerable impact on climate change and environmental deterioration. Utilizing quarterly data and the QARDL technique, the environmental Kuznets curve hypothesis for Malaysia was investigated by a number of researchers (Muhammad Shahbaz, Shahzad, & Mahalik, 2018; Sharif, Afshan, et al., 2020; Suki et al., 2020; Yan Wang et al., 2019; Z. Xu et al., 2018). Results showed that globalization has a favorable political and social influence on environmental sustainability. Employing yearly data spanning between 1972 and 2013, Mehmood and Tariq (2020) assessed the EKC theory for South Asia. Globalization has a lower chance of raising carbon dioxide emissions in the short run than it does in the long term. Conversely, the association between globalization and carbon dioxide emission exhibits detrimental effects if short-term elasticity is greater than long-term elasticity. The impact of economic growth, urban population increase, and energy usage on environmental quality in China are researched by X. P. Zhang and Cheng (2009). The findings of the analysis showed that the utilization of economic growth has a favorable impact on environmental deterioration. In the published literature, a number of studies have used various econometric techniques to evaluate the idea of different explanatory variables, GHG emissions, and nations or groups of nations. Additionally, it was suggested that an economy's policies determine what kind of influence trade has on the environment. In this context, two different theories emerged to emphasize the connection between global trade and CO_2 emission. Selden and Song (1994) revealed a strong correlation between real growth and environmental degradation throughout the early phases of economic development. However, after a certain threshold of development, this correlation turns unfavorable. It indicates that when the economy hits a certain per capita income, economic expansion initially worsens the environmental condition and eventually improves it. Balsalobre-Lorente et al. (2018) explored the real GDP and carbon dioxide emission nexus in the five European Union (EU-5) countries for the time span between 1985 and 2016. The inverted U-shaped assumption of income negatively affects carbon dioxide emission in Vietnam (C. F. Tang & Tan, 2015). Economic development and carbon dioxide emission in the EU-5 nations have been determined to have an N-shaped interrelation. In Tunisia, the EKC hypothesis was investigated over the years spanning from 1971 to 2012, and the findings supported the presence of a monotonic positive EKC curve (Farhani & Ozturk, 2015). Research findings in many other nations do not support the EKC income theory (Al-Mulali et al., 2015). Nevertheless, several investigations have supported the EKC hypothesis (Al-Mulali et al., 2016; S. Wang et al., 2016).

According to the EKC's inverted U-shape, when a country initially starts to perform effectively, the acceleration of economic expansion causes the environment to go worse. However, once economic growth reaches a certain threshold, further increases in the economy lead to an upgrade in environmental conditions (Charfeddine & Mrabet, 2017). The technological impact might be the cause of this threshold (Danish et al., 2018). In order to validate the EKC hypothesis, Dogan and Seker (2016) investigated the relationship between real output and carbon dioxide emission in the context of OECD nations. Apergis and Payne (2009) examined the energy usage and EKC nexus in the states of Central America from 1971 to 2004. The growth-environment relationship is primarily studied using the EKC theory, which was supported by their Pedroni tests for cointegration and FMOLS findings (Canas et al., 2003). Different emissions categories have been employed in earlier research to evaluate environmental deterioration.

A large number of evidence-based research that focused on single-country assessments supported the EKC hypothesis and revealed a U-shaped relationship between income and carbon dioxide emission, including Alam et al. (2016) for Indonesia, India, China, and Brazil, C. F. Tang and Tan (2015) for Vietnam, Muhammad Shahbaz et al. (2014) for Tusnia, T. Li, Wang, and Zhao (2016) for China, Katircioğlu (2014) for Singapore, Seker, Ertugrul, and Cetin (2015) for Turkey, and Balaguer and Cantavella (2016) for Spain. The environmental Kuznets curve hypothesis has also obtained validation from other research using panel data sets (Apergis, 2016), including those for both developing and developed countries (Zaman et al., 2016), MENA countries (Arouri et al., 2012), and 15 OECD countries (Zafar, Saud, et al., 2019). In contrast, certain investigations, including those for the United States (Dogan & Turkekul, 2016), Pakistan (G. Ali et al., 2017), Nigeria (Alege et al., 2016), and G7 nations (Ajmi et al., 2015) did not uncover evidence in favor of the EKC. Apparently, the outcomes of these analyses were diverse and inconclusive.

In contrast to Pakistan, where a U-shaped correlation between income level and environmental condition was verified (opposite to the EKC theory), China showed a statistically significant and unfavorable influence of these factors, according to Ahmed et al. (2020) and Ahmed, Zafar, and Mansoor (2020). The research using panel data analyses by Al-Mulali et al. (2015) and Ozturk, Al-Mulali, and Saboori (2016) showed that the EKC theory exclusively remains true for high and upper-middle-income nations. Additionally, the outcomes of the second research addressing the aforementioned two income categories validated those of Al-Mulali et al. (2015). The detrimental effects of economic development on environmental sustainability have also been demonstrated by Destek (2019) for seventeen developing nations, Alola, Bekun, and Sarkodie (2019) for sixteen member states of the European Union, and Uddin et al. (2017) for the top twenty-seven emission generating nations. Additionally, Aydin, Esen, and Aydin (2019) utilized twenty-six European Union member states to conduct a panel smooth transition regression analysis for the time interval between 1990 and 2013. For the GCC member states, a panel cointegration test was carried out for the time span between 1991 and 2017 by Ansari et al. (2020). For this group of nations, they observed that the EKC hypothesis is inappropriate. Several other research articles specifically concentrate on the OECD member states along with the findings mentioned above. Ozcan, Tzeremes, and Tzeremes (2020) and R. Ulucak and Koçak (2018) among others demonstrated that economic development in OECD nations affects the environmental quality. Additionally, R. Ulucak and Ozcan (2020) observations for twenty-six OECD nations for the timeframe between 1980 and 2016 supported the viability of the EKC hypothesis. In contrast, Destek and Sinha (2020) reported that during the time period under consideration, there is a U-shaped relationship between the abovementioned factors for twenty-four OECD nations. The factors that affect the quality of the environment in the APEC territory have been the subject of numerous researches. Y.-J. Zhang et al. (2016) utilized the influence of corruption in the model to examine the EKC in the APEC regions.

To establish the validity of the EKC hypothesis, the researchers employed quantile regression. According to Magazzino (2017), growing income in APEC nations is correlated with reduced energy usage and CO_2 emission. Sinha and Sengupta (2019) investigated how the energy mix affected NO_2 emission in APEC nations and established an N-shaped relationship of income with NO_2 emission. For Asian countries, Apergis and Ozturk (2015) used the GMM approach to investigate the EKC hypothesis. The survey's controllable variables were institutions, industry share of GDP, land, and population growth. They discovered an inverted U-shaped relationship of GDP per capita with carbon dioxide emission. For Malaysia, China, and Turkey, Pata (2018a), Y. He and Lin (2019), and Suki et al. (2020) correspondingly confirmed the presence of EKC. Additionally, Murshed & Dao (2020) examined at the EKC theory' applicability to Sri Lanka, India, Nepal, Pakistan, and Bangladesh between 1972 and 2014. According to the experimental evidence, India and Bangladesh are the only countries where the EKC hypothesis remains true.

For thirty-six Asian nations spanning from 1991 to 2017, Bilgili et al. (2021) investigated the relationship between private and public health care spending, environmental degradation, and economic development. The EKC hypothesis was validated by quantile regression, GMM, and FMOLS analysis across Asia. Additionally, Asia contributes significantly to the world's CO_2 emission and is closely interlinked with the entire globe. On the issue of the nexus of globalization with environmental deterioration in Asia, there is, however, insufficient published research. The consequences of several aspects of globalization, such as current health expenditures, human capital, managing GDP, and environmental deterioration, including carbon dioxide emission and carbon footprint, have not been studied for Asian countries. Hence, it was crucial to incorporate these aspects into the research and offer suggestions to the authorities of the Asian countries.

4.3. Human Capital, Globalization, and Environment

One of the crucial inputs used in the production process for value-added products is human capital (HC) (Fang, 2016; X. Zhang et al., 2016). The human capital structure consists of knowledge, skills, competency, training, job experience, and education. Three different components make up human capital. The first one is general human capital, which is also known as human capital stock and is made up of both education and common experiences. The second is based on training, education, and skill, which is termed as firm-specific human capital. The third component is task-specific human capital, frequently referred to as training, experience, skills, and knowledge (Fang, 2016). In the published research, there has been an increased focus on the relationship among globalization, carbon dioxide emission, and human capital (measured by the average number of years in school). Globalization could be broadly defined as a process or circumstance of the connecting, combining, and integrating of people in the areas of economics, politics, culture, education, and technology. National boundaries are regarded as a component of globalization, which was intended to regulate the environment in the late 20th and early 21st centuries. Heckscher Ohin (H-O)'s Stopler-Samuelson trade theorem states that globalization is associated with higher per capita income, a narrowing of the income disparity, environmental control, and worker training. At the regional scale, globalization may contribute to a stable solution, such as efficiently distributed resources, investment in innovation, openness to global trade, knowledge, technology, ideas, and cross-border culture (Le Goff & Singh, 2014).

In order to manage environmental quality, globalization and human capital are closely interconnected. Globalization boosts human capital's effectiveness, according to Hickman and Olney (2011). Additionally, it is acknowledged that human capital has a significant influence on how well nations perform in the context of continuous economic development and technological innovations (Teixeira & Queirós, 2016). It is noteworthy to mention that carbon dioxide emission and ecological sustainability are related to the economic mechanisms by which human capital influences economic development. A person's capacity to comprehend issues regarding energy consumption and environmental degradation grows with technical education. Human capital is thought to have a significant impact on lowering carbon dioxide emissions (Kwon, 2009).

The fundamental characteristic that determines human capital is an individual's capability of learning. Throughout many countries, it also serves as the main determinant of economic progress. Accordingly, Chakraborty and Gupta (2014) explore the connections among human capital, economic progress, and environmental quality and discover a favorable link between human capital and environmental quality. The researchers further explain that when people are conscious and educated, they prefer using the resources at hand effectively without doing much damage to the environment. To put it another way, environmental pollution has a detrimental impact on the individual’s health, which significantly lowers that person's capacity for learning. Similar to how it affects material resources, pollution may also have an adverse effect on human capital, especially when it disrupts the environment for learning. According to Roth (2017), air pollution has a detrimental effect on academic success and human capital development. Goetz, Debertin, and Pagoulatos (2016) explore how income, human capital, and environmental sustainability are interconnected. They conclude that possessing better education has a distinctive, beneficial impact on the environment. To put it another way, regions with higher education levels tend to have better environmental circumstances. This suggests that education not only contributes to economic development but also has a significant positive impact on the environment. Environmental pollution is regressed on the income inequality Gini coefficient, educational attainment, and income, according to Torras and Boyce (1998). They demonstrate that the level of education, especially in underdeveloped nations, significantly affects environmental quality. However, Petrosillo et al. (2007) revealed that the level of education of tourists greatly influences their perceptions. To put it another way, those who have completed high school tend to cause less harm to the ecosystem. As was previously mentioned, human capital may potentially be the answer to the sustainability of the environment. Environmental deterioration is associated with it and has been reported in the published research along with correlations to natural resources.

Employing the dynamic OLS (DOLS) and fully modified OLS (FMOLS) approaches, Danish, Ulucak, and Khan (2020) explored the interconnection of natural resources with the environment in the BRICS countries (Brazil, Russia, India, China, and South Africa). Human capital was not regarded as a possible nexus variable, nevertheless, by the research. But the biggest offender in terms of environmental deterioration was economic development. The effect of human capital on the quality of the environment in G7 nations between 1971 and 2014 was investigated by Ahmed, Zafar, and Ali (2020). Ahmed et al. (2020) employed the autoregressive distributed lag (ARDL) approach to investigate the relationship among human capital, natural resources, and ecological sustainability in China and found that human capital secures ecological sustainability. The research outcomes demonstrated that human capital benefits the environment whereas natural resources deteriorate it. In the United States, Zafar et al. (2019) explored how natural resources and human capital affected the ecosystem in the time span between 1970 and 2015. They found that the United States' environmental condition was improved by human capital. Employing the ARDL method, Danish et al. (2019) investigated the effects of human capital and biocapacity on environmental deterioration in Pakistan between 1971 and 2014. Interestingly, they observed that biocapacity and human capital mutually contributed to the deterioration of the ecosystem. This stands in contrast to previous research evidence.

In certain cases, human capital emerges to have a beneficial influence on environmental quality, particularly in nations that have experienced economic transformation (from agricultural to industrial) and shifted from human capital with lower pollution levels to higher pollution levels. Environmental contamination in this kind of nation will resemble a U-shape. According to Emmanuel (2014), human capital is self-generating, shareable, transportable, and expandable in contrast to traditional labor. According to the researcher, human capital is transferable and expandable in the respect that the information stock raises a person's level of human capital as the basic understanding develops and grows through time. In the meantime, information is transferable and shareable to others who possess the expertise and also have the capacity to share it with others. In accordance with the aforementioned, the researcher draws the conclusion that increased economic diversity and the acquisition of human capital will accelerate economic progress in emerging nations.

An investigation by Bakan and Gökmen (2016) on the effects of human capital on economic progress in Turkey reveals that economic development and human capital have a favorable and substantial correlation. He reaches the conclusion that inadequate and poor-quality education hinders the performance of the Turkish economy by adopting education as a stand-in for human capital. Similarly, Eyyüp Ecevit (2016) applies the ARDL technique to explore the correlation between economic growth and human capital in Turkey from 1990 to 2013. The researcher discovers a long-term interrelation of human capital with economic development. Additionally, he emphasizes that investing in human capital is important for maintaining Turkey's development since it favorably benefits the country's progress in the areas of health and education. For the time frame between 1923 and 2007, Beskaya, Savas, and Samiloglu (2010) explore at the long-run correlation between per capita income and enrollment in schools in Turkey. They uncover evidence of a long-term interconnection of real income with school enrolments using the ARDL technique to co-integration. Real income and school enrollment demonstrate a bidirectional causal relationship in terms of causality, whereas human capital drives real income in a linear direction. Rusli and Hamid (2014) conducted an empirical investigation into the connection of economic growth with human capital in Malaysia and discovered a favorable correlation between these categories. In addition, they argue that Malaysia's economy has developed substantially because of improvements in human capital, and therefore that efforts should be made to achieve high-income status by 2020. Additionally, Islam et al. (2016) evaluated the influence of human capital on Malaysian economic progress and concluded that education had a favorable impact on the country's economic growth. Likewise, secondary and higher education considerably contributed to Nepal's Real GDP Per Capita, according to Nowak and Dahal's (2016) research. A. J. Abdullah (2013), on the other hand, investigates how human capital affects economic growth and discovers conflicting data that indicate that human capital is adversely associated with Nepalese economic growth. According to Zafar et al. (2019), the utilization of human capital results in better environmental conditions and lower carbon dioxide emissions.

4.4. Health Expenditure and Environment

There has been an increase in severe acute respiratory syndrome due to the coronavirus pandemic, a particular form of highly contagious disease (Abbas, 2020). Public outrage regarding economic liberty increased in response to COVID-19 breakouts and has become the new norm (Su et al., 2020). The significance of healthcare systems grew significantly in the post-COVID world. Increased health expense was stressed in recently published studies on the coronavirus and at the expense of defense spending (Yoosefi Lebni et al., 2021). The body of research focuses on the correlation of environmental factors with health expenditures. Munir Ahmad et al. (2021) extensively examined carbon dioxide emissions and the cost of healthcare. Their research demonstrated that China's healthcare expenditures enhanced carbon dioxide emission by employing the STIRPAT approach. S. Zaidi and Saidi (2018) reported a two-way causal linkage of carbon dioxide emission with health expenditures. Per capita income and health expenditures have an inverted U-shaped relationship, according to S. A. R. Khan, Zaman, and Zhang (2016). They suggested that it requires economic maturity subsequently in the economic growth process to minimize infections. Their findings demonstrated a connection between per-capita health expenditure and carbon dioxide emission.

Alimi, Ajide, and Isola (2020) explored how CO_2 emissions affected healthcare expenses. They observed that health expenditure rises as a result of environmental deterioration employing data for fifteen West African nations from 1995 to 2014. Exclusively public health expenditures induced these outcomes; private health expenditures did not provide any appreciable impact. The study made the argument that people are unlikely to spend their own money on health issues raised by growing carbon emissions. Yahaya et al. (2016) reported an advantageous long-term effect of per-capita income, carbon dioxide, nitrous oxide, and carbon monoxide on health expenditures by employing a panel dataset of 125 emerging economies. Nevertheless, sulfur dioxide and nitrous oxide had no immediate effect on the per-capita health expenditure in emerging nations. Ibukun and Osinubi (2020) likewise revealed in a scientific study that growing health expenditures are associated with declining environmental conditions.

For 36 Asian nations between 1991 and 2017, Bilgili et al. (2021) examined the relationship between public and private health spending, economic growth, and environmental degradation. They employed quantile regression analysis, GMM, and FMOLS. Both public and private healthcare spending have a decreasing impact on CO_2 emissions, according to FMOLS and quantile regressions. Public and private healthcare spending can reduce CO_2 emissions, according to quantile regression analyses, although the outcomes vary depending on the levels of CO_2 emissions. A substantial determinant of health expenditures was shown to be greenhouse gas emissions. Carbon monoxide is the second most important greenhouse gas in terms of impact, following carbon dioxide (Murshed et al., 2021). Using panel data from 125 nations, Yahaya et al. (2016) demonstrated that greenhouse gas emissions considerably raise the expense of healthcare. By considering infant mortality and population density as determinants of health, Metu et al. (2018) additionally expand this model. According to Gangadharan and Valenzuela (2001), measures of health are being affected by deteriorating environmental conditions. It was reported that infant mortality and population density have a favorable impact on health care expenditure by using time series data from the ARDL and Nigeria model.

Greenhouse gas also has an adverse impact on healthcare expenditure. Odusanya, Adegboyega, and Kuku (2014) revealed that greenhouse gas negatively impacts health in Nigeria. The findings, however, were in contrast with those of other research that focused on particular nations; for example, H. Abdullah, Azam, and Zakariya (2016) identified a correlation of greenhouse gas with Malaysia's healthcare expenditure. It has been discovered that health-related expenses are a major contributor to CO_2 emissions. According to Blázquez-Fernández, Cantarero-Prieto, and Pascual-Sáez (2019), there is a correlation between carbon dioxide emission and healthcare expenditure. For the MENA countries, Khoshnevis Yazdi and Khanalizadeh (2017) discovered comparable outcomes. Their research showed experimental proof of an increased environmental crisis brought on by growing healthcare expenses. Jorgenson and Burns (2004) reported findings in support of earlier research that health expenditure increases CO_2 emission using a panel of twenty nations. Results from an analysis of the relationship between power generation and healthcare expense by Zaman and Abd-el Moemen (2017) showed that healthcare expenses accelerate environmental deterioration.

S. A. R. Khan et al. (2019) revealed that healthcare expenses lead to increases in CO_2 emissions utilizing panel data for fifty-eight Belt and Road Initiative nations and the GMM and FMOLS methods. C.-M. Wang et al. (2019) have used the ARDL cointegration model to examine the relationships between healthcare expenditures, GDP per capita, and carbon dioxide emission in eighteen OECD nations between 1975 and 2017. For Norway and New Zealand, the investigators observed a bidirectional causal relationship of health expenditures with carbon dioxide emission. For example, I. Ullah et al. (2020) applied 2SLS and 3SLS utilizing data of Pakistan for the timeframe between 1998 and 2017, and reported a favorable impact of carbon dioxide on healthcare expenditure. His findings are comparable to those of Shahzad et al. (2020), who examined data of Pakistan from 1995 to 2017 utilizing FMOLS and DOLS. Comparable findings were obtained for China by Yu, Zhang, and Zheng (2016), who revealed that waste and wasted gases enhance healthcare expenses. These investigations utilized Chinese provincial data and utilized the quantile regression and FMOLS models, which are two distinct methodologies. According to X. Xu et al. (2019), quantile regression seems to be a much preferable option available for comparing regions based on income in order to attain the aims of the research. In their provincial investigation, they observed that low-income zones had contrasting outcomes to medium and upper-income zones.

4.5. Carbon Footprint and CO_2 Emissions as a Proxy for Environmental Degradation

In order to investigate the effects of globalization on environmental quality by using the EKC theory, it is obscure what environmental deterioration proxies need to be utilized. The answer appears to rely exclusively on a number of variables, including the economic framework and economic growth of the target nation under investigation. The carbon footprint and carbon dioxide emission proxies were the two indicators of environmental deterioration that were utilized to focus the analyses in this research. The carbon dioxide indicator is used since data are readily available, however, in recent times, the ecological carbon footprint (ECF) indicators have become the key indicators of environmental deterioration. The term "ecological footprint" was used initially in the 1990s to refer to using water and land for producing all human-consumed resources as well as for disposing of human-generated trash. Researchers have employed the ecological footprint, a holistic metric (Al-Mulali, Tang, et al., 2015b; Alessandro Galli et al., 2012), as a measure of environmental deterioration (Charfeddine, 2017; Hassan et al., 2019; Yong Wang et al., 2013). The ecological footprint contributes to highlighting the immediate and long-term environmental effects of manufacturing and consuming practices (R. Ulucak & Bilgili, 2018). The approach for determining the ecological footprint has seen significant development in recent times, and the published research outcomes have detailed multiple changes and improvements. Since it would be impractical to discuss each of these methods separately and thoroughly, the methodologies have been grouped together into several broad categories. This research utilized carbon dioxide emission and the ecological carbon footprint as indicators of environmental deterioration.

According to the published works, a number of researchers concentrated on the issue of organizational carbon footprint (Alvarez et al., 2014; Aroonsrimorakot et al., 2013; Güereca et al., 2013; Larsen et al., 2013; Onat et al., 2014; Ozawa-Meida et al., 2013). In particular, the Greenhouse Gas Protocol (Protocol, 2004) is acknowledged as a guiding criterion in the contributions in the field of organizational carbon footprint. It is commonly accepted that the release of CO_2 and other emissions by humans is what causes worldwide climate change (Benjaafar et al., 2012; Mouzon et al., 2007; Thomas, 2017). The International Energy Agency estimates that in 2018, the carbon footprint associated with energy increased by 1.7 percent to a record-breaking 33.1 gigatons. In order to fulfill the stabilization target of IPCC 450 ppm (Metz et al., 2007), CO_2 emissions must be reduced by an absolute 50 to 85 percent by 2050, when it will be eighty percent greater than they are now (Jackson, 2011). Particularly in sectors with significant levels of pollution and energy consumption, driving carbon footprint reduction (CFR) has been a priority that cannot postpone (Yenipazarli, 2016). Nevertheless, since carbon footprint reduction efforts require large investments and might restrict their operations and incomes, companies are more focused on maximizing profitability than on lowering their carbon footprint (R. Zhao et al., 2017). Many nations have implemented CO_2 emission monitoring regulations and developed mechanisms including carbon cap-and-offset, carbon cap-and-trade, and carbon taxes in an effort to support companies' carbon footprint reduction activities (Aldy et al., 2010; Halat & Hafezalkotob, 2019; Kang et al., 2019; C. S. Tang & Zhou, 2012; F. Tao et al., 2018; Varbanov et al., 2015). Essentially, current carbon control rules are developed in the setting of comprehensive knowledge, meaning that before adopting these regulations, authorities would have total carbon-related data regarding companies. A progressive model was developed by B. Wu, Liu, and Xu (2017) to investigate how industries are affected by carbon control rules while low-carbon governmental strategies expand. The findings demonstrate that the adoption of low-carbon regulations, as well as the rate of diffusion, are significantly influenced by companies' expectations about carbon regulation. According to a published article, encouraging companies to minimize their carbon footprint by managing carbon pricing is more effective for authorities than setting a carbon cap (Kang et al., 2019).

Bello, Solarin, and Yen (2018) explored the specific environmental effects of hydroelectricity demand in Malaysia as a developing country. Although accounting for urbanization, GDP, and GDP square for the time span between 1971 and 2016, the researchers employ four distinct environmental deterioration indicators, comprising carbon dioxide emission, carbon footprint, ecological footprint, and water footprint, as targeted indicators. The impacts of globalization, human capital, financial progress, and the usage of renewable energy on the carbon and environmental footprint were assessed by Shi and Yin (2021) and X. Wang (2021). For twenty years, from 1997 to 2016, data from China, India, Russia, and Brazil were utilized for this reason. The ARDL methodology was used to investigate the panel data of twenty years that was gathered for these nations. According to the report's observations, both short- and long-term environmental deterioration are significantly positively influenced by human capital. Additionally, the research findings have shown that globalization both temporarily and permanently minimizes environmental deterioration. Globalization has been proven to be a negative indicator of carbon and ecological footprints, whereas economic growth and human capital have been shown to be effective indicators of these two metrics. These insights are believed to offer a significant addition to the academia as well as to application, since they will enable experts and administrators to understand the comparative influence that energy, educational, economic, and trade policies have in causing environmental deterioration.

This investigation is innovative in four different ways in particular: firstly, as far as we are aware, no research has examined the impact of all components of globalization on environmental deterioration by controlling GDP, human capital, and current health expenditures in Asian countries. It enriches the field of research by utilizing two environmental indicators—the CFP and CO_2 emissions—into a single analysis. By including control variables, the model avoids specification bias in the correlation among the CFP, CO_2 emissions and globalization. Secondly, this represents the very initial research that employs the KOF indices for general globalization, economic globalization, trade globalization, financial globalization, social globalization, interpersonal globalization, and political globalization to interpret the aspects of the Asian countries. Thirdly, this research utilized the EKC methodology to explore the interconnections within globalization, economic growth, human capital, health expenditures, and pollution in Asian economies. Asian nations are among those possessing the highest levels of environmental degradation in the world, as well as the highest rates of economic development and globalization. Lastly, to evaluate the correlation of globalization with environmental quality, a novel panel quantile regression method has been used in the investigation. This research would assist policymakers in Asian nations ensuring environmental sustainability during the globalization process and improving the financial and healthcare systems of their nations.

CHAPTER 5

EMPIRICAL METHODOLOGY AND DATA WITH THEORETICAL FRAMEWORK

5.1. Theoretical Framework

Understanding how the independent variable- globalization and the control variables impact carbon emission is essential before the starting of the experimental approaches that were utilized in this research. Considering the importance of globalization and emphasizing how it affects carbon emissions by different mechanisms prevalent in both developing and developed economies in the global context is vital from the perspective of globalization. Additionally, it is now regarded that this phenomenon is a modern economic strategy that enhances economic development and welfare by decreasing barriers to international flows and investment. On the other hand, many describe globalization as a vehicle that influences economic activities and carbon emissions in various ways.

Environmentalists have frequently brought up globalization in their discussions, and they have emphasized its wide-ranging consequences. Globalization can influence the environment in both positive and negative ways. Manufacturers have enhanced productivity as a result of globalization to keep up with demand. The environment could be negatively impacted by increased production because more natural resources would be depleted before they would be restored. On the other hand, globalization would facilitate the transfer of developed to developing nations of the benefits of eco-friendly technology and processes. For instance, importing more environmentally friendly technology and adopting stronger environmental guidelines and laws can lessen pollution in developing nations.

Whenever a nation engages in trade and investment initiatives, it subsequently produces more products and services, releasing increased carbon dioxide into the atmosphere. By lowering carbon emissions via the diffusion of information and technology, globalization improves the quality of environmental health. Multinational companies, for example, may boost economic progress without compromising environmental quality by using cleaner technologies. Firstly, carbon emission degrades environmental conditions if a nation persists in emitting increased carbon dioxide into the atmosphere. Secondly, the type of technologies utilized in economic activity determines how quickly the environment will degrade. There is no denying point that economic development will be enhanced if companies utilize polluting, energy-intensive manufacturing methods. In addition to having a negative effect on global warming and climate change, such approaches will deteriorate the quality of the environment.

Various aspects of globalization have a significant influence on carbon emissions. Through financial and trade integration, globalization links different nations. Every economy needs a great deal of energy to develop, which also generates carbon dioxide emissions. Social connections, cultural exchange, and informational outflow all contribute to social globalization. Social globalization, for example, makes it possible for a nation to utilize the expertise of other nations in protecting the environment. Besides, social globalization is increasing tourism, making phone or internet connections with friends internationally, causing carbon emissions, and ultimately deteriorating the environment. Conservation of the environmental quality benefits both citizens and economies overall. Political globalization also includes the number of diplomatic missions, as well as participation in significant global missions and alliances, which increases resource consumption and air pollution ratios. In contrast, by participating in those missions, nations can implement strict regulatory policies for environmental pollution. So, the effects of globalization on the environment are mixed and inconclusive.

According to Tamazian and Rao (2010), the strong enforcement of environmental policies together with quality agencies across globalization has a crucial impact on enhancing environmental quality. The ascending slope of the EKC curve represents how trade causes environmental quality to decline in response to economic development. The EKC hypothesis has dealt with this issue considerably in terms of how economic growth is interconnected with carbon emissions. Furthermore, if residents of developing nations do not alter their attitudes regarding conscientious environmental quality, it will continue to decline in the context of a globalized world. It is challenging to preserve economic development by lowering CO_2 emissions, particularly for developing economies. Human-driven economic efforts are linked to carbon emissions (G. Wang et al., 2017). Human development, which is closely correlated to human capital, is a crucial contributor to the economic growth of a nation. The human capital framework acknowledges the importance of educated, creative, experienced, and qualified workers as input variables in the production process (T. Ali, 2017). According to Chakraborty and Gupta (2014), educated individuals tend to manage the resources at their disposal in an effective manner without doing much damage to the environment. High levels of literacy have an independent and advantageous impact on environmental quality, according to Stephan J. Goetz, Debertin, and Pagoulatos (1998). All this is to say, the environmental quality tends to be better in nations with high literacy levels. The above suggests that education contributes significantly to both contribute to the betterment and bringing about extra advantages for the enhancement of environmental quality.

Furthermore, it is widely acknowledged that spending on healthcare is crucial in the campaign towards climate change. A smart approach to enhance improved health and lower carbon emissions rates to counteract global warming is to encourage emerging economies to employ environmentally friendly technologies. Spending on healthcare is strongly correlated with the rising demand for human healthcare. Likewise, air pollution was one of the highest environmental hazards in 2019, where nine out of ten individuals breathe polluted air (WHO, 2019b). Global warming and air pollution both have the propensity to enhance the prevalence of various diseases. As a result of climate change, which is greatly influenced by the ecological footprint as well as other GHG emissions, it is anticipated that from 2030 to 2050, around 250 million fatalities will occur yearly as a result of excessive temperature, diarrhea, malaria, and malnutrition (WHO, 2019a).

Published studies have demonstrated a strong correlation of economic growth with healthcare expenditure, which is one of the fundamental aspects of economic development. Increased expenditures on human capital are a consequence of strong economic growth. Hence, spending on healthcare could contribute both in environmental sustainability and stimulate economic growth (Solomon Prince Nathaniel et al., 2021). Healthcare expenditure rise has now become a common area of concern for developed countries. According to the concept of environmental economics, investing in preventive healthcare greatly raises the standard of living for people and the environment, which has a beneficial impact on economic growth. The COVID-19 pandemic is a catastrophe since it has seriously endangered both the economic conditions and public health. This outbreak is a concrete example of continuing inequality in the healthcare segment. Additionally, there are few investigations that explored the relationship between healthcare expenditures and human capital togetherly in the context of environmental deterioration. Nevertheless, the correlation among globalization, economic growth, human capital, healthcare expenditures, and environmental quality in Asian nations has not yet been investigated in the published research available.

5.2. Data Description

The carbon footprint and carbon dioxide emission are two distinct dependent variables that are used to define environmental degradation. To assess the influence of globalization on environmental quality in Asian countries, the independent variables are the indicators of globalization, such as the general globalization index, economic globalization index, trade globalization index, financial globalization index, general globalization index, social globalization index, interpersonal globalization index, and political globalization index. Control variables are determined from the thorough literature research and include GDP, GDP square, human capital, and current health expenditures. For the timespan between 2000 and 2017, this research utilized an annual data collection for selected Asian countries. Based on these selected variables and their data availability, finally, twenty-two Asian countries were chosen for this research, which is represented in Table 5.1. It also includes related CO_2 emissions (metric tons per capita) and carbon footprint (gha per capita) in 2018 according to their rank. Figure 5.1 and Figure 5.2 are illustrated based on these tabulated values.

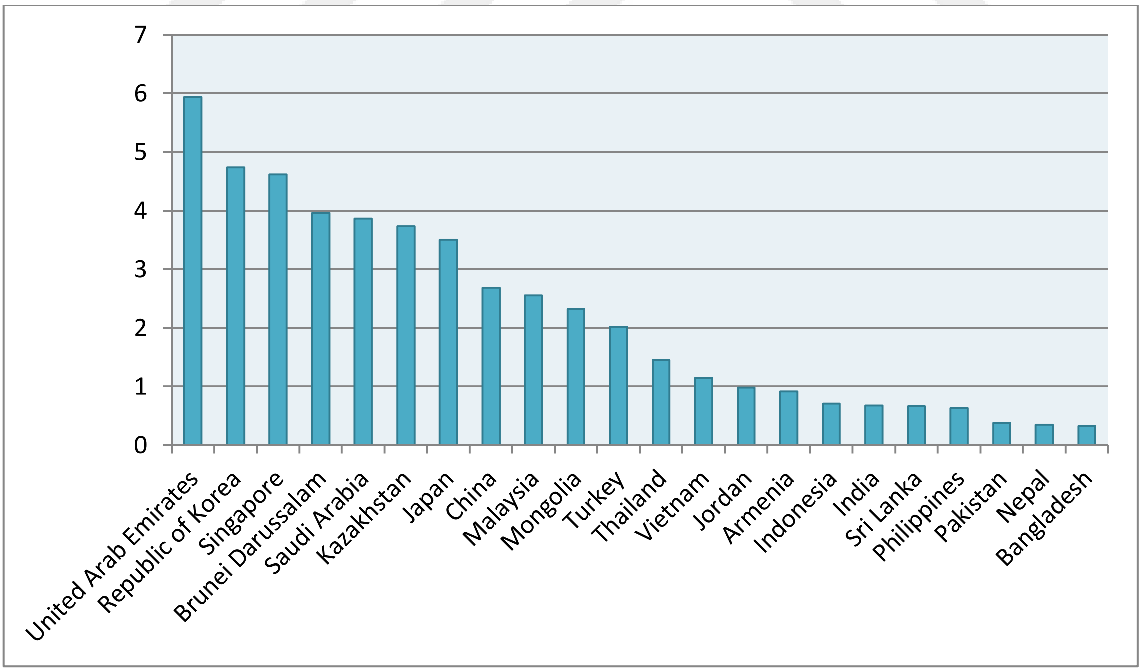
Table 7.1 The selected Asian countries in this analysis and the related CO_2 emissions (metric tons per capita) and Carbon footprint (gha per capita) in 2018

Rank	Country	CO_2 emissions (metric tons per capita)	Rank	Country	Carbon footprint (gha per capita)
1.	United Arab Emirates	18.39068	1.	United Arab Emirates	5.93979
2.	Brunei Darussalam	17.57740	2.	Republic of Korea (South Korea)	4.73282
3.	Saudi Arabia	15.46639	3.	Singapore	4.62122
4.	Kazakhstan	11.85132	4.	Brunei Darussalam	3.96671
5.	Japan	8.80168	5.	Saudi Arabia	3.86903
6.	Singapore	8.40623	6.	Kazakhstan	3.73354
7.	Malaysia	7.75215	7.	Japan	3.50028
8.	China	7.48733	8.	China	2.67920
9.	Mongolia	6.79765	9.	Malaysia	2.55450
10.	Turkey	5.00036	10.	Mongolia	2.32338
11.	Thailand	3.70237	11.	Turkey	2.02278
12.	Vietnam	2.98914	12.	Thailand	1.45053
13.	Jordan	2.48662	13.	Vietnam	1.14039
14.	Indonesia	2.15560	14.	Jordan	0.97792
15.	Republic of Korea (South Korea)	1.97772	15.	Armenia	0.91247
16.	Armenia	1.93445	16.	Indonesia	0.70289
17.	India	1.81270	17.	India	0.67651
18.	Philippines	1.29928	18.	Sri Lanka	0.66800
19.	Sri Lanka	1.00092	19.	Philippines	0.63208
20.	Pakistan	0.88259	20.	Pakistan	0.38362
21.	Nepal	0.54065	21.	Nepal	0.34622
22.	Bangladesh	0.51711	22.	Bangladesh	0.32246

Source: (GFN, 2022; WDI, 2022)

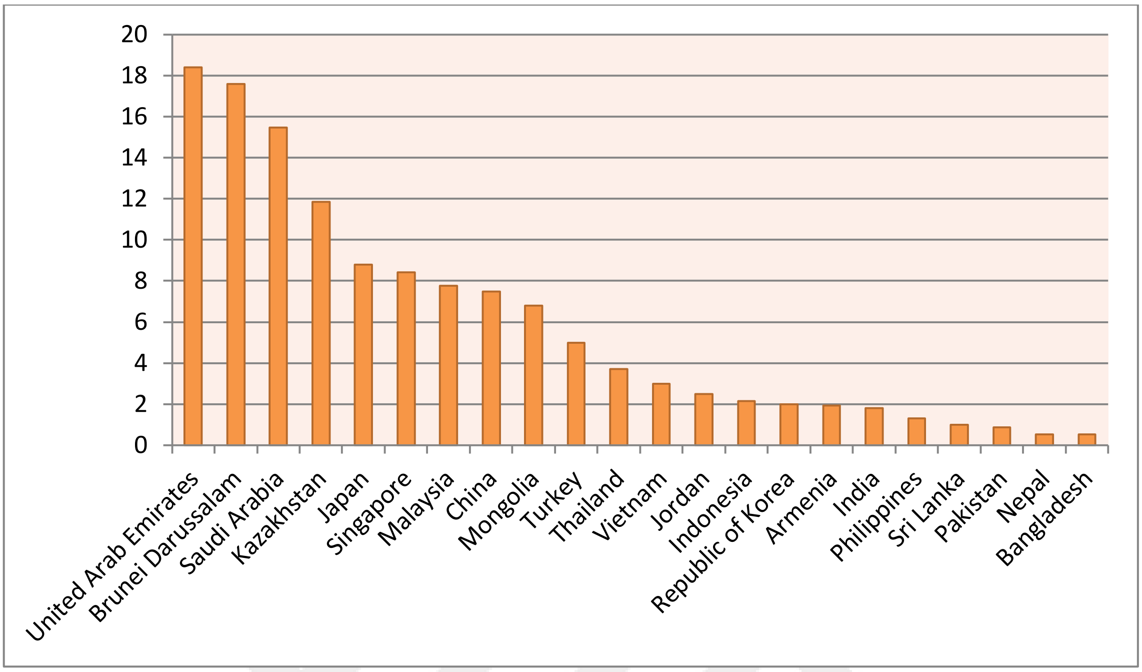
The Global Footprint Network (GFN) Global Footprint Network (2020) was used as the source for the Carbon footprint (gha per capita) data. The KOF Globalization Index (Dreher, 2006; KOF, 2020), which was presented by the ETH, Zurich KOF, and KOF Swiss Economic Institute (KOF, 2020), was used to determine the globalization indicators. Dreher (2006) and Dreher et al. (2008) presented the Original KOF index. Afterward, Gygli et al. (2019) subsequently updated this index. The data was obtained from the World Bank Indicator (WDI, 2020) website for carbon dioxide emission (in metric tons per capita), GDP per capita (in constant 2010 US dollars), and Current health expenditure per capita (current US dollars). From Penn World Table Version 10.0, the data on human capital per person has been collected. The sample size was decreased to twenty-two (22) nations by excluding those whose data were unreliable for the investigation. Due to the statistical features of the methods utilized, a balanced panel has been preferred. Descriptions of the data sources, variables, and measures are presented in Table 5.2.

Figure 7.1 Carbon footprint (gha per capita) of selected Asian countries in 2018



Source: Author’s Illustratıon Usıng Data from GFN

Figure 7.2. CO_2 emissions (metric tons per capita) of selected Asian countries in 2018



Source: Author's Illustratıon Usıng Data from WDI

The prior investigations in the published research are taken into consideration while evaluating and determining the appropriate variables. This is because published literature is expected to be consistent in its identification and categorization of variables. The data spanning the years between 2000 and 2017 has been determined based on the data availability, and Figure 5.2 shows the trends of these candidate variables in selected Asian countries average between 2000 and 2017. To assist in reducing heteroscedasticity, natural logarithms have been used to transform all variables. Typically, the logarithm of the variables is used in published studies. Relevant variables are taken into account as control variables to avoid the omitted-variable bias. The following are brief descriptions of the variables which are utilized in the model.

Table 7.2. Data source & variables

Variables	Unit	Symbol	Source of Data
Carbon Footprint	Carbon footprint in global hectares (gha per capita)	CFP	(Global Footprint Network, 2020) https://www.footprintnetwork.org/our-work/cities/
CO_2 Emissions	CO_2 Emissions (Metric tons per capita)	CO_2	World Development Indicators (WDI, 2020)https://databank.worldbank.org/source/world-development-indicators
General Globalization Index	KOF globalization Index, 2020	GGI	https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html
Economic Globalization Index	KOF globalization Index, 2020	EGI	https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html
Trade Globalization	KOF globalization Index, 2020	TGI	https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html
Financial globalization Index	KOF globalization Index, 2020	FGI	https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html
Social Globalization Index	KOF globalization Index, 2020	SGI	https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html
Interpersonal Globalization Index	KOF globalization Index, 2020	IGI	https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html
Political Globalization Index	KOF globalization Index, 2020	PGI	https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html
Economic growth	GDP per capita (constant 2010 US$)	GDP	World Development Indicators (WDI, 2020) https://databank.worldbank.org/source/world-development-indicators
Human Capital	Human capital per person (based on Years of schooling and returns to education)	HC	PWT 10.0 https://www.rug.nl/ggdc/productivity/pwt/?lang=en
Current Health Expenditure	Current health expenditure per capita (current US$)	CHE	World Development Indicators (WDI, 2020) https://databank.worldbank.org/source/world-development-indicators

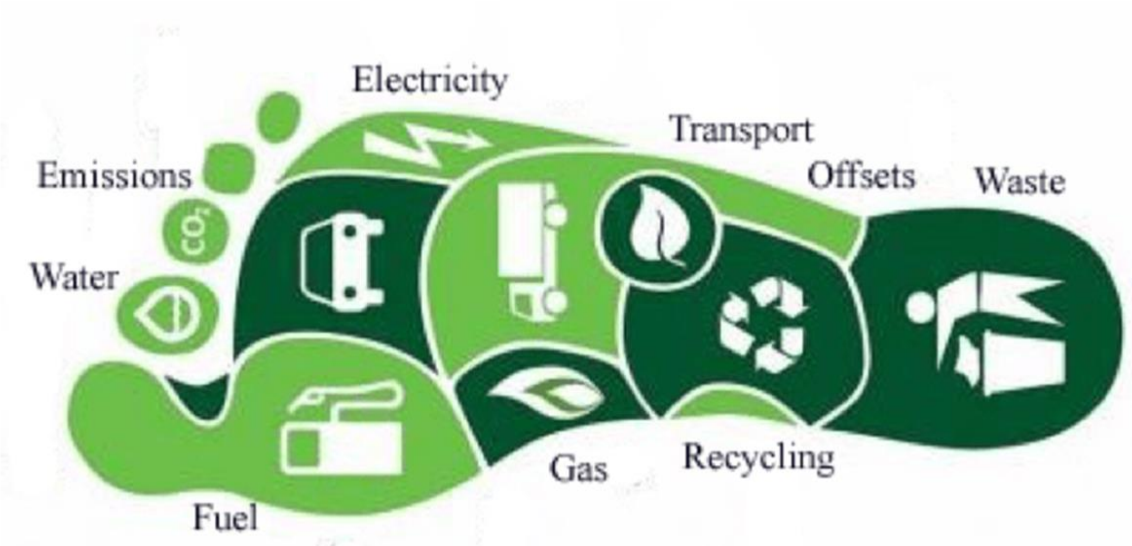
5.2.1. Dependent Variables

5.2.1.1. Carbon Footprint (CFP)

The ecological carbon footprint is a dependent variable, which has a stronger connection to air pollution. Utilizing global hectares (gha) per person of forest lands as a scale of measurement, national footprint accounts estimate the ecological carbon footprint. The principal objective of the research is to explore precisely this correlation by analyzing the interconnection among globalization, carbon dioxide emission, and the ecological carbon footprint. The proportion of carbon emission that industry or entity emits presently is typically referred to by the phrase "carbon footprint." Since it represents one competitive requirement for biologically productive land, the carbon footprint is indeed an important component of the ecological footprint. Once there is insufficient biocapacity made available to collect these emissions, carbon emissions from the combustion of fossil fuels grow up in the environment. Consequently, the tons of CO_2 emission are stated as the proportion of required productive land to absorb those pollutants once the carbon footprint is represented as part of the overall ecological footprint. The above demonstrates the proportion of biocapacity is required to counterbalance the emissions caused by the use of fossil energy (GFN, 2020). Figure 5.3 represents the figurative image of carbon footprint which indicates the carbon footprint sources from where carbon footprint emerges, i.e., using electricity, transport, offsets, waste, recycling, burning gas, fuel, water and emissions.

The term "carbon footprint" refers to a way of estimating the overall amount of greenhouse gas emissions expressed as carbon dioxide equivalents (CO2e) on climate change produced by the activities of individuals, industries, enterprises, cities, or nations (Madkour, 2019). The Intergovernmental Panel on Climate Change's recommended techniques and standard emission factors were used to measure greenhouse gas emissions and carbon footprint in the form of CO2e (IPCC, 2006).

Figure 7.3. Figurative image of carbon footprint



Source: (GFN, 2020)

The carbon footprint is likely to be among the most appropriate way to assess emissions (Pandey et al., 2011) and environmental consequences (Čuček et al., 2010; Klemeš, 2010) amongst different indices. Policymakers may more efficiently determine the amounts of emissions generated by various industrial groups using the carbon footprint. These are then employed to calculate the impact of commercial operations on regional and international environmental quality (Ramachandra, 2012). Documentation on carbon footprints can assist organizations in undertaking emission reduction efforts, both internally as well as among external partners. Additionally, organizations are disclosing their carbon footprint findings to the public in an effort to control the issues related to climate change, boost market share, and acquire preferred promotional strategies (Lee, 2011). A strong foundation for comparing the outcomes with carbon dioxide emission is enabled by the integration of carbon footprint. Carbon footprint may also be described as the carbon dioxide emission that is generated by the process throughout the entire lifespan of a product, either intrinsically or extrinsically (T. M. J. Wiedmann, 2007). The concept of carbon footprint needs to be expanded to include these gases, though, since the majority of activities could also generate additional greenhouse gases. In carbon footprint analyses, the expression carbon dioxide equivalent (CO_2e) is therefore frequently employed. Equivalent in this context refers to the calculation of the global warming potential of GHGs apart from carbon dioxide and the inclusion of that potential in the analysis.

Ecological Carbon Footprint is defined in a number of different ways (Network, 2007; Patel, 2006; T. Wiedmann & Minx, 2008). Since the required data is collected from the Global Footprint Network (GFN) for this research, the interpretation of the Ecological Carbon Footprint (ECF) is adopted here. The Ecological Carbon Footprint has been described as "the forest land areas necessary to absorb anthropogenic CO_2 emissions" in accordance with the National Footprint Account (Network, 2014). It may similarly refer to the CO_2 emission generated from the utilization of fossil fuel as well as the carbon contained in imported products. The consumption-based method is used to determine the environmental carbon footprint. It also encompasses those greenhouse gas produced by human activities in any way at any phase in the manufacturing and service life cycles. The CO_2 emission contained in marketed products and services is also included with this. The Ecological Carbon Footprint is employed in this research as a proxy for environmental deterioration (Charfeddine & Mrabet, 2017).

The concept that the carbon footprint is measured in the total land area does not always mean that carbon sequestration is the only answer to the carbon issue. This only serves to demonstrate the proportion of biocapacity required to handle unprocessed carbon wastes and prevent any accumulation of carbon in the atmosphere. The method of analyzing this allows us to manage the climate change issue holistically rather than just shifting the responsibility from one natural process to the other. In reality, the world's inability to eliminate all the CO_2 from fossil fuels, even though still meeting other needs, is what causes climate change. This paradigm likewise places climate change in a larger perspective that connects together all of the existing environmental challenges. A single, overarching issue that includes deforestation, climate change, the increasing extinction of species, food scarcity, collapsed fisheries, and overgrazing is caused by the fact that humankind is seeking too much from the planet than it can offer. Instead of confronting a single concern at the cost of the other, it is preferable to concentrate on one problem as well as addressing all of its aspects. The self-interest to act is also made much more apparent by this. The Ecological Footprint of humankind is presently 60%

comprised of its carbon footprint, which is also its fastest-growing constituent. Since 1961, civilization's carbon footprint has multiplied eleven times. The most important measure we can undertake to avoid overflow and survive within limits in this globe is to reduce the carbon footprint of humankind (GFN, 2020).

5.2.1.2. CO_2 Emissions (CO_2)

The fundamental concept is to evaluate the ecological consequences by means of the ecological footprint of consumption's carbon dimension. In order to achieve this, the concept of the carbon footprint is utilized here, which takes into account the total area of forest land needed to capture emissions caused through the use of fossil fuels, chemical process alterations, land use changes, and CO_2 emission absorbed by seas. This comprises carbon emissions into the atmosphere and emissions from residential fossil fuel usage that is explicitly or implicitly linked to the consumption and production practices of economic entities such as governments, industries, corporations, individuals, and organizations.

This study measures the amount of CO_2 emission in metric tons per capita or thousands of metric tons per capita. In contrast to land usage, alterations in land usage, or deforestation, emissions are caused by the burning of solid, liquid, and gaseous hydrocarbons in industrial production, transportation, construction, and power generation. They are also caused by cement production and gas flare-ups in the manufacturing industries. Carbon dioxide makes up roughly 75 percent of the overall emissions in the atmosphere human breathe and is a common greenhouse gas that normally exists in the environment. This may, however, persist in the atmosphere for a very long time. According to published studies, the concentration of CO_2 has increased from 270 parts per million (PPM) in the 1700s to 355 PPM currently. Through controlling atmospheric temperatures, this spontaneously produced non-flammable gas guarantees that this earth stays habitable, even if its progressive entrance into the atmosphere significantly contributes to global warming. By continuous increases in global temperatures, this has posed a challenge to affect the climate of the earth severely throughout the past century. CO_2 is the most substantial GHG produced by the burning of fossil fuels and the influence that people have on forest ecosystems, as per the United States Environmental Protection Agency (EPA). According to published research, humans are responsible for up to 110.5 million tons of carbon dioxide in the atmosphere every day. According to NASA, over the past 150 years, human industrial activity has caused the atmospheric concentrations of carbon dioxide to reach 400 parts per million from 280.

Although a number of countries recognize that climate change is a big challenge, after adopting the 2016 Paris Agreement, the majority are still having difficulty lowering their carbon emissions. Although plants and humankind can benefit from exposure to carbon dioxide, excessive CO_2 can have a detrimental impact on human health. This comprises a variety of symptoms like lightheadedness, headaches, anxiety, accelerated heart rate, breathing difficulties, high blood pressure, convulsion, and exhaustion. More harmful consequences on the ecosystem may potentially emerge from an upsurge in atmospheric CO_2 levels. Heat will then be confined in the environment to a greater extent when more carbon dioxide becomes trapped in the air. This affects climate change and causes an increase in worldwide temperatures. This leads to adverse weather conditions, such as severe drought, heat waves, tropical storms, and wildfires, which have a detrimental impact on agricultural productivity and interrupt the natural routines of the animals. Carbon emissions significantly disrupt human health by increasing respiration problems as a result of growing environmental pollution. The destruction of food and extinction of certain animal species due to carbon emissions is much worse for humankind. Despite being essential for growth, CO_2 emissions also have negative impacts on plant growth, as per researchers of the University of Washington. These experts contend that excessive atmospheric CO_2 causes thicker leaves. These thicker leaves seem to be not particularly good at lowering the atmospheric CO_2 concentration, which would therefore entail disastrous consequences (E. Brooks, 2021).

5.2.2. Independent Variables

5.2.2.1. Globalization Index (GI)

Despite the fact that the level of globalization differs substantially, it is mostly independent of geography. Essentially, the assessment indicates that certain nations have a higher percentage of systematic globalization than many others. Certain places are much more globalized than others, despite the fact that globalization has become more apparent during the past eight years across all countries.

5.2.2.2. The KOF Index

In 2002, the KOF globalization index was first released (Dreher, 2006). This index encompasses a substantial time length as well as numerous nations. The KOF Index additionally includes previously unconsidered aspects of globalization. The 123 nations and twenty-three variables all make up the 2002 KOF Index. The dimensions of globalization, including social, political, and economic, are all included in the overall globalization index. The phenomenon of building networks within entities spanning different continents is regarded as globalization, which is coordinated by various streams, including those of individuals, knowledge and opinions, currency, and products. This is a practice that blurs the borders between nations, brings together their cultures, economies, technologies, and structures of administration, and creates intricate chains of interconnectedness. Social, political, and economic globalization are more explicitly referred to as the dimensions of globalization. Social globalization is characterized by the dissemination of concepts, knowledge, representations, and individuals. Political globalization is distinguished by the spread of governmental ideologies. Economic globalization, which is defined by transnational movements of capital, information, products, services, and also the conceptions that go along with market transactions.

Well over a hundred published research using the KOF globalization index have revealed conflicting findings about how globalization affects various indices. None of them used the concepts of sustainable development or ecological sustainability to contextualize the assessment of globalization. The KOF index was utilized by Dreher, Gaston, and Martens (2008) to examine how globalization has affected different ecological concerns, including carbon dioxide, biochemical oxygen demand, sulfur dioxide, and the production of round wood. The researchers determined a panel from 1970 to 2000 and a cross-sectional average over thirty years. According to the panel regressions, globalization typically has a negative impact on sulfur dioxide emissions and water contamination but has no impact on the production of round wood or carbon dioxide emissions. Once the globalization index is divided into its three constituent dimensions, including social, political, and economic—the investigation indicates that economic globalization seems to have a marginally beneficial impact on the production of round wood. Political globalization reduces water contamination, whereas social globalization has a somewhat favorable impact on carbon dioxide emissions. The 30-year cross-sectional analysis reveals that although political globalization seems to have no impact at all, social globalization has a positive impact on water contamination and round wood supply, and economic globalization has an adverse influence on sulfur dioxide emissions. Since this survey examines a broad range of environmental factors rather than concentrating on a particular claim, the findings mentioned above might be regarded as unclear and even conflicting. In light of this, additional inquiry is necessary in order to formulate, implement, and assess how globalization affects the ecological aspects of environmental sustainability.

Economic, social, and political globalization are the three dimensions that make up the KOF Globalization Index. The dimensions of the KOF globalization index have all been calibrated so that each one is assigned a number between 1 and 100. Upon that measure, 1 represents the low level of globalization, while 100 represents the high level. Trade and financial globalization are both sub-indices of economic globalization. Interpersonal, informational, and cultural globalization are all sub-indices of social globalization (Gygli et al., 2019). These indices and sub-indices were used to test our hypotheses.

5.2.2.3. Economic Globalization Index (EGI)

The economic globalization index is evaluated based on portfolio investments, foreign direct investment, actual trade flows, and constraints, such as taxes, tariff rates, and import quotas on global commerce, among others. One of three principal aspects of globalization, along with the other two, cultural globalization, and the generic term of globalization that is frequently discussed in published research is economic globalization. The vast worldwide exchange of products, services, currency, information, and technologies is referred to as economic globalization. Through a stepped-up cross-border transfer of commodities, services, knowledge, and currency, this is the growing economic cooperation and interconnectedness of local, provincial, and national economies throughout the planet. Manufacturing, financing, marketplaces, technologies, organizations' strategies, administrations, firms, and individuals are the main constituents of economic globalization.

Economic globalization has been growing since the beginning of multinational trading activities, but it has achieved so at a faster rate as a result of advancements in long-distance shipping efficiency, communications technologies, the priority of relevant data instead of capital assets in the economic system, and scientific and technological advances. The World Trade Organization and the General Agreement on Tariffs and Trade that substantially reduced trade restrictions and started opening nations' capital accounts and current accounts have also accelerated the growth of globalization. The latest economic upswing has now been predominantly fueled by industrialized countries merging with emerging ones by eliminating trade barriers, cutting corporate costs, foreign direct investment, as well as transnational migrations (Wikipedia, 2022b).

5.2.2.4. Trade Globalization Index (TGI)

Trade globalization is an indicator of economic interconnectedness and is a form of economic globalization. It roughly reflects the percentage of a nation's total production that is for export and the proportion of employment there that are reliant on international trade. It stands for the share of global production that would be utilized for exporting and importing goods within nations.

A straightforward definition of trade globalization by Preyer and Brös (2013) is the percentage of global production that transcends country borders. Trade globalization is one of the different categories of economic globalization, according to Chase-Dunn, Kawano, and Brewer (2000). They specify trade globalization as that of the degree whereby the international transaction of goods has enhanced in comparison to the transfer of goods in regional communities and implement it explicitly as the whole of all shipments from abroad like a proportion of the universal product, which seems to be the total of all national gross domestic products (GDPs). Trade globalization, according to Erreygers and Vermeire (2012), is the extent of divergence of the actual distribution of bilateral trade flows and associated gravity benchmark, which is solely based on distance and size differences. The researchers point out that trade globalization would indeed be enhanced if only volume and location influenced the proportion of bilateral trade flows, i.e., neither trade restrictions nor any other variables would be relevant. According to Babones (2007), trade globalization is the measure of a nation's degree of globalization that is most frequently utilized in research evidence. World Development Indicators, a database maintained by the World Bank, includes data on the majority of mainstream economies.

5.2.2.5. Financial Globalization Index (FGI)

Financial globalization refers to the internationalization or merging of financial sectors throughout the world. The establishment of a unified financial market and the facilitation of the seamless transfer of financial capital across borders are the major objectives of this globalization. Additionally, it will enable investors to make investments and gain profits on those investments from any location on earth. The liberalization of domestic financial markets, the expansion of international banking and financial entities, and the formation of additional financial mechanisms are the main causes that have significantly contributed to the emergence of financial globalization.

Financial analysts believe that globalization will help to enhance living standards worldwide, particularly in underdeveloped countries. Additionally, it facilitates risk diversification and considerably expands the range of investment options involved in investing. Furthermore, globalization helps enterprises and governments cut the cost of money when obtaining funding from outside. Many people also think that globalization may lead to more effective resource distribution on a global scale. The ease of accessing overseas financial resources is another benefit of globalization. Information and technology are becoming simpler to obtain as well. Additionally, it makes international purchases and mergers smoother (eFinancemange, 2022).

As a result of financial globalization, emerging nations might well be able to effectively control macroeconomic volatility, particularly by lowering consumption volatility compared to production volatility. This is one of the hypothesized advantages of financial globalization, aside from boosting development. Financial globalization can result in a number of different results, including (i) domestic capital flight and its contrasting consequences on net capital flows, investments, and development; (ii) capital inflows and capital expenditure and increased economic expansion; and (iii) volatile domestic financial markets and unstable capital flows.

2.5.2.5. Distinction between Trade and Financial Globalization

Trade and financial globalization are the two sub-dimensions that make up the economic aspect of the updated KOF Globalization Index. This is thought as a substantial gain well over KOF Globalization Index 2007 as well as other globalization indexes. Prior investigations have used the difference between trade liberalization and financial liberalization. For instance, Jaumotte, Lall, and Papageorgiou (2013) investigate how financial and trade globalization impact the distribution of income inside a nation. The findings indicate that whereas financial globalization was favorably related to income inequality, trade globalization was adversely connected with this. According to Kose et al. (2009), the relationship between production volatility and development is influenced by both financial and trade globalization. In the case of trade globalization, the influence is typically more pronounced. Nevertheless, other analyses demonstrate that financial and trade globalization are closely interrelated (Lane & Milesi-Ferretti, 2008).

5.2.2.6. Social Globalization Index (SGI)

Social globalization is the exchange of ideas and information across national boundaries. Three different types of social globalization are categorized by the KOF Index. The very first one relates to personal contacts or interpersonal interactions, the second one is to information flow statistics, and the third one is related to cultural proximity.

Personal Contacts: This index aims to document interpersonal contact amongst citizens of various nations. It encompasses transnational telecom traffic (the number of minutes each user sends and receives globally), the typical call cost to the USA, and the amount of inbound and outbound tourists to which a nation's people are subjected. The amount of overseas community is often used to reflect current contacts with individuals from different nations, and government, as well as workforce transactions gained and spent (as a GDP percentage), are used to determine whether and how much a country interacts with other nations.

Information flows: The aspect of information flows is intended to quantify the prospective transmission of knowledge and ideas, whereas personal contact statistics is intended to record quantifiable contacts amongst individuals from various nations. It takes into account the number of daily newspapers, landline phones, satellite television users, radios, and web servers and subscribers, all per 1,000 persons. All of these factors somewhat approximate the likelihood of obtaining news from other nations and therefore assist in the transfer of knowledge throughout the globe.

Cultural Proximity: The aspect of globalization that is possibly the toughest to understand is cultural proximity. In considerable proportion, the term "cultural globalization" relates to the dominance of American cultural output (Saich, 2000). In a lot of the societal aspects of the world, the U.S. is arguably the trendsetter (Rosendorf, 2000). The total quantity of McDonald's outlets in a nation is taken into account as a proximate measure of cultural proximity. The globalization of McDonald's is a universal metaphor for the process of globalization on its own.

5.2.2.7. Interpersonal Globalization Index (IGI)

Interpersonal globalization is a kind of social globalization. It documents face-to-face contact amongst residents of various nations. Through international personal phone calls, the interconnection might take place. Transnational voice traffic, assessed in mins per person on the landline or wireless phones, includes personal interactions. The most frequent type of direct contact, which researchers assess utilizing three main criteria, is face-to-face contact with foreigners. Tourism and international students recorded as incoming and outgoing might be seen as forms of transitory mobility, where migration is defined as the quantity of foreign-born people living in the country. Along with passports, travel visas are essential tools used by contemporary nations to regulate the migration of people (Czaika et al., 2018). International connectedness is measured by the number of airports that offer international flights, adjusted with population movements. Lastly, personal contacts are always a part of transnational exchanges received and paid. All these factors are considered for the national community.

5.2.2.8. Political Globalization Index (PGI)

One of the three primary aspects of globalization that are frequently discussed in published writings is political globalization. Political globalization can be defined as the expansion of the scale and diversity of the international political systems. The political globalization index is associated with a number of factors, including the presence of embassies of other nations, multilateral agreements, institutional memberships, and involvement in multinational missions. It relates to the expansion of the political system on a global scale. This framework consists of local authorities, and associated federal and multinational organizations, along with aspects of the worldwide civil society that are government-independent, which includes social movement groups and non-governmental entities. The significance of the nation-state is decreasing, and other entities are becoming more prominent in politics, which is one of the main issues of political globalization. Political globalization is thought to have its foundations in the establishment and continued survival of the United Nations.

Political globalization is described by William R. Thompson as the growth of an international political framework and associated authorities which regulate intergovernmental interactions, not all of which are restricted to commerce (Modelski et al., 2007). Political globalization was presented by Valentine M. Moghadam as a growing tendency toward internationalism, wherein the United Nations keeps considerable importance, towards the rise of a multinational government system, and towards the onset of regional and global NGOs that serve as regulatory agencies over government entities and have continued to enhance their initiatives and impacts (Moghadam & Valentine, 2005). According to Manfred B. Steger, it relates to the development and strengthening of political connections throughout the world (Steger, 2017). Colin Crouch's more detailed explanation is as follows: Political globalization is the term used to describe the increase in power held by organizations that provide transnational governance, including the World Trade Organization, the International Monetary Fund, and the World Bank. However, it also describes the growth and impact of multinational NGOs, multinational advocacy groups, and social movement groups that operate internationally and form a type of transnational civil society (Crouch, 2012).

5.2.3.Control Variables

In accordance with published research, the control variables employed in this research might have an impact on the dependent variable, like environmental deterioration. Control variables are managed to minimize the impact of ambiguous and irrelevant variables, therefore more precisely and thoroughly demonstrating the correlation among the principal variables.

5.2.3.1. Gross Domestic Product (GDP)

A quantitative estimate of the market values for all of the finished products and services produced in a state over a certain interval of time is termed the gross domestic product. Nevertheless, variations in the inflation rate and living expenses of the states are not reflected in GDP (nominal) per capita. Hence, for assessing living standards among countries, adopting a base of GDP per capita at purchasing power parity (PPP) might be more beneficial than utilizing nominal GDP, which is better for contrasting the national economy in the global marketplace. The impact of each profession or segment of the economy on the overall GDP could also be quantified. The Mean Standard of Living and per capita GDP are both calculated as the proportion of GDP to the overall residents in an area.

Different domestic and global economic associations presented the definitions of GDP. According to the Organization for Economic Cooperation and Development (OECD), the gross domestic product is an estimate of total production that includes all individual and organizational entities that are engaged in manufacturing and providing services. According to an International Monetary Fund (IMF) release, GDP estimates the monetary worth of the finished products and services manufactured in a country over a certain timespan and purchased by the ultimate user.

GDP is frequently employed as a benchmark for cross-national assessments and as a general indicator of economic development. It is frequently regarded as the most potent quantitative measure of country advancement and growth around the whole globe. The growth imperative, meanwhile, is frequently criticized since critical downsides like resource exploitation, environmental damage, and underpaid domestic labor are not included in GDP statistics, which were never supposed to assess progress. To assess how the economy influences individual progress and well-being, critics commonly suggest different economic models like doughnut economics that employ other metrics of progress or different other measures like the OECD's Better Life Index (Wikipedia, 2022c).

5.2.3.2. Human Capital (HC)

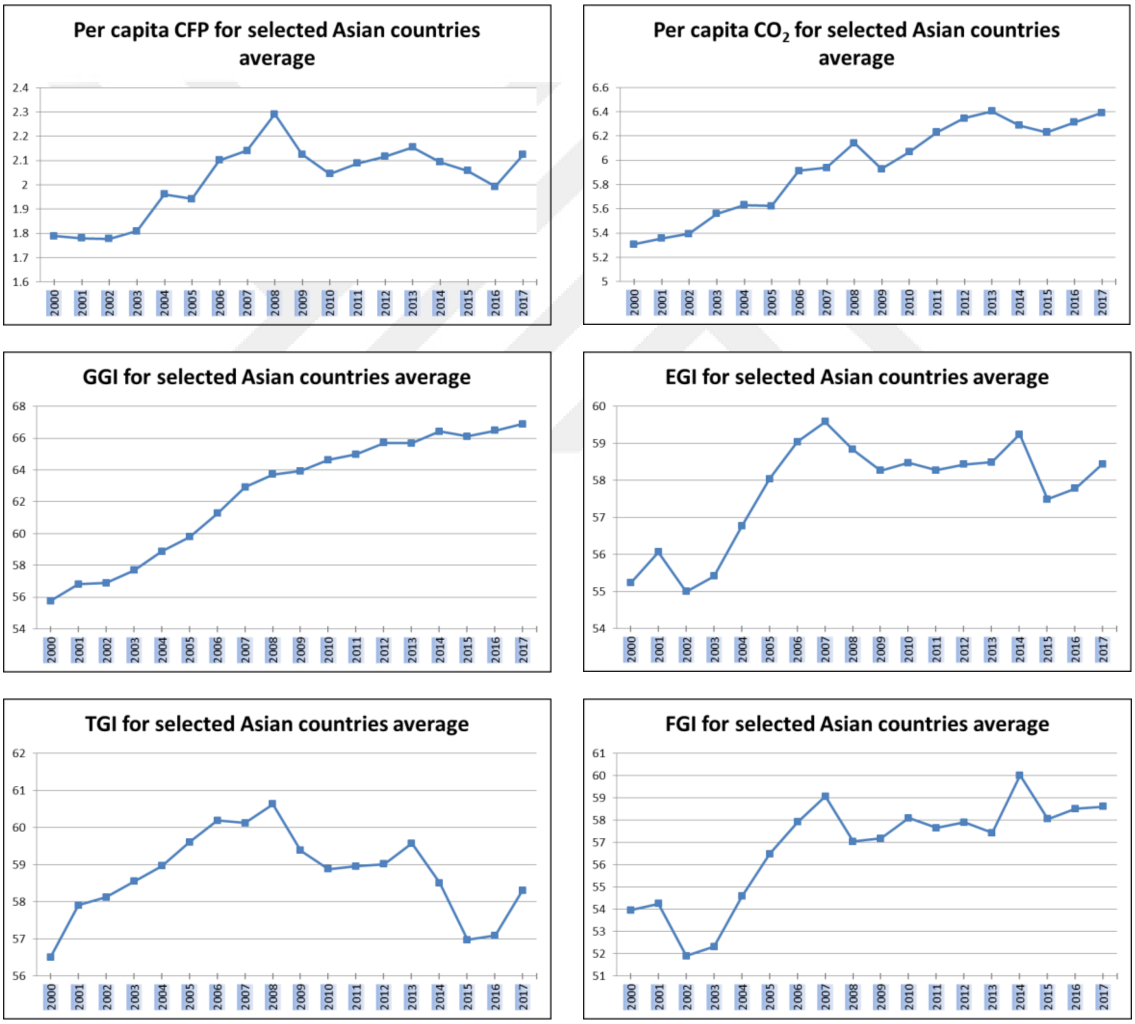
The human capital index is calculated for each individual depending on periods of education and returns from schooling. In accordance with a prevalent strategy in the published research (Caselli, 2005), a human capital index is incorporated in the PWT version 8, which is based on the typical years spent in school (Barro & Lee, 2013) and an anticipated rate of returns from schooling, according to projections of the Mincer equation from all over the planet (Psacharopoulos, 1994). Experts like Cohen and Soto (2007) and Fuente and Doménech (2006) have argued that the BL data possessed negative attributes associated with their varied usage of source data, which has drawn a great deal of emphasis to the compilation of information collected on the average schooling duration in the research arena. Due to differences in categorization techniques throughout databases or surveys, generating statistics on the average number of years people spend in school generally involves combining data from decadal national surveys alongside school enrollment information.

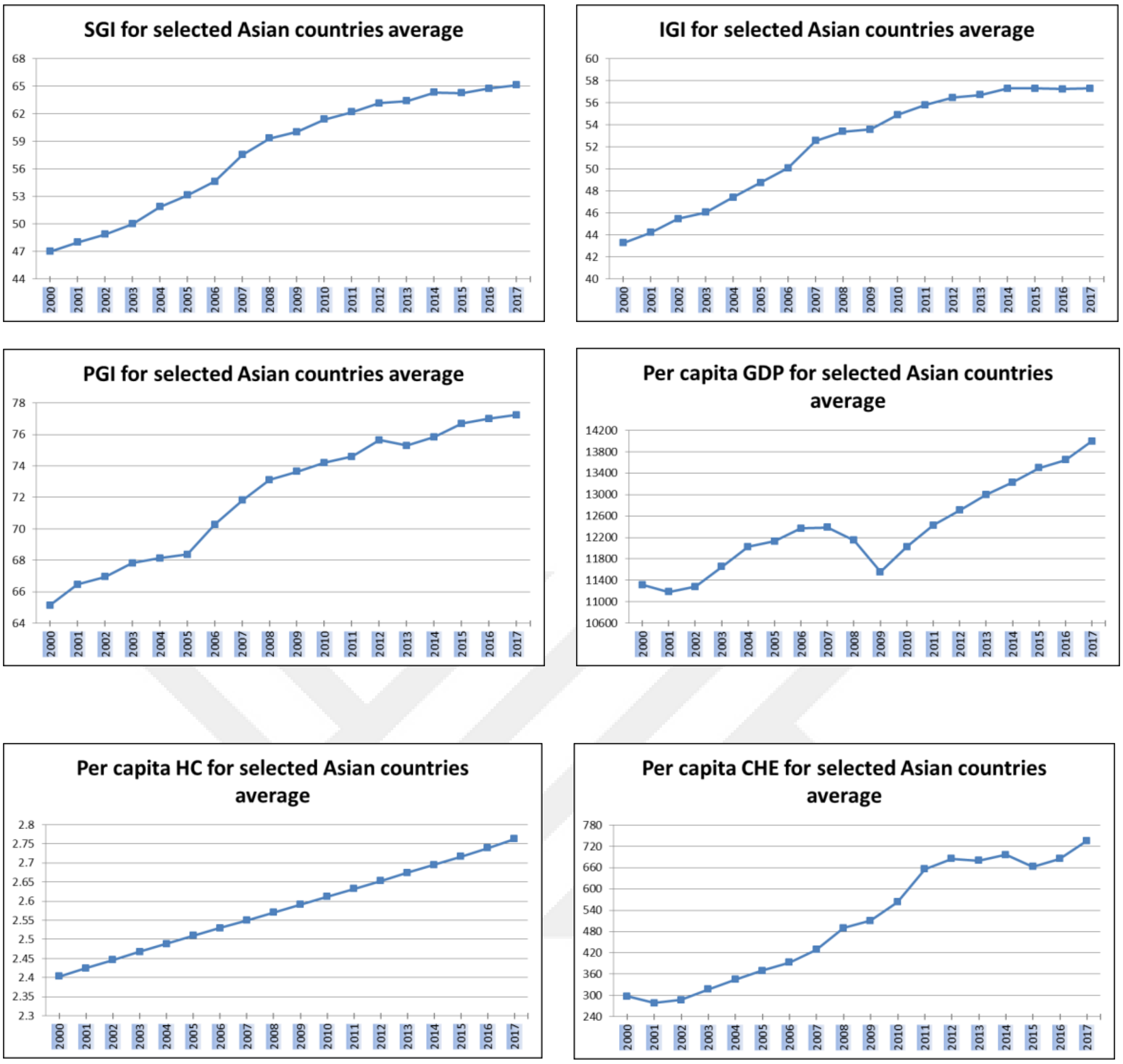
5.2.3.3. Current Health Expenditure (CHE)

Current health expenditure comprises the cost of healthcare products and services needed annually, as estimated by CHEs per capita in the prevailing USD. Capital health expenses in infrastructure, equipment, technology, and vaccine supplies for emergencies or epidemics are not included in this measure. The term CHE refers to how much money is spent on health-related issues in each nation in accordance with the scale of its economy. In contrast to investments, exporting, and transitional usage, it only covers costs related to the ultimate expenditure on healthcare products and services. Current health expenditure demonstrates the economic significance of the healthcare domain and the financial value placed on maintaining good health. The CHE field, which is measured differently, has replaced the position of the previous health expenditures ground.

In the updated System of Health Accounts (SHA), the World Health Organization (WHO) has amended healthcare spending statistics utilizing the new worldwide categorization for health expenditures (WHO, 2011). Within the context of the SHA, the WHO has developed healthcare spending projections (WHO, 2011). Irrespective of the organization or agency that funded and controlled such expenditures, this SHA framework records all healthcare expenditures in a particular nation during a specified timeframe. It produces accurate and thorough statistics on national healthcare expenditures, which can assist in the development of evidence-based public policy.

Figure 7.4 Trend of variables in selected Asian countries average between 2000 and 2017





Source: Author's Illustratıon

5.3. Empirical Model

A model is broadly a graphical presentation or numerical depiction of an economic circumstance that appropriately reflects the target population and sample size. While models are thought to demonstrate a representation of reality, it is essential that the explanatory variables be chosen in a way that accurately represents reality. Three scenarios might cause the model to be biased when it is specified. The first is the absence of an important variable, the second is the addition of irrelevant variables, and the third is the model's adoption of an incorrect functional form. Based on the aforementioned justifications, economic growth, human capital, and current health expenditure were added as control variables to reduce the chance of getting a fictitious result that could make the findings worthless.

The models are selected based on existing studies that confirm the suitability of the models employed in this research, whereas the datasets are selected in accordance with the availability of data. This study considers examining the effects of globalization indicators, including general globalization, economic globalization, trade globalization, financial globalization, social globalization, interpersonal globalization, and political globalization, as well as the influence of economic growth, human capital, and current health expenditure, on the quality of the environment in terms of carbon footprint and carbon dioxide emissions for Asian countries by employing the annual data for the timespan between 2000 and 2017. And, in light of this, this research assessed the viability of the EKC hypothesis. This investigation includes two distinct models, each used separately to assess the impacts of globalization on the environment. Additionally, these models incorporate some control variables such as GDP, human capital, and current health expenditures. Thus, the following formulation could be utilized to express the functional form of these two models:

$$CFP = f(GGI, EGI, TGI, FGI, SGI, IGI, PGI, GDP, GDP^2, HC, CHE) \quad (1)$$

and,

$$CO_2 = f(GGI, EGI, TGI, FGI, SGI, IGI, PGI, GDP, GDP^2, HC, CHE) \quad (2)$$

Where CFP, CO_2, GGI, EGI, TGI, FGI, SGI, IGI, PGI, GDP, and GDP^2, HC, CHE represent per capita carbon footprint, per capita CO_2 emissions, general globalization, economic globalization, trade globalization, financial globalization, social globalization, interpersonal globalization, and political globalization index, per capita income, squared per capita income, per capita human capital, and per capita current health expenditures correspondingly. If the EKC hypothesis is true, per capita income will be positive, and squared per capita income will be negative for both models, including CFP and CO_2, separately.

In accordance with the EKC hypothesis, the quality of the environment deteriorates, and CFP as well as CO_2 rises during the early phases of economic development; however, as economies develop and CFP as well as CO_2 falls, environmental quality typically improves. GDP^2—the squared GDP equivalent—is an indicator of growth. Therefore, someone might indeed test EKC in Equation (1) and Equation (2) to see if there is an inverse U-shaped relationship of environmental quality with per capita GDP.

To settle the data for more precise calculations, each modeled variable are converted into respective natural logarithms (ln) (Muhammad Shahbaz, Shahzad, et al., 2016). The econometric log-linear panel function of Equations (1) and (2) could be reformulated as follows in accordance with Destek and Sarkodie (2019) and Tamazian and Rao (2010):

$$lnCFP_{it} = \alpha_i + \gamma_1 lnGGI_{it} + \gamma_2 lnEGI_{it} + \gamma_3 lnTGI_{it} + \gamma_4 lnFGI_{it} + \gamma_5 lnSGI_{it} + \gamma_6 lnIGI_{it} + \gamma_7 lnPGI_{it} + \gamma_8 lnGDP_{it} + \gamma_9 lnGDP^2{}_{it} + \gamma_{10} lnHC_{it} + \gamma_{11} lnCHE_{it} + u_{it} \qquad (3)$$

and,

$$lnCO_{2it} = \varphi_i + \beta_1 lnGGI_{it} + \beta_2 lnEGI_{it} + \beta_3 lnTGI_{it} + \beta_4 lnFGI_{it} + \beta_5 lnSGI_{it} + \beta_6 lnIGI_{it} + \beta_7 lnPGI_{it} + \beta_8 lnGDP_{it} + \beta_9 lnGDP^2{}_{it} + \beta_{10} lnHC_{it} + \beta_{11} lnCHE_{it} + \varepsilon_{it} \qquad (4)$$

Here, subscripts i and t signify cross-section units (in this case, this is Asian countries) and times (in this case, this is years) correspondingly. i (where i =1, 2, ..., 22) are cross-section for the durations t = 1, 2,…,18. α_i and φ_i are intercepts, γ_i and β_i symbolize the coefficient estimates, u_{it} and ε_{it} denote the error terms of these two models correspondingly. Depending on equations (1) and (2) correspondingly, the equations (3) and (4) are developed. All these equations use the same selection of independent and control variables. lnCFP, $lnCO_2$, lnGGI, lnEGI, lnTGI, lnFGI, lnSGI, lnIGI, lnPGI, lnGDP, $lnGDP^2$, lnHC, and lnCHE demonstrates selected variables' logarithm correspondingly to the Asian countries. A rise in the carbon footprint and carbon dioxide emission indicates the degradation of the environment since the logarithm of both indicators reflects the number of environmental limits on human demands.

5.4. Empirical Methodology

This study employs yearly data for the time span between 2000 and 2017 to analyze the connection of all components of globalization with the environment by employing a few specified control variables and to test the validity of the EKC hypothesis in the context of globalization in a panel of specified Asian countries. The empirical techniques employed in this thesis are described in this section. The stationarity assumption is examined thoroughly in this research, and its consequences are explored. Hence, to check for data stationarity, the research used a unit root test. It is essential to use unit root testing to prevent spurious regressions. Initially, we employ the Im, Pesaran, and Shin (2003) panel unit root test as well as the Levin, Lin, and Chu (2002) panel unit root test, which are both first-generation panel unit root tests. Second, we continue with the cross-sectional dependency (CD) tests since they reveal cross-section dependence and act as a guideline for the econometric techniques to be used. Contemporary panel studies have seen an upswing in the use of the CD test due to evidence that residuals are not actually cross-sectionally independent. In a macroeconomic analysis with substantial inter-economy relationships, Urbain and Westerlund (2006) claimed that the "cross-sectional independence" hypothesis is untrue. CD test is the fundamental problem with the panel method (Pala, 2020). The CD tests assist in resolving panel data difficulties and assure the robustness and consistency of the estimators (Dogan et al., 2020; S. Nathaniel et al., 2020). Due to the increased possibility of cross-sectional dependency in macro panel data analysis, we conduct three CD tests, i.e., the Breusch-Pagan Lagrange multiplier (LM) test (Breusch & Pagan, 1980), the Pesaran CD test (Pesaran, 2004) and the scaled LM (Pesaran, 2004) to investigate the existence of cross-sectional dependency in our model. If the obtained results support CD, econometric strategies to deal with CD concerns would be employed. Third, the involvement of CD could make first-generation tests inefficient, necessitating the use of second-generation tests like the cross-sectionally augmented DF (CADF) and cross-sectionally augmented IPS (CIPS) to identify the integration of features related to globalization, economic growth, human capital, current health expenditures, and carbon footprint in addition to carbon dioxide emissions. The published research have extensively addressed these latest generations of panel unit root testing. To assess whether the cointegration equation's slope coefficients are homogenous, the slope homogeneity test was used.

Swamy (1970) originally established the test; however, Pesaran and Yamagata (2008) promoted the test of Swamy. Additionally, the Kao (1999) panel cointegration test was employed in this study to determine whether there was a long-term correlation among the potential variables. Finally, as was mentioned in the Introduction segment, Quantile regression is a crucial aspect of our estimating methodologies. We are able to address a number of econometric concerns that the prior studies have neglected using this method. This research thus offers a current perspective and contributes to the existing empirical and theoretical research.

It is important to determine whether the variables are stationary or not before stepping on to examine the statistical evaluation of the variable utilizing panel cointegration analysis. For example, Sari, Hammoudeh, and Ewing (2007) propose that in the case of time series, the characters of time series can be identified by using robust unit root estimators that are appropriate for the model. In order to prevent spurious regression, variables in panel data analysis, which includes time series and cross sections, need to be stationary, just like in time series.

To put it another way, even if the regression may include a greater value, although this greater value, these variables might not be associated at all, the conventional values of t, F, and R^2 tend to be biased, and the regression results may present a misleading conclusion (C. Brooks, 2004). The likelihood of spurious regression will be reduced, and the significance of regression will increase as a result of the stationary variable (MacKinnon, 2010).

5.4.1 Panel Unit Root Test

The presence of a unit root in associated variables is a prerequisite when assessing a cointegration relation within the variables. There are many panel unit root tests that could well be found in the literature. The existence of cross-sectional dependence amongst panel members is not taken into account by the set of panel unit root tests that are characterized as first-generation panel unit root tests. These assessments divide into two categories: homogenous cases and heterogeneous cases. The homogeneous panel unit root test assumes individual differences in homogenous autoregressive coefficients. This group includes the Levin, Lin, and Chu (2002) (LLC) panel unit root test. As it is unacceptable that the stationarity characteristics of all series of a variable are identical for all panel members, the hypothesis that autoregressive coefficients are equivalent throughout the panel is highly constrictive. The heterogeneous panel unit root tests get over this restriction by enabling the panel's autoregressive coefficients to differ across the panel. This group includes the panel unit root tests reported by Im, Pesaran, and Shin (2003) (IPS).

In the context of cross-sectional dependence, the findings of the first generation unit root test might not even be appropriate, wherein they will presume excess rejection of the null hypothesis (O'Connell, 1998). A cross-sectional dependency test would be performed in the assessment to determine whether the variables exhibit cross-sectional dependency. Cross-sectional dependency is crucial for panel data since, as J. Bai and Kao (2006) remark, ignoring the dependence assumption will give biased and inconsistent results as well as size distortions. To verify the variable stationarity, unit root tests are used in this research. The objective of the aforementioned tests is to determine if they will all yield the same outcome (Mahadeva & Robinson, 2004). In the present global context, a shock in one country may also have an impact on other countries, and that is why cross-sectional independence might not be valid, according to Kar, Nazlıoğlu, and Ağır (2011).

The participants of the panel are assumed to be cross-sectionally dependent in the second-generation panel unit root testing. The existence of dependency across the panel may be the result of a number of variables, including economic links resulting from widespread global disruptions, geographical spillover impacts, or similar unrecognized attributes (Badi H Baltagi & Hashem Pesaran, 2007). This research uses Pesaran's (2007) Cross-Sectional Augmented IPS (CIPS), and Cross-Sectionally Augmented Dickey-Fuller (CADF) panel unit root test, both of which take into account the heterogeneity and cross sectional-dependence.

7.1.1.1 First Generation Panel Unit Root Tests

7.1.1.1.1 Levin, Lin, and Chu (2002) (LLC) Unit Root Test

For all panel units with cross-sectionally independence, the LLC panel unit root test formulated on the Augmented Dickey-Fuller (ADF) test permits homogeneity in the autoregressive coefficient's dynamics. The accompanying panel ADF standard is taken into account by the LLC unit root testing to determine whether a unit root exists.

$$\Delta y_{i,t} = \alpha_i + \beta_i y_{i,t-1} + \sum_{j=1}^{p_i} \gamma_{i,j} \Delta y_{i,t-j} + e_{i,t} \quad (5)$$

Where the initial difference process operator is indicated by Δ. The variables that are about to be checked for unit root are represented by the vector $y_{i,t}$. The coefficients that need to be assessed are α_i, β and $\gamma_{i,j}$. The random variable $e_{i,t}$ is generally and independently distributed for all i and t, with zero means and finite heterogeneous variance, $e_{i,t}$: ~ $IID(0, \sigma_i^2)$. The ADF regression's chosen number of lags, p_i, is an undefined number.

The LLC test presumes that the lagged dependent variable's persisting parameters β_i are homogenous (similar) for each participant in the panel's cross-sections (i.e., $\beta_i = \beta$ for all i). This indicates that cross-sectional dependence is not considered, allowing the lag order β_i to change unhindered. In light of these presumptions, the following hypothesis assessments for the LLC panel unit root test are developed:

H_0: $\beta_1 = \beta_2 = ... \beta_i = \beta = 0$ (Specifies unit root)

H_1 : $\beta_1 = \beta_2 = ... \beta_i = \beta < 0$ (Specifies no unit root)

The hypothesis test for whether a unit root exists is H_0: $\beta = 0$, and the test for whether a unit root does not exist is H_1: $\beta < 0$ for every i. The LLC unit root test's hypothesis formulation resembles that put out by Dickey and Fuller. As was already established, the LLC test is commonly utilized as a panel root test, but its flaws originate from the presumption that β is homogenous across all cross-sections. Im, Pesaran, and Shin (2003) evaluated this issue.

5.4.1.1.. Im, Pesaran and Shin (2003) (IPS) Unit Root Test

To address the flaws in the LLC test, IPS unit root test was designed. To assess if a unit root exists, Im et al. (2003) introduced a panel unit root test, which is an elaboration of the LLC test and is likewise based on Eq (5). Contrary to the LLC test, the IPS test supports the cross-sectional independence assumption despite allowing for variation of the first-order autoregressive parameters for all panelists. In other words, IPS individually evaluated the β for each cross-section, allowing it to be heterogeneous for each cross-sectional unit. In light of this, the IPS unit root test formula is as follows:

$$\Delta y_{it} = \alpha_i + \beta_i y_{it-1} + \sum_{j=1}^{p_i} \theta_{ij} \Delta y_{it-j} + e_{it} \tag{6}$$

Following is an illustration of the IPS test's null and alternate hypothesis:

H_0: β_i= 0, for every cross-section (i = 1, 2, 3,..., N)

H_1: β_i < 0, for a minimum of one cross-section (i =N_1 + 1, ..., N)

This test's null hypothesis presumes that all cross-sections have a unit root, which illustrates non-stationarity. The alternative hypothesis, in contrast, presumes that one or more cross-sections of the panel do not have unit root. The results of the IPS test show how one series could be averaged out when β varies through cross-sections.

5.4.1.2. Second Generation Panel Unit Root Tests

5.4.1.2.1. Pesaran (2007) Cross-Sectionally Augmented Dickey-Fuller (CADF) Unit Root Test

As previously stated, first-generation conventional panel unit root tests are not used when there is cross-sectional dependency among panelists since these tests have a tendency to suffer from size abnormalities and skew the results in favor of the alternative hypothesis. Pesaran (2007) recommended using a new second-generation panel unit root test to overcome this flaw by accounting for the existence of cross-sectional dependency and producing accurate estimates.

Cross-sectional dependence is taken into consideration when analyzing unit root in heterogeneous panel data series using Pesaran's CADF unit root test. A common variable that influences cross-sectional units is also assumed by Pesaran. It makes sense that this would utilize the ADF statistic and afterward take the mean value of all cross-sectional units. The test eliminates dependence by calculating averages. The below-mentioned formula provides an estimate for this unit root test using N cross-sections of nations and T time periods:

$$\Delta y_{it} = \mu_i + \rho_i y_{i,t-1} + c_i \bar{y}_{t-1} + c_i \Delta \bar{y}_t + \epsilon_{it} \tag{7}$$

$$\bar{y}_{t-1} = \frac{1}{N} \sum_{i=1}^{N} y_{i,t-1}\,; \quad \Delta \bar{y}_t = \frac{1}{N} \sum_{i=1}^{N} \Delta y_{it} \tag{8}$$

The cross-sectional averages of the lagged levels $\bar{y}_{t-1}$ and the first difference $\Delta\bar{y}_t$ for every set demonstrate the cross-sectional dependency for one common factor when $\bar{y}_{t-1}$ and $\Delta\bar{y}_t$ are added to the equation (7) (Badi Hani Baltagi & Baltagi, 2008). Below are the statements for the null and alternative hypotheses.

$$H_0 : \rho_i = 0 \text{ (for every cross} - \text{section)}$$

$$H_1 : \rho_i < 0 \ (i = 1,2,3, \dots, \mathrm{N}), \ \ \rho_i = 0 \ (i = N_1 + 1, \ N_1 + 2, \dots, N)$$

Each cross-section has a unit root, according to the null hypothesis, while certain cross-sections may not have a unit root, according to the alternative hypothesis.

5.4.1.2.2. Cross-Sectional Augmented IPS (CIPS) Unit Root Test

Pesaran (2007) introduced the CIPS test, a second-generation panel unit root test, which takes into account the CD in the set. The pivotal benefit of the CIPS test above earlier tests like the IPS panel unit root test is that it takes CD into consideration. This test signifies that the undetected common factor is the cause of the cross-sectional dependency. By averaging the individual CADF distribution that is shown as a CIPS, Pesaran (2007) derives the improved IPS statistics. The CIPS is presented as follows for the ith cross-sectional unit:

$$CIPS = \frac{1}{N} \sum_{i=1}^{N} CADF_i \tag{9}$$

The null hypothesis (ρ_i = 0 for all i.) that represents the unit root is compared with the alternative (ρ < 0), which indicates stationarity in the CIPS panel unit root test.

5.4.2. Cross-section Dependence Test

The assumption that participants are cross-sectional independent (CD), which was mentioned above, is a significant flaw in ordinary panel unit root testing (first generation). However, due to the interdependence of the states on a national and international scale, the assumption of independence is commonly not valid when macroeconomic indicators are used. The approximations will be contradictory and misleading if the cross-sectional dependency is not managed properly (Phillips & Sul, 2003). Additionally, O'Connell (1998) emphasized that the panel-based unit root test will be biased for dismissing the joint unit root hypothesis if contemporaneous correlations amongst data are not taken into account. The cross-section dependency phenomena must be taken into consideration in econometric modeling in a panel scenario since neglecting the CD in the estimation would result in inefficiency and inaccurate findings. Three separate tests — the Breusch-Pagan Lagrange multiplier (LM) test, introduced by Breusch and Pagan (1980), the Pesaran CD test, developed by Pesaran (2004), and the scaled LM presented by Pesaran (2004) — were utilized to determine whether CD might be present among the participants in this study.

5.4.2.1. Breusch-Pagan Lagrange Multiplier (LM) Test

The LM test statistic that is derived from the calculation of the panel data model presented as follows was suggested by Breusch and Pagan (1980).

$$y_{it} = \alpha_i + \rho_i \, x_{it} + u_{it} \quad ; \qquad i = 1,2, \ldots, N \quad ; \qquad t = 1,2, \ldots, T \qquad (10)$$

In this case, α_i is the individual intercepts and ρ_i is the slope coefficients, which may differ amongst individuals, and x_{it} is a $k \times 1$ explanatory variable vector.

The null hypothesis that there is no cross-sectional dependency is compared to the alternative hypothesis that there is cross-sectional dependence in the LM test could be represented as-

$$H_0 : \rho_{ij} = \rho_{ji} = Cov\left(u_{it}, u_{jt}\right) = 0 \qquad \text{for every t, and } i \neq j$$

$$H_1 : \rho_{ij} \neq \rho_{ji} \neq Cov\left(u_{it}, u_{jt}\right) \neq 0 \qquad \text{for atleast one pair of } i \neq j$$

The way to demonstrate the Breusch-Pagan LM test is as follows:

$$LM = T \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}_{ij}^2 \sim \chi^2_{N(N-1)/2} \tag{11}$$

Here, N is the total number of groups in the panel and T_{ij} is the total number of records for which the coefficient of the correlation was calculated. $\hat{\rho}_{ij}$ is a sampling estimation of the paired correlation coefficients amongst the residuals derived from the individual ordinary least squares (OLS) estimation of Eq (10) for every dataset.

$$\hat{\rho}_{ij} = \hat{\rho}_{ji} = \frac{\sum_{t=1}^{T} \hat{u}_{it}\hat{u}_{jt}}{(\sum_{t=1}^{T} \hat{u}_{it}^2)^{1/2} \ (\sum_{t=1}^{T} \hat{u}_{jt}^2)^{1/2}} \tag{12}$$

For *N* that is comparatively small and *T* that is reasonably big, the Breusch-Pagan LM test is applicable.

5.4.2.2. Pesaran Scaled LM Test

Pesaran (2004) suggests the Scaled LM test for large panels, which is a regulated form of the LM test in which $T \to \infty$ is first, and $N \to \infty$ is second, in order to address this issue. The LM test's scaled form is presented below:

$$LM_{sc} = \sqrt{\frac{1}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} (T\hat{\rho}_{ij}^2 - 1) \sim \mathrm{N}(0,1) \tag{13}$$

The test has an asymptotic distribution that is similar to standard normal under the null hypothesis that there is no cross-sectional dependency. However, the Scaled LM test exhibits size distortion for small time dimensions (*T*), and the distortion becomes worse as *N* grows.

5.4.2.3. Pesaran CD Test

Pesaran (2004) designed a test for panels with $T \to \infty$ and $N \to \infty$ in either sequence to solve this problem. This is a basic error CD test, considering the averaged pairwise correlation coefficients ($\hat{\rho}_{ij}$) of the OLS residuals, which have been derived using the standard augmented Dickey and Fuller (1979). The Pesaran test performs well with relatively small-sized samples and could be used for dynamic heterogeneous panels. Performing a Pesaran CD test involves:

$$CD = \sqrt{\frac{2T}{N(N-1)}} \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}_{ij} \right) \sim N(0,1) \qquad (14)$$

For $T_{ij} > 3$ and reasonably large N, the distribution of CD statistic tests under the null of cross-sectional independence is a two-tailed standard normal distribution.

Even though the actual individual population pairwise correlations are non-zero, Pesaran, Ullah, and Yamagata (2008) claimed that the CD test would fail in some circumstances when the population average pairwise correlations are zero. Furthermore, whenever the correlation coefficients have a zero mean in the cross-sectional dimension in stationary dynamic panel data models, the CD testing is unable to reject the null hypothesis. Pesaran (2004) proposed another test statistic, which is a bias-adjusted test derived from the average of the pairwise correlation coefficients for large panels, wherein $T \to \infty$ comes first, followed by $N \to \infty$ comes next. This test statistic is intended to mitigate size distortions in the Scaled LM test and to address the aforementioned drawbacks.

5.4.2.4 Bias-adjusted Scaled LM

Depending on the application of the precise mean and variance of the LM test, the bias-adjusted test that is a revised form of the LM test, is proposed by Pesaran, Ullah, and Yamagata (2008). The bias-adjusted LM test could be conducted using the formula below-

$$LM_{adj} = \sqrt{\frac{2}{N(N-1)}} \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}_{ij} \frac{(T-k)\hat{\rho}_{ij}^2 - \mu_{Tij}}{\sqrt{v_{Tij}^2}} \right) \sim N(0,1) \tag{15}$$

Where k is the regressors' number, and μ_{Tij} and v_{Tij}^2 are the precise mean and variance of (T-k)$\hat{\rho}_{ij}^2$ correspondingly, in accordance with Pesaran, Ullah, and Yamagata (2008). The LM_{adj} test is asymptotically distributed as standard normal under the null hypothesis, wherein $T \to \infty$ comes first, followed by $N \to \infty$ comes next. If the cross-section dependence exists for the prospective variables, then we should conduct the second-generation panel unit root tests mentioned above.

5.4.3 Homogenity Test

It is important to execute the homogeneity panel test of Pesaran and Yamagata (2008) since several panel roots test statistics and cointegration tests are dependent on the parameter estimates of the homogeneity or heterogeneity of cross-sectional units. This test's null hypothesis asserts that all of the betas' parameters are essentially the same, i.e., equivalent to zero. The alternatives presume that the cross-sectional units' beta parameters are dissimilar from one another.

5.4.4. Co-integration Test

The panel cointegration test is used to assess if different series are connected to establish an equilibrium relationship ranging across the long run if there are unit roots in the series. The panel cointegration techniques are utilized to boost the strength of traditional cointegration analysis for pure time series, just like in the panel unit root tests. According to the cointegration principle, these variables could be employed to build a model while there is cointegration within the independent and dependent variables. We compare cointegration among the variables under consideration to the null hypothesis that there is no cointegration. Various panel cointegration tests are broadly used in the published literature, including Pedroni (1999, 2004), Kao (1999), and Westerlund-Edgerton (2007).

The Pedroni and Westerlund-Edgerton co-integration tests work only for the models which have a maximum of seven variables. Since there are more than seven variables in this study that is why these two tests could not be used here. Only the Kao panel cointegration test was used in this research for checking the long-run relationship among the candidate variables.

5.4.4.1. Kao Co-integration Test

The cointegration test of Engle and Granger (1987) was extended by Kao (1999). The method of cointegrated regressions below is taken into account by the Kao cointegration test:

$$y_{it} = \alpha_i + x_{it}\beta + u_{it} \tag{16}$$

$$x_{it} = x_{it-1} + \varepsilon_{it} \tag{17}$$

Here, α_i stands for individual constant values, and β is the slope parameter, which Kao identifies as the co-integrating vector's assumptions from Eq. (17) with $\beta_i = \beta$. x_{it} and y_{it} are integrated processes of order one for all i, and u_{it} is a stationary error measure.

The Kao cointegration test is a residual-based cointegration test. Kao uses Augmented Dickey-Fuller (ADF), and Dickey-Fuller (DF) tests to examine the residual $\hat{u}_{it}$ of the panel estimation. These tests are performed using:

$$\hat{u}_{it} = \rho\hat{u}_{it-1} + \sum_{j=1}^{p} \emptyset_j \, \Delta\hat{u}_{it-j} + v_{it} \tag{18}$$

In this case, from Eq (17), the residuals $\hat{u}_{it}$ are attained. A comparison is made between the alternative hypothesis of stationary residuals, H_1: $\rho < 1$, and the null hypothesis of no cointegration, H_0: $\rho = 1$. For the null and alternative hypotheses, Kao (1999) used the assumption that either all the relationships are not cointegrated, or they are cointegrated. In the panel data, Kao suggested five ADF and DF forms of cointegration tests to assess the null hypothesis of cointegration.

5.4.5.Panel Data Estimation

5.4.5.1 Quantile Regression Methodology

Consider writing the panel regression as-

$$Y_{it} = \alpha_i + X_{it}'B_i + \eta_{it} \tag{19}$$

Where Y, α, X, and η represent k×1 column vector, k×1 vector of constants, k×n matrix of the independent variable(s), n×1 signifies slope vector, and η_{it} is k×1 the residual term vector, correspondingly. According to Kao, Chiang, and Chen (1999) and Pedroni (2001), if vector Y_{it} and matrix X_{it} follow an I(1) process, they would be cointegrated, and If the residual term η_{it} for an ith section at time t follows an I(0) process, it would be stationary. By employing a homogeneous (like, $B_i = B_0$) and a heterogeneous variance structure (like, $B_i \neq B_0$), the cointegration analyses are carried out. In accordance with the findings of Kao, Chiang, and Chen (1999) and Pedroni (2001), the cointegration test was carried out using Eq. (20).

$$\eta_{it} = \gamma\eta_{it-1} + u_{it} \tag{20}$$

Homogeneous panel cointegration null hypothesis and panel heterogeneous cointegration null hypothesis are represented in Equation (21) and Equation (22) correspondingly.

$$H_0 \ : \ \gamma_i = \gamma_0 = 1 \text{ for all } I; \quad H_A \ : \ \gamma_i = \gamma_A < 1 \neq \gamma_0 \tag{21}$$

$$H_0 \ : \ \gamma_i = \gamma_0 = 1 \text{ for all } I; \quad H_A \ : \ \gamma_i < 1 \neq \gamma_0 \tag{22}$$

Where, γ_A < 1, one can reject the null of no cointegration.

Whenever the assumptions are not satisfied, the predictions made by the ordinary least squares (OLS) regression approach in regression analysis do not qualify as useful predictions (Osborne, 2000). Importantly, the OLS approach may not be able to estimate the B vector effectively and persistently when the variance has a heterogeneous structure. In this case, different regression models are required, like quantile regression models that take into account the data's heterogeneity and quantile structure (John &

Nduka, 2009; Katchova, 2013). Although no assumptions are formed on the distribution of the error term it predicts, quantitative regression models are more flexible and robust compared to OLS model estimates (Belaïd et al., 2020). Depending on the response of the conditional mean (expected mean value) of the dependent variable to the independent variable, the OLS approach generates predictions. Quantile regression, in contrast, intends to determine the conditional median or other values, for instance, the 10th, 25th, 75th, and 90th quantiles of the response variable (Ong et al., 2015).

Koenker and Bassett Jr (1978) introduced and Koenker and Hallock (2001) established the panel quantile regression model, which does not need the sequence of economic variables to match with a normal distribution. It evolved into a thorough procedure for statistical analysis of both linear and nonlinear models in a variety of disciplines, including social, economic, environmental, and so on (Andrews & Phillips, 1987; Koenker & Hallock, 2001). Compared to OLS, this model offers a more reliable and accurate coefficient estimate (Marasinghe, 2014; B. Xu & Lin, 2018). Experts in the disciplines of economics (H. Zhu et al., 2016), environment (R. Xu et al., 2017), soil resource management (Steers et al., 2011), and climate (Paltasingh & Goyari, 2018) have all utilized the panel quantile regression approach. In order to assess the impacts of globalization, economic development, human capital, as well as current health spending on the environmental quality in Asian nations, the panel quantile regression approach is utilized in this research. The model for the specified quantities in the dependent variable's conditional distribution is determined through quantile regression (Palma et al., 2020; Sirin & Yilmaz, 2020; B. Xu & Lin, 2020). Consequently, the linear regression model is typically represented as the following equation-

$$z_i = \alpha_0 + \alpha_1 y_{i1} + \dots\dots + \alpha_p y_{ip} \quad i = 1, \dots\dots, \mathrm{n} \tag{23}$$

The number of parameters in the equation is indicated by p in Equation (23). The quantity of data points is represented by the term i. The quantile regression model equation for the τ-th quantile has a close resemblance to the linear regression model, and the model could be represented as follows:

$$Q_\tau(z_i) = \alpha_0(\tau) + \alpha_1(\tau) y_{i1} + \dots\dots + \alpha_p(\tau) y_{ip} \quad i = 1, \dots\dots, \mathrm{n} \tag{24}$$

Consequently, alpha coefficients have evolved into functions that vary based on the quantile (Dye, 2020). The panel quantile regression model could ultimately be represented as Equation (25).

$$Q_\tau\, z_{it}\left(\tau \middle| z_{i,t-1}, X_{it}\right) = \varsigma_i + \gamma(\tau) z_{i,t-1} + \mathrm{x}_{it}^{T}\, \beta(\tau), \quad i = 1, \ldots, \mathrm{n.t} = 1, \ldots T_i \tag{25}$$

In this case, z_{it} is the estimated output, z_{it-1} is the lag of the z_{it}, x_{it} represents the exogenous variables, and ς=(ς1,...,ςN)' signifies the N×1 vector of intercepts. According to Galvao and Montes-Rojas (2010)**,** the impacts of the covariates (z_{it-1}, x_{it}) are permissible to rely on the quantile, τ, of interest.

The carbon footprint and carbon dioxide emission in selected Asian states are measured using quantile regression in this research. Equation (3) and Equation (4) are modified into the below mentioned format for this regard.

$$\begin{aligned} Q_\tau(lnCFP_{it}) = \alpha_i &+ \gamma_{1\tau} lnGGI_{it} + \gamma_{2\tau} lnEGI_{it} + \gamma_{3\tau} lnTGI_{it} + \gamma_{4\tau} lnFGI_{it} + \gamma_{5\tau} lnSGI_{it} \\ &+ \gamma_{6\tau} lnIGI_{it} + \gamma_{7\tau} lnPGI_{it} + \gamma_{8\tau} lnGDP_{it} + \gamma_{9\tau} lnGDP^2{}_{it} + \gamma_{10\tau} lnHC_{it} \\ &+ \gamma_{11\tau} lnCHE_{it} + u_t \end{aligned} \tag{26}$$

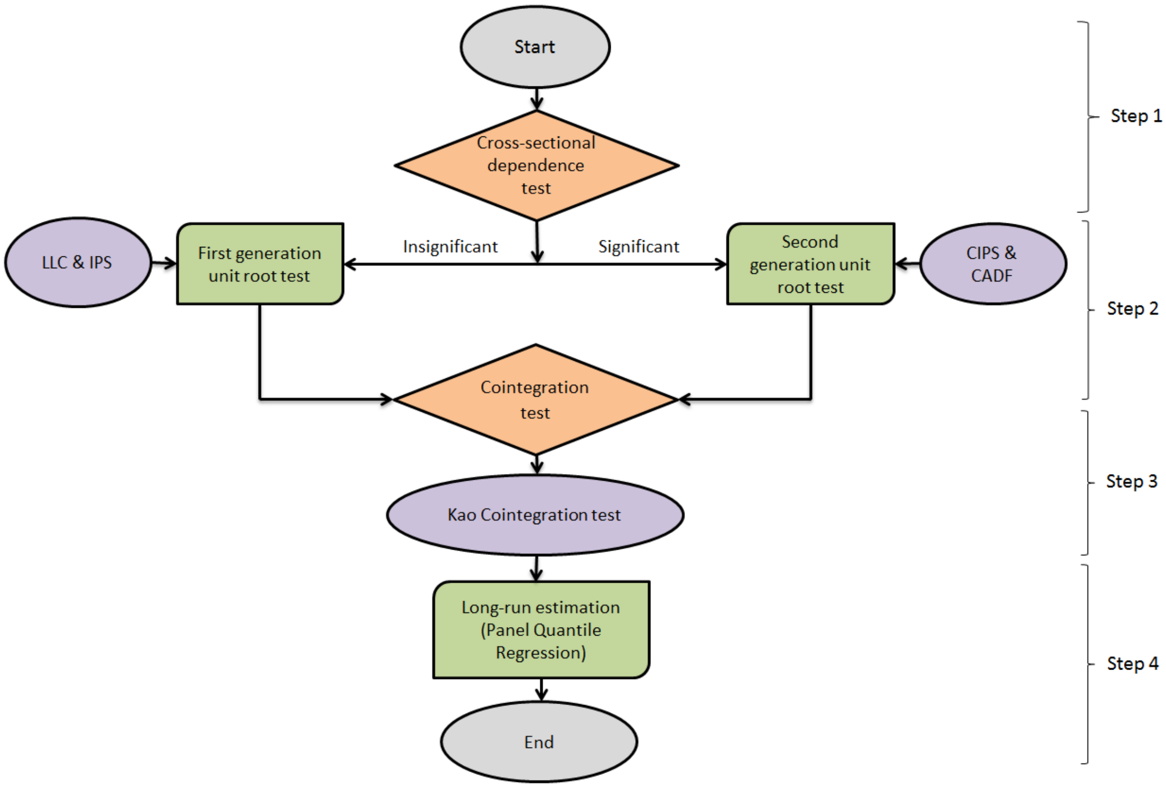
and,

$$\begin{aligned} Q_\tau(lnCO_{2it}) = \varphi_i &+ \beta_{1\tau} lnGGI_{it} + \beta_{2\tau} lnEGI_{it} + \beta_{3\tau} lnTGI_{it} + \beta_{4\tau} lnFGI_{it} + \beta_{5\tau} lnSGI_{it} \\ &+ \beta_{6\tau} lnIGI_{it} + \beta_{7\tau} lnPGI_{it} + \beta_{8\tau} lnGDP_{it} + \beta_{9\tau} lnGDP^2{}_{it} + \beta_{10\tau} lnHC_{it} \\ &+ \beta_{11\tau} lnCHE_{it} + \varepsilon_t \end{aligned} \tag{27}$$

The reference point for the explicative variables is τ.

In this context, Q_τ refers to the quantile regression τth estimate in both carbon footprint and carbon dioxide emissions. The coefficients $\gamma_{1\tau}$, $\gamma_{2\tau}$, $\gamma_{3\tau}$, $\gamma_{4\tau}$, $\gamma_{5\tau}$, $\gamma_{6\tau}$, $\gamma_{7\tau}$, $\gamma_{8\tau}$, $\gamma_{9\tau}$, $\gamma_{10\tau}$, $\gamma_{11\tau}$ and $\beta_{1\tau}$, $\beta_{2\tau}$, $\beta_{3\tau}$, $\beta_{4\tau}$, $\beta_{5\tau}$, $\beta_{6\tau}$, $\beta_{7\tau}$, $\beta_{8\tau}$, $\beta_{9\tau}$, $\beta_{10\tau}$, $\beta_{11\tau}$ are the parameters of quantile regression of these two distinct models correspondingly, which represent the influencing factors. If $\gamma_{8\tau} > 0$ and $\gamma_{9\tau} < 0$ in Eq. (26), the EKC hypothesis concerning GDP and carbon footprint could be verified to exist at the τ-th quantile; besides if $\beta_{8\tau} > 0$ and $\beta_{9\tau} < 0$ in Eq. (27), the EKC hypothesis concerning GDP and carbon dioxide emissions could be verified to exist at the τ-th quantile. As an overview, Figure 5.5 represents a schematic depiction of the methodological framework of this research.

Figure 7.5 Methodological framework of this research



Source: Author's Illustratıon

CHAPTER 6

ESTIMATION RESULTS AND DISCUSSION

The findings of a number of tests that were covered in the earlier segment are presented in this chapter, including the descriptive statistics summaries, the cross-sectional dependence test, the co-integration test, the panel unit-root test, and the quantile regression estimation. The cross-section dependence test, co-integration test, and quantile regression have all been carried out for the carbon footprint (CFP) and CO_2 emissions (CO_2) individually because there are two distinct dependent variables, which include CFP and CO_2, for two separate equations that have the same independent variables. The stationarity of all potential variables was initially tested in this research. This was accomplished by applying just the first generation panel unit root test, which included the Im, Pesaran, and Shin (2003) panel unit root test (IPS) and the Levin, Lin, and Chu (2002) panel unit root test (LLC). Assessing the homogeneity test and cross-section dependency test for the panel data series is crucial as there are two distinct models for two distinct dependent variables to evaluate the environmental impacts of globalization. This research investigates Pesaran's (2007) Cross-Sectionally Augmented Dickey-Fuller (CADF) unit root test and Cross-Sectionally Augmented IPS test (CIPS) unit root test in the meantime for co-integration upon verifying the cross-sectionality with the 2nd generation panel unit roots. This study then implements the Kao cointegration test that has been performed to assess the significance of long-term estimates among the variables. Lastly, this study examines the effects of various aspects of globalization, economic growth, human capital, and current health expenditure on CFP and CO_2 in the chosen Asian countries using panel quantile regression estimations.

The descriptive statistics of panel variables for the chosen Asian nations are shown in Table 6.1. It provides the descriptive attributes of the employed indicators by mean, median, maximum, minimum, standard deviation, skewness, kurtosis, and the Jarque-

Bera (JB) probability test. The findings of the JB probability test, which are comparable to those from Dawar et al. (2021), confirm the violations of the normality assumption. Because of the asymptotic normality of OLS, the t and F significance tests are still valid in the scenario that the normal distribution is still valid when the sample size is quite big. The normality assumption in quantile regression analysis is completely discarded (Wenz, 2019). Even when the errors include substantial skewness and kurtosis, quantile regressions using moments estimations appear to function efficiently, according to Machado and Silva (2019).

Table 8.1 Descriptive Statistics of the Variables

Variables	Mean	Median	Max	Min	SD	Skewness	Kurtosis	JB	Prob	Obs
lnCFP	0.043	0.092	2.411	-2.988	1.276	-0.363	2.511	12.643	0.002	396
$lnCO_2$	1.109	1.235	3.372	-2.297	1.326	-0.466	2.451	19.320	0.000	396
lnGGI	4.119	4.137	4.439	3.497	0.181	-0.751	3.708	45.483	0.000	396
lnEGI	4.012	4.059	4.550	2.999	0.307	-0.835	3.630	52.532	0.000	396
lnTGI	4.023	4.066	4.565	2.992	0.330	-0.755	3.555	42.720	0.000	396
lnFGI	3.993	4.055	4.541	2.990	0.313	-0.891	3.715	60.778	0.000	396
lnSGI	4.012	4.050	4.484	2.955	0.312	-0.974	3.741	71.687	0.000	396
lnIGI	3.872	3.969	4.497	2.587	0.428	-0.788	2.982	41.026	0.000	396
lnPGI	4.252	4.330	4.527	3.299	0.242	-1.510	5.671	268.148	0.000	396
lnGDP	8.548	8.252	11.055	6.121	1.380	0.203	1.895	22.888	0.000	396
$(lnGDP)^2$	74.97	68.097	122.21	37.466	24.048	0.401	1.939	29.186	0.000	396
lnHC	0.926	0.968	1.380	0.318	0.217	-0.610	2.926	24.652	0.000	396
lnCHE	5.147	5.095	8.559	2.124	1.537	0.120	2.133	13.363	0.001	396

Source: Author’s Illustratıon

6.1. Empirical Results

By examining a long-term relationship that influences economic growth, human capital, and current health expenditure in chosen Asian countries between the years 2000 and 2017, this research intends to assess the environmental impacts of all-encompassed globalization and also to examine the applicability of the EKC hypothesis in this scenario. Prior to estimating cointegration and panel quantile regression models, two separate statistics, including LLC and IPS from the 1st generation panel unit root tests, would be employed in the first phase to determine if the research variables are stationary or not. To reach this objective, the two tests of panel unit root discussed above were utilized in the present research for the study variables both in levels and in first difference.

6.1.1. First-Generation Panel Unit Root Test

Upon introducing the concept and specifications of each unit root test, Table 6.2 shows the test outcomes for the LLC and IPS panel unit root tests for all of the variables. Only the findings of the LLC and IPS tests are included in this table.

Table 8.2 Results of first-generation panel unit root tests.

Series	Levin-Lin-Chu (LLC)		Im-Pesaran-Shin (IPS)	
	Levels	1st difference	Levels	1st difference
lnCFP	-5.1677 ***	-6.4545***	-0.5023	-8.8789***
$\ln CO_2$	-3.4320 ***	-4.7835***	2.3023	-7.9295***
lnGGI	-6.4065 ***	-7.2467***	-1.6749**	-7.7500 ***
lnEGI	-3.0237 **	-9.8185***	-0.2755	-8.4391 ***
lnTGI	-2.5202 **	-7.3513***	-0.6863	-8.9840 ***
lnFGI	-5.8046 ***	-11.4805***	-1.1142	-8.5931***
lnSGI	-7.7508 ***	-5.5748***	-1.8181**	-7.0661***
lnIGI	-7.9954 ***	-3.0707***	-3.5851**	-6.0282***
lnPGI	-5.0193 ***	-9.8699***	-1.0638	-9.2957 ***
lnGDP	-2.0873 **	-6.5471***	6.1103	-5.7282***
$(\ln GDP)^2$	-1.2646	-6.4961 ***	7.2443	-5.7600 ***
lnHC	0.8606	-3.5849 ***	6.2263	-1.3478*
lnCHE	-5.0953 ***	-5.2436***	3.1357	-7.7217 ***

Note: *, ** and * show the significance level of 10%, 5%, and 1%, respectively.**

In accordance with all of the findings of the used tests, as demonstrated in Table 6.2, each variable in this research contains a unit root. The null hypothesis of the unit root that asserts all of the variables are stationary is rejected by all unit root tests. The LLC findings under examination show that, with the exception of GDP square and human capital, nearly all prospective variables are stationary at level, although they all become stationary at the first difference. Additionally, according to the IPS findings, just the GGI, SGI, and IGI variables are stationary at level; yet, similarly to LLC unit root testing, all of the variables become stationary at the first difference. According to the findings of these two unit root tests, the null hypothesis of a unit root test can only be rejected at the first differences rather than at the level for all variables. As a result, the first differences were also examined. The panel cointegration test amongst the research variables was made possible by the fact that each of the results in Table 6.2 is statistically significant at the first differences of 1%, 5%, and 10%. This indicates that these findings meet the requirement of undertaking cointegration since all variables seem to I(1). These tests do not take into account any cross-sectional dependence amongst the panel representatives, which is an important deficiency. Asian nations, on the other hand, have a considerable level of globalization in economic relationships and high levels of integration. Since this exploratory research is based on information collected from Asian nations, it is crucial to consider cross-sectional dependence. Four separate tests were conducted to ascertain whether or not the cross-sectional dependence existed, and the findings are summarized in Table 6.3.

6.1.2. Cross-Sectional Dependence Test in the Series

The cross-section dependence (CD) test is covered in this section. It includes the Lagrange multiplier (LM) test (Breusch & Pagan, 1980), the scaled LM test (Pesaran, 2004), the bias-corrected scaled LM test, and the Pesaran CD test (Pesaran, 2004). The findings are summarized in Table 6.3. As stated already, the CD test is crucial since it serves as a roadmap for more such investigations. Hence, the above verifies that the 2nd generational panel unit root test is applicable. The results of these CD tests, as reported in Table 6.3, indicate the existence of CD by rejecting the null hypothesis of cross-section independence throughout the nations at the 1% and 5% significance levels for all the variables. Therefore, the series' CFP, CO_2, GGI, EGI, TGI, FGI, SGI, IGI, PGI, GDP, GDP2, HC, and CHE variables are all cross-sectionally dependent. This suggests that, because of CD and the globalization trend, the occurrence of a single economic disaster in one country will have a consequence on the economies of other nations. As the CD tests demonstrated that CD existed in the panel data, subsequent analyses in this research focus on resolving CD-related and other panel data-related shortcomings. Additionally, the findings of the LLC and IPS tests may be skewed and deceptive in the scenario where cross-sectional dependency is present. Since the cross-sections are considerably dependent upon one another, this research takes into account this dependency and employs tests that take it into account. Therefore, it becomes crucial to conduct the prospective variables' second-generation panel unit root tests. Consequently, in the subsequent stage, the second-generation panel unit root tests-CADF and CIPS, developed by Pesaran (2007), have been utilized.

Table 8.3. Outcomes of cross-sectional dependence tests

Variables	Breusch-Pagan LM	Pesaran scaled LM	Bias-corrected scaled LM	Pesaran CD
lnCFP	1929.066***	79.001***	78.354***	15.171***
$lnCO_2$	2290.849***	95.833***	95.186***	22.483***
lnGGI	3150.460***	135.826***	135.179***	55.654***
lnEGI	1268.828***	48.284***	47.637***	9.364***
lnTGI	1323.433***	50.825***	50.178***	2.031**
lnFGI	1101.347***	40.492***	39.845***	9.93***
lnSGI	3781.084***	165.165***	164.518***	61.455***
lnIGI	2799.815***	119.512***	118.865***	47.725***
lnPGI	3185.460***	137.4534***	136.807***	55.200***
lnGDP	3327.836***	144.078***	143.431***	39.672***
$(lnGDP)^2$	3327.458***	144.060***	143.413***	39.588***
lnHC	3014.948***	129.521***	128.874***	47.995***
lnCHE	3598.237***	156.658***	156.011***	59.840***

Note: *, ** and * show the significance level of 10%, 5%, and 1%, respectively.**

6.2.3. Second-Generation Panel Unit Root Test

The CIPS and CADF test outcomes are summarized in Table 6.4. The CIPS findings demonstrate that CO_2, EGI, TGI, IGI, GDP, and GDP square are not stationary at the level. However, almost all of the variables are stationary at the first difference with significance level 1% and 5%, indicating that these outcomes offer sufficient proof to reject the null hypothesis. Also, CADF shows similar findings. However, it is evident that for CIPS and CADF tests at the significance level 1% and 5%, each of the variables examined appear stationary at their first differences, showing that they have been all integrated at order one [I (1)]. The scheme under this instance could be analyzed for cointegration.

Table 8.4. Outcomes of second-generation panel unit root tests

Variables	CIPS unit root test		CADF unit root test	
	Levels	1^{st} Diff	Levels	1^{st} Diff
lnCFP	-2.250 **	-4.136 ***	-2.706 ***	-6.015***
$lnCO_2$	-1.380	-3.435 ***	1.446	-1.671**
lnGGI	-2.302 **	-3.673 ***	-3.810***	-6.760***
lnEGI	-1.768	-3.845 ***	-0.702	-7.512***
lnTGI	-1.812	-3.997 ***	0.063	-6.296***
lnFGI	-2.233 **	-3.883 ***	-4.722***	-8.178***
lnSGI	-2.638 ***	-3.435 ***	-4.550 ***	-6.290***
lnIGI	-2.026	-4.078 ***	-0.781	-2.152**
lnPGI	-2.461 ***	-4.450***	-2.172**	-2.152**
lnGDP	-2.065	-2.986 ***	0.167	-1.312*
$(lnGDP)^2$	-1.922	-2.941 ***	0.560	-0.997
lnHC	-0.240	-1.576	1.758	-3.442 ***
lnCHE	-2.311 **	-3.894 ***	-2.813***	-6.061***

Note: *, ** and * show the significance level of 10%, 5%, and 1%, respectively.**

This study also included cross-sectional dependence and slope heterogeneity tests in the models prior to undertaking panel data estimations to avoid getting biased and inconsistent parameter predictions.

6.2.4. Homogenity Test and Cross-Sectional Dependence Test of the Models

The outcomes of the tests of slope heterogeneity and cross-sectional dependence in the models are presented in Table 6.5. By rejecting the null hypothesis of cross-sectional independence in both models, Breusch and Pagan LM, Pesaran scaled LM, and Pesaran CD tests demonstrate that cross-sectional dependency exists in the panel of twenty-two Asian nations over the years between 2000 and 2017. It is possible that the dependence results from certain fundamental issues like rising energy costs, technological advancements, or global pandemics. Fixed or panel effect panel estimates may provide biased and inconsistent estimators in the context of cross-sectional dependency.

It is possible to presume that all estimated coefficients for each cross-sectional unit in panel data estimations are identical (Juhl & Lugovskyy, 2014). Population statistics, in contrast, could disprove this assumption. Type II error that indicates the non-rejection of a false null hypothesis may develop in this context and result in skewed estimated parameter values. Therefore, the use of Pesaran-Yamagata Delta and Pesaran-Yamagata Adj. Delta homogeneity panel test seems to be effective (Ditzen & Bersvendsen, 2021; Pesaran & Yamagata, 2008). This test's null hypothesis indicates that each of the betas' parameters is identical — in other words, equivalent to 0. The alternative asserts that the cross-sectional units' beta parameters are dissimilar from one another. The p-values indicate that all these tests yield enough justification to reject the null hypothesis of homogeneous slopes, which implies that not all slope coefficients remain the same throughout the cross-sectional unit. By estimating the parameters at, for example, the lower tail, median tail, and upper tail of the conditional distribution, panel quantile regressions could address consistency problems resulting from slope heterogeneity. As a result, beta coefficient of each variable will change within quantiles, and the estimated quantile coefficient vector turns into a function of the quantile.

Table 8.5 Cross-sectional dependence and slope heterogeneity test for each model

	Models			
	Model-1 (CFP)		Model-2 (CO_2)	
	Value	Prob	Value	Prob
Breusch-Pagan LM	893.732***	0.000	839.905***	0.000
Pesaran scaled LM	30.833***	0.000	28.329***	0.000
Pesaran CD	6.278***	0.000	-1.755*	0.079
Pasaran-Yamagata Delta	3.210***	0.001	2.876***	0.004
Pesaran-Yamagata Adj. Delta	6.091***	0.000	5.457***	0.000

Note: *, ** and * show the significance level of 10%, 5%, and 1%, respectively.**

Therefore, it was apparent from Table 6.4 and Table 6.5 that cross-sectional dependency existed in both of the developed models. Additionally, by using second-generation unit root tests, we confirmed that all of the prospective variables of this research were stationary at the first difference, suggesting that they are integrated at order one — in other words, I (1). The system could be evaluated for cointegration to see whether the variables are cointegrated or not because each variable in the panel is I(1). In order to determine whether a long-term equilibrium among the variables exists, the Panel Kao cointegration test has been utilized in this research.

6.2.5 Co-integration Test

By utilizing cointegration panel tests, the long-term balance among variables could be examined. According to the cointegration principle, these variables could be utilized to develop a model as long as there is cointegration within the independent and dependent variables. All variables are stationary at the first-order difference, as shown by the findings of Table 6.2 and Table 6.4 as well. The Kao cointegration test was used in this research to verify the long-term relationships between CFP as well as CO_2 and other candidate variables (Kao, 1999).

Table 8.6 Results of panel Kao co-integration tests for each model

Statistics	Model-1 (CFP)		Model-2 (CO_2)	
	Values	p-values	Values	p-values
Modified Dickey-Fuller t	-3.8528[a]	0.0001	-2.2180[b]	0.0133
Dickey-Fuller t	-4.1854[a]	0.0000	-2.3267[a]	0.0100
Augmented Dickey-Fuller t	-3.0611[a]	0.0011	-1.3109[c]	0.0949
Unadjusted modified Dickey-Fuller t	-5.3101[a]	0.0000	-2.3562[a]	0.0092
Unadjusted Dickey-Fuller t	-4.7439[a]	0.0000	-2.3942[a]	0.0083

Note: a, b & c denote 1%, 5% and 10% significance levels, correspondingly.

The outcomes shown in Table 6.6 indicate that the null hypothesis of no co-integration is rejected since the p-values of the test statistics in model-1 and model-2 are significant at the significance levels 1%, 5%, and 10%. It remains valid for the five test statistics presented in the table, and it offers substantial proof that all panels in the data are cointegrated, demonstrating that these variables evolve in harmony over the long term. Furthermore, statistical evidence reveals that the variables are I(1) and cointegrated, indicating a long-run balanced linkage among CFP as well as CO_2 , and the factors impacting them could be utilized to assess the models. The fundamental assumptions for evaluating quantile regression are those revealed by the significance of cointegration test findings. Therefore, one can perform the estimations employing quantile regression based on the results of unit root tests and cointegration tests.

6.2.6. Panel Quantile Regression Results

The findings of the estimation are represented in Table 6.7 and Table 6.8. The findings of the panel quantile regression on the impact of globalization—general globalization, economic globalization, financial globalization, trade globalization, social globalization, interpersonal globalization, and political globalization index—as well as the controls variables—GDP, GDP^2, human capital, and current health expenditure—on CFP and CO_2 are shown in both of the tables. In this study, the panel data included twenty-two

Asian countries. Quantile distributions for every dependent variable, CFP, and CO_2 individually, at the 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th, and 90th percentiles, are reported as outcomes. The economies with lower CFP and CO_2 levels fall into the lower quantiles, which include the 10th, 20th, 30th, 40th, and 50th. The economies with greater CFP and CO_2 are represented by the higher quantiles, including the 60th, 70th, 80th, and 90th. These tables demonstrate that the role of influencing variables on CFP and CO_2 varies over quantiles. To assist nations in adopting measures to minimize CFP and CO_2, these consequences need to be investigated. Besides, Figure 6.2 and Figure 6.3 show the graphical summary of long-run relationships between CFP as well as CO_2 with other candidate variables separately.

The significance levels were selected based on Fisher's proposed grading: "If P is between 0.1 and 0.9, there is definitely no reason to doubt the hypothesis tested (Fisher, 1950)". Fisher recommended that the stated p-values be $P < 0.01$ and $P < 0.05$ but rarely $P < 0.001$ (Dahiru, 2008).

6.2.6.1. The Effects of Economic Growth on the Environment

Table 6.7 and Table 6.8 reveal that the models using panel Asian data support the EKC hypothesis, which states that pollution rises with income up to a certain point before commencing to decline. It implies that environmental quality improves as economies grow and income levels rise. Here, air pollution, which is represented by CFP and CO_2, represents environmental deterioration. At starting per capita income levels (GDP), CFP and CO_2 levels rise in conjunction with income growth. Subsequently, when nations raise their GDP^2 (per capita income), CFP and CO_2 levels decrease. This suggests that the initial effects of GDP per capita on environmental deterioration are favorable. On the other hand, the growth in GDP per capita is beneficial in reducing environmental deterioration after reaching an optimal level. Earlier investigations have confirmed these observations (Sabir & Gorus, 2019; R. Ulucak & Bilgili, 2018). In the selected twenty-two Asian nations, there is ultimately an inverted U-shaped curve under EKC in both circumstances (Bilgili et al., 2021; Mehmood & Tariq, 2020; Murshed & Dao, 2020). This outcome from Table 6.7 and Table 6.8, which EKC has, is supported by a number of published studies (Munir Ahmad, Akram, et al., 2021; Aziz et al., 2021; Katircioglu et al., 2020; H. Zhao et al., 2020).

The estimation results from panel quantile regression (QREG) analysis are presented in Table 6.7 and Table 6.8. The estimations of GDP on CFP attained from the 20th, 30th, 40th, 50th, 60th, 70th, 80th, and 90th quantiles are 5.663, 1.241, 1.185, 1.05, 0.997, 1.826, 2.604, 3.038 and 3.613, correspondingly; likewise, on CO_2 are 3.742, 3.87, 3.856, 4.586, 5.322, 5.113, 4.393, 4.12 and 4.236, correspondingly. With the exception of the CFP 20th quantile, they are all highly significant. In contrast, the influence of GDP^2 on CFP are -0.316, -0.042, -0.034, -0.025, -0.021, -0.058, -0.099, -0.117 and -0.150, correspondingly; likewise on CO_2 are -1.172, -0.166, -0.159, -0.198, -0.250, -0.235, -0.190, -0.173 and -0.177 correspondingly. According to a hypothetical model, the GDP^2 has a negative impact on both CFP and CO_2. This is in accordance with a number of other earlier investigations carried out for different nations, including ASEAN nations (Saboori & Sulaiman, 2013), African nations (Muhammad Shahbaz, Mahalik, et al., 2016), China (Muhammad Shahbaz, Khan, et al., 2017), Turkey (Muhammad Shahbaz, Ozturk, et al., 2013), and Pakistan (S. Ali et al., 2015). The findings also show that while all of the CO_2 coefficients are significant at the 1% level, the CFP coefficients from 20th to the 50th are not (Aziz et al., 2021).

Another observation is that practically every quantile of CFP and CO_2 are positively and significantly impacted by economic growth. It is obvious that this is because higher economic growth depends on conventional fuels for manufacturing products, which increases pollution. This observation corresponds to the findings of many other published articles (W. Chen & Lei, 2018; T. Li et al., 2016; Salari et al., 2021; Saud et al., 2020; Seker et al., 2015). This suggests that the enhanced economic progress that Asian countries have undergone is a contributing factor to the country's economic downturn, and the consequences of this are reflected in the unrestrained growth rates of the sectors that are quite responsible for the environmental degradation as they grow. These observations are consistent with those of Ozcan, Tzeremes, and Tzeremes (2020) for thirty-five OECD member states and Sharif et al. (2019) for seventy-four selected countries worldwide. These results, however, contradict with the findings made by Bento and Moutinho (2016) for Italy, which revealed a negative correlation between economic growth and carbon dioxide emissions.

Table 8.7 Panel quantile regression outputs following Model-1 (CFP)

Variables	Quantile Levels (Dependent Variable-CFP)								
	10th	**20th**	**30th**	**40th**	**50th**	**60th**	**70th**	**80th**	**90th**
lnGGI	-2.668 (5.417)	-6.357 (9.84)	-2.535 (2.498)	-1.883 (1.833)	-4.094 (2.636)	-6.148[c] (3.316)	-5.077[c] (3.005)	-7.741[a] (2.100)	-5.422[a] (1.493)
lnEGI	24.034[b] (11.52)	20.90 (20.93)	19.487[a] (5.309)	16.484[a] (3.896)	16.928[a] (5.602)	17.709[b] (7.048)	13.997[b] (6.388)	10.515[b] (4.454)	5.816[c] (3.175)
lnTGI	-11.05[c] (5.931)	-9.039 (10.78)	-9.046[a] (2.735)	-7.79[a] (2.007)	-7.895[a] (2.886)	-8.354[b] (3.631)	-6.925[b] (3.291)	-4.737[b] (2.294)	-2.537 (1.636)
lnFGI	-9.066 (5.890)	-8.425 (10.70)	-8.645[a] (2.716)	-7.283[a] (1.993)	-6.969[b] (2.866)	-6.939[c] (3.605)	-5.205 (3.267)	-3.260 (2.278)	-1.444 (1.624)
lnSGI	2.231 (1.932)	3.215 (3.512)	2.006[b] (0.891)	2.228[a] (0.654)	3.260[a] (0.940)	3.970[a] (1.183)	3.964[a] (1.072)	4.450[a] (0.748)	3.111[a] (0.533)
lnIGI	0.127 (0.558)	-0.301 (1.015)	-0.288 (0.257)	-0.584[a] (0.189)	-0.811[a] (0.272)	-1.001[a] (0.342)	-1.283[a] (0.310)	-1.413[a] (0.216)	-1.279[a] (0.154)
lnPGI	-1.427 (1.883)	1.341 (3.422)	0.245 (0.868)	-.023 (0.637)	0.560 (0.916)	0.949 (1.153)	0.283 (1.045)	1.407[c] (0.729)	0.320 (0.519)
lnGDP	5.663[a] (0.926)	1.241 (1.623)	1.185[a] (0.427)	1.05[a] (0.313)	0.997[b] (0.451)	1.826[a] (0.567)	2.604[a] (0.514)	3.038[a] (0.358)	3.613[a] (0.255)
(lnGDP)^2	-0.316[a] (0.053)	-0.042 (0.096)	-0.034 (0.024)	-0.025 (0.018)	-0.021 (0.026)	-0.058[c] (0.032)	-0.099[a] (0.029)	-0.117[a] (0.020)	-0.150[a] (0.015)
lnHC	-6.894[a] (0.618)	-2.376[b] (1.122)	-1.618[a] (0.285)	-1.552[a] (0.209)	-1.765[a] (0.301)	-1.069[a] (0.378)	-1.089[a] (0.343)	-0.978[a] (0.239)	-0.519[a] (0.170)
lnCHE	0.005 (0.177)	0.017 (0.321)	0.010 (0.082)	-0.018 (0.599)	-0.051 (0.086)	-0.240[b] (0.108)	-0.240[b] (0.098)	-0.276[a] (0.068)	-0.266[a] (0.049)
Constant	-27.57[a] (4.409)	-10.66 (8.013)	-10.88[a] (2.032)	9.878[a] (1.492)	-8.671[a] (2.145)	-9.219[a] (2.699)	-10.936[a] (2.446)	-10.928[a] (1.706)	-11.03[a] (1.216)

Note: (1) This table shows the results of the panel quantile regression model with the CFP as dependent variable. (2) a, b & c denote 1%, 5% and 10% significance level, respectively. (3) Standard errors in parentheses.

Table 8.8 Panel quantile regression outputs following Model-2 (CO_2)

Variables	Quantile Levels (Dependent Variable-CO_2)								
	10th	**20th**	**30th**	**40th**	**50th**	**60th**	**70th**	**80th**	**90th**
lnGGI	-0.546 (2.292)	-6.137[a] (1.882)	-9.894[a] (2.009)	-7.591[c] (4.059)	-8.212[b] (3.791)	-8.832[a] (2.411)	-7.998[a] (2.475)	-11.353[a] (1.601)	-10.634[a] (1.650)
lnEGI	18.739[a] (4.872)	20.876[a] (4.000)	20.456[a] (4.270)	22.644[a] (8.629)	7.422 (8.059)	11.064[b] (5.124)	14.391[a] (5.261)	8.847[b] (3.404)	3.961 (3.506)
lnTGI	-9.076[a] (2.510)	-9.340[a] (2.061)	-8.641[a] (2.200)	-10.490[b] (4.445)	-2.805 (4.151)	-4.637[c] (2.634)	-6.213[b] (2.710)	-3.000[c] (1.753)	-0.866 (1.806)
lnFGI	-8.431[a] (2.492)	-9.211[a] (2.046)	-8.680[a] (2.184)	-10.037[b] (4.413)	-2.092 (4.122)	-3.652 (2.621)	-5.412[b] (2.691)	-2.349 (1.741)	0.157 (1.793)
lnSGI	1.499[b] (0.818)	3.257[a] (0.671)	4.417[a] (0.717)	3.181[b] (1.448)	4.417[a] (1.352)	4.640[a] (0.860)	3.398[a] (0.883)	3.927[a] (0.571)	4.021[a] (0.588)
lnIGI	-1.172[a] (0.236)	-1.055[a] (0.194)	-0.996[a] (0.207)	-0.595 (0.419)	-1.484[a] (0.391)	-1.520[a] (0.249)	-1.320[a] (0.255)	-0.969[a] (0.165)	-1.124[a] (0.170)
lnPGI	-0.789 (0.797)	1.171[b] (0.654)	2.349[a] (0.698)	1.553 (1.411)	1.543 (1.318)	1.879[b] (0.838)	1.989[b] (0.860)	3.235[a] (0.557)	2.719[a] (0.573)
lnGDP	3.742[a] (0.392)	3.870[a] (0.322)	3.856[a] (0.343)	4.586[a] (0.694)	5.322[a] (0.648)	5.113[a] (0.412)	4.393[a] (0.423)	4.120[a] (0.274)	4.236[a] (0.282)
$(\ln GDP)^2$	-0.172[a] (0.022)	-0.166[a] (0.018)	-0.159[a] (0.020)	-0.198[a] (0.040)	-0.250[a] (0.037)	-0.235[a] (0.024)	-0.190[a] (0.024)	-0.173[a] (0.016)	-0.177[a] (0.016)
lnHC	-1.202[a] (0.261)	-0.698[a] (0.215)	-0.533[b] (0.229)	-0.315 (0.463)	-0.484 (0.432)	-0.489[c] (0.275)	-0.117 (0.282)	-0.369[b] (0.183)	-0.332[c] (0.188)
lnCHE	0.100 (0.075)	-0.124[b] (0.061)	-0.218[a] (0.066)	-0.218 ().133)	-0.152 (0.124)	-0.195[b] (0.079)	-0.165[b] (0.081)	-0.166[a] (0.052)	-0.240[a] (0.054)
Const	-18.85[a] (1.866)	-16.77[a] (1.532)	-14.42[a] (1.635)	-16.39[a] (3.304)	-19.12[a] (3.086)	-18.81[a] (1.962)	-16.03[a] (2.015)	-12.52[a] (1.303)	-12.35[a] (1.343)

Note: (1) This table shows the results of the panel quantile regression model with the CO_2 emissions as dependent variable. (2) a, b & c denote 1%, 5% and 10% significance level, respectively. (3) Standard errors in parentheses.

The findings indicate that the lower quantiles experience the highest impact of economic expansion and that as quantile levels go up, this coefficient declines. It could be noted that different levels of GDP per capita have varying effects on the environment's CFP and CO_2 emissions. Furthermore, the impacts of economic expansion on CFP and CO_2 are increasing in the upper-quantile countries after continually an initial decrease from the lower- to middle-quantile countries. It reveals that economic growth will have less of an impact on CFP and CO_2 increase. Because the confrontation between environmental degradation and economic expansion eventually gets worse as the economy grows (Aziz et al., 2021; W. Chen & Lei, 2018). As a result, the economy's increasing growth has encouraged a quick rise in CFP as well as CO_2 emissions. In spite of the fact that CFP and CO_2 have constantly grown in economies with elevated CFP and CO_2, their intensity has reduced. This indicates that the government's environmental policies would be strengthened for the high-emission countries whose economies continue to be in a highly developed state. For example, according to R. Wu, Geng, and Liu's (2017) analysis of the BRICS panel, nearly one-third of global resources were diverted to accommodate China's requirements, which had the highest footprint. In addition, China is the country with the world's largest carbon emissions, and its economic growth rate has increased as a result of changes in its strategic growth plan (W. Chen & Lei, 2018).

6.2.6.2. The Effects of the Multi-dimensions of Globalization on the Environment

Observations from the quantile regression estimations indicate that general globalization (GGI) seems to have no serious influence on CFP in lower emission countries with negative significant greater emissions (60th to 90th quantiles), having ratings of -6.148, -5.077, -7.741, and -5.422, correspondingly. In contrast, this variable has a negative and quite noticeable highly significant impact on CO_2 at nearly every level except the 10th quantile. Therefore, general globalization results in lower to increasing degrees of CO_2 while also causing a drop in CFP at higher levels in Asian countries. The observations of this research are in conformance with those of Muhammad Shahbaz, Khan, et al. (2017), who investigated at the effects of globalization on China's carbon dioxide emission from 1970 to 2012. The results show that China's CO_2 emissions are reduced by general globalization and its sub-indices (economic, political, and social globalization). Additionally, Haseeb et al. (2018) reported that among the BRICS countries, globalization has an unfavorable but insignificant relationship with carbon dioxide. However, studies by Ahmed et al. (2019), Figge, Oebels, and Offermans (2017), Z. Xu et al. (2018), and other researchers revealed a marginal correlation between globalization and environmental quality.

Economic globalization considerably enhances CFP (apart from the 20th quantile) and CO_2 (apart from the 50th and 90th quantile) throughout every quantile. This is apparent in terms of global capital flows, the spreading of technology, and cross-border trade in products and services. The coefficients of economic globalization for the 20th, 30th, 40th, 50th, 60th, 70th, 80th, and 90th quantiles of the CFP are 24.03, 20.90, 19.49, 16.48, 16.93, 17.71, 13.99, 10.52, and 5.82 correspondingly. For CO_2, the coefficients are 18.74, 20.88, 20.46, 22.64, 7.42, 11.06, 14.39, 8.85, and 3.96 correspondingly. The coefficients of economic globalization on CFP and CO_2 are high in lower emission producing economies, and then the values decrease to higher emissions producing economies. Asia's rapid economic growth in recent decades has increased worldwide competitiveness and led to an increase in commercial enterprises that affect the environmental quality and its inherent resources. As a result of the growing economic activity, Asia's environment is being deteriorating more and more by industrial pollutants. Furthermore, the longer a product moves, the more fuel is being used, and the more CFP and CO_2 are released globally. It has been demonstrated that these emissions have a considerable negative influence on biodiversity in addition to contributing to global pollution, climate change, and acidification of the oceans. Additionally, Asia is a significant manufacturer and exporter of products and services. A number of developing nations launched their domestic industrialization as globalization progressed, whereas developed nations started to move their polluting industries there as well (Cole, 2004; Kolcava et al., 2019). Several developing nations failed to devote enough focus on environmental concerns in order to earn more from globalization and international trade and instead expanded the polluting industries that were moved from the developed nations.

Bilgili et al. (2020) and Yurtkuran (2021), who reported a positive contribution of economic globalization on environmental degradation in Turkey, validate the estimated findings of this study. This result contrasts with those of Muhammad Shahbaz, Khan, et al. (2017), who reported that China's emissions of carbon dioxide have decreased as a result of economic globalization between 1970 and 2012, and Ahmed et al. (2019) revealed that the ecological footprint is not significantly influenced by economic globalization.

By using panel quantile regression analysis, trade globalization (i.e., via trade regulations) estimates for the carbon footprint from the 20th, 30th, 40th, 50th, 60th, 70th, 80th, and 90th quantiles are -11.05, -9.04, -9.05, -7.79, -7.9, -8.35, -6.93, -4.74, and -2.54, correspondingly. For carbon dioxide, the estimates are -9.08, -9.34, -8.64, -10.49, -2.81, -4.64, -6.21, -3.00 and -0.866, correspondingly. The coefficients are almost all confirmed to be significant. The coefficients of trade globalization (TGI), which refers to the purchasing and selling of commodities and services within various nations, such as through trade agreements, show that globalization has a considerable adverse consequence on both the CFP and CO_2 in Asia. This indicates that the environmental deterioration in Asian economies is eased by trade globalization. Two different approaches that trade could positively impact the environment. First of all, increased market access for exporters may encourage the emergence of new technology, goods, and services aimed at reducing climate change. Secondly, the growth in income brought on by trade could drive the community to push for improved environmental sustainability or reduced GHG emissions. The obtained findings of this research are in line with those of Bilgili et al. (2020) and Jorgenson and Givens (2014), who indicate that trade globalization has led to a downturn in environmental deterioration.

The environmental effects of economic globalization, particularly trade globalization (a sub-dimension of economic globalization) have attracted extensive interest in the social sciences, despite the fact that the correlation between economic globalization and environmental concern has been overlooked in prior studies. Newer theoretically generated study approaches concentrate on the level toward which comparable export patterns affect the environment across countries and the ways in which spatial aspects of commerce lead to environmental deterioration across national boundaries. Both of these are fundamental traits of trade globalization. From a positive standpoint, it is asserted that any type of global economic integration, notably increased export quantities, ultimately results in a comparative reduction in negative environmental consequences by improving the efficiency of resource usage in productive and collaborative practice (Cole, 2004, 2006). Such improved efficiency is partially fueled by economic growth brought on by global commerce, which promotes investments in technology and associated facilities to cut down on resource inputs as well as waste byproducts (Mol, 2003). Additionally, higher volumes of imports and export may enhance the chance for technical innovations, such as more environmentally friendly industrial methods, which could spread from one country to another. In contrast, it therefore stated from a critical standpoint that focusing on the export-oriented industry is one approach for countries to remain competitive in the global economy and that doing so results in an increase in environmental pollution and degradation (McMichael, 2008). Previous studies on the effects of export volumes on the environment have yielded a varied mix of findings, partially because of the sort of degradation that was investigated (Jorgenson & Givens, 2014; Roberts & Parks, 2007; York & Rosa, 2012).

The financial globalization (FGI), which is a sub-dimension of the overall KOF globalization indices, is being utilized to represent the influence of financial advancement on the worldwide platform, in line with Gygli et al. (2019), who explored the KOF globalization index that has commonly been using to unveil the environmental implications of globalization (Gygli et al., 2019). As an aspect of economic globalization, financial globalization is described as the integration between the domestic financial system of a country and global financial systems. Countries often have to liberalize the capital account and domestic financial sector in order to achieve this integration (Georgieva Svrtinov et al., 2013).

According to empirical findings, the FGI of Asian countries (for instance, portfolio investment and international reserves) decrease environmental deterioration. Only the 30th to 60th quantiles have values of 8.65, 7.28, 6.97, and 6.94, correspondingly—where the effects of financial globalization on carbon footprint are negative but strongly significant. The impact of financial globalization on CO_2 in Asia is likewise negative but significant solely in the lower quantiles from 10th to 40th and higher quantile (such as 70th quantile) at the significance levels 1% and 5%. Additionally, it is apparent that the influence of financial globalization on CFP and CO_2 is negligible for high emission countries in Asia. This indicates that the increasing trend in Asia's environmental quality level is an outcome of financial globalization. The findings of Z. Ş. Ulucak et al. (2020), who validated the indication of a detrimental impact of financial globalization on environmental deterioration in developing countries for the yearly data spanning from 1974 to 2016 in Turkey, are consistent with the above findings (Bilgili et al., 2020). These observations were also confirmed by several other investigations (Destek & Sarkodie, 2019; Saud et al., 2020). Al-Mulali, Tang, and Ozturk (2015a), Ahmed and Wang (2019), and Mahmood Ahmad, Jiang, et al. (2021), who concluded that FGI has a favorable influence on CO_2 in Canada. According to analyses by Adebayo, Akadiri, et al. (2022) employing QQ regression for G7 countries, the implications of FGI on carbon emissions are negative for Canada, France, Germany, the USA, and the UK and positive for Japan and Italy. Additionally, for the E7 countries, Adebayo (2022) used quantile-on-quantile regression (QQR), showing that the impact of FGI on carbon dioxide is beneficial for Turkey, India, China, and Brazil, as well as negatively for Mexico, Russia, and Indonesia.

The findings of this study demonstrate that financial globalization has a detrimental effect on the environment degradation. The reality is that certain Asian countries have been able to manage FGI in such a manner that they have progressed in terms of technology and have decent biodiversity and ecosystems internationally, despite the fact that the environmental protection index (EPI) rating (EPI, 2022) is not that great for Asian countries, could be the contributing factor of this opposite correlation between FGI and environmental quality in these countries. Additionally, the spreading of green technologies as a result of financial globalization could reduce environmental damage. Asia, therefore, intends to make increased contributions to sustainability and green efforts to boost its environmental friendliness. Additionally, as an advantage of financial globalization, inflows of foreign capital and global stocks of assets and liabilities could afford Asian states additional financial assistance by supporting investments in the development of eco-friendly technology.

Table 6.7 and Table 6.8 both demonstrate indications of the beneficial effects of social globalization on environmental degradation in Asian countries in terms of migration, traveling, cultural intimacy, tourism, telecommunications, and transfers. The coefficient value reveals that a 1% rise in SGI would result in increases in CFP of approximately 2.23%, 3.22%, 2.01%, 2.23%, 3.26%, 3.97%, 3.96%, 4.45%, and 3.11%, and decreases in CO_2 of approximately 1.5%, 3.26%, 4.42%, 3.18%, 4.42%, 4.64%, 3.4%, 3.93%, and 4.02%, correspondingly. All other CFP quantiles with the exception of just the 10th and 20th and all CO_2 quantiles are highly significant at the level of 1% and 5%. It is observable that the SGI coefficients rise from low emissions nations to high emissions nations. The analyses of Bilgili et al. (2020) in Turkey, Sasana (2018) in Indonesia, Destek (2020) in CEECs, and Muhammad Shahbaz, Mallick, et al. (2015) in India are all in accord with the results of this study, which also show that social globalization has a significant positive impact on environmental degradation. These results conflict with or concur with research conducted in Saudi Arabia by Z. Xu et al. (2018) that found no statistically significant correlation between social globalization and carbon emissions. While Muhammad Shahbaz, Khan, et al. (2017) demonstrated that the general index and sub-indices of globalization demonstrate that globalization in China is reducing CO_2, Ahmed et al. (2019) disclose that outcomes strongly demonstrate that general globalization, along with social, political, and economic aspects, seems to have no substantial consequence on the environmental footprint in Malaysia.

In the early stages of social globalization, residents' standard of living commenced increasing as more individuals continued to visit overseas or make phone or internet connections with friends internationally. As a result, the country’s overall carbon dioxide emissions began to rise along with the increase of carbon dioxide emissions per capita. Evidently, a rise in the overall carbon footprint might result from the increase in frequent airplane travel (Becken & Shuker, 2019; Dube & Nhamo, 2019; Guardian, 2010).

Tourism, migration, international voice traffic, and transfers are all examples of interpersonal globalization, which is one of social globalization's sub-dimensions. Policies and other resources that allow for direct contact between citizens of other nations are examples of interpersonal globalization indicators that are typically negative and have a strong influence on both CFP and CO_2. The coefficients of interpersonal globalization have the following values for CFP: 0.127, -0.301, -0.288, -0.584, -0.811, -1.001, -1.283, -1.413, and -1.279, and for CO_2: -1.172, -1.055, -0.996, -0.595, -1.484, -

1.520, -1.320, -0.969, and -1.124 correspondingly. The findings demonstrate that the values of the lower quantile, the 10th to 30th quantiles of CFP, and the 40th quantile of CO_2 are not statistically significant, whereas the middle and upper quantiles of the CFP and nearly each of the quantiles of CO_2 emission indicate that IGI significantly reduces environmental performance. This result is in line with research by Bilgili et al. (2020), which examined all aspects of Turkey's ecological footprint for the years 1970 to 2014 and found that interpersonal globalization had an adverse impact on environmental degradation. This suggests that IGI improves environmental quality. Additionally, IGI could assist in spreading the benefits of eco-friendly practices and technology from industrialized to emerging nations. For instance, importing greener technology or creating stronger environmental policies and standards could help in lessening pollution in emerging economies.

Additionally, as a sub-dimensions of social globalization, interpersonal globalization continues to progress, and environmental concern is being extensively disseminated throughout the entire planet by the internet, tourism, cultural exchange, and other means. Furthermore, environmental awareness raising and promotion contribute to preventing environmental deterioration (X. Chen et al., 2019). The information from the World Bank database, which shows that many Asians move to another country and promote their cultures and environmental consciousness, also partially confirms this. Moreover, the number of internet users and tourists from other countries has been rising in recent years. Both the internet and tourism are effective instruments for promoting cultural interchange and environmental consciousness.

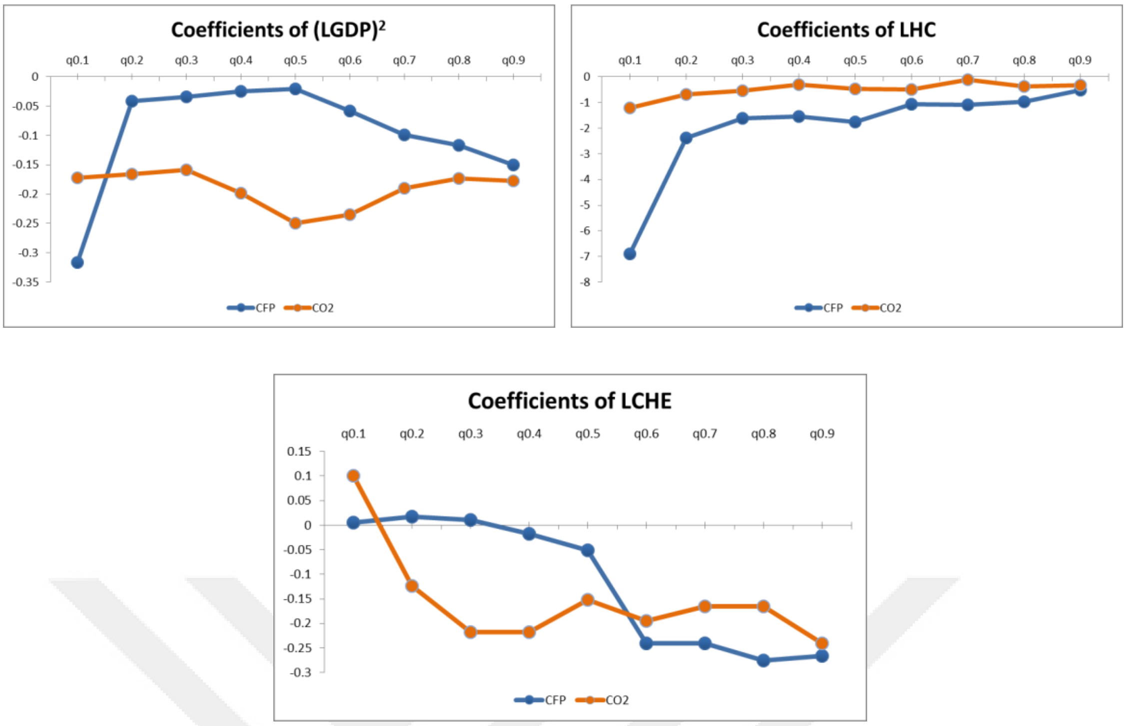
Political globalization (PGI) is determined by a variety of aspects, including the presence of embassies in other nations, multilateral treaties, global institutional memberships, and engagement in global initiatives. The PGI coefficients are consistent with those of Figge, Oebels, and Offermans (2017), appearing not significant at nearly all quantiles except the 80th of CFP, indicating that there is no apparent influence on the CFP in Asian countries. The connection between PGI and environmental quality has also been observed in other research to be insignificant (Dreher et al., 2008; Z. Xu et al., 2018). In contrast, it can be demonstrated that the impact of PGI on CO_2 is strongly positively significant at the most quantiles (20th, 30th, 60th to 90th quantiles), having values of 1.17, 2.35, 1.88, 1.99, 3.24, and 2.78, correspondingly, whereas only the 10th quantile is negative. The only quantiles that are not significant are the 10th, 40th, and 50th. Altogether, the findings imply that political globalization is responsible for the increase in environmental degradation in Asian nations. Sasana (2018), who asserts that PGI enhances CO_2 in Indonesia, supports the findings of this research. Furthermore, Muhammad Shahbaz, Mallick, et al. (2015) found that India's CO_2 emissions rise by more than 1% for every 1% increase in globalization due to social, political, and economic globalization. In addition, N. Wang et al. (2018) noted that the impact of political globalization in the G20 countries on PM2.5 concentrations is noticeably favorable and is particularly pronounced in countries with exceptionally low and high emissions. The observations of this research suggest that political globalization considerably reduces carbon dioxide emission, in contrast to research by Bilgili et al. (2020), Destek (2020), and Muhammad Shahbaz, Khan, et al. (2017), which indicate the opposite.

Additionally, it was noticed that the influence generally grows and then drops in a degree once it is tracked from the lower to the upper quantiles of the distribution. Particularly, the significant estimated coefficient is lowest at the 20th quantile and highest at the 30th, 80th, and 90th quantiles indicating that political globalization has a stronger influence on environmental quality in low emission and high emission regions. One explanation for this is that globalization could accelerate structural transformation by restructuring national industrial systems as a result of industries that are more focused on meeting global demand for their commodities, which increases resource consumption and air pollution ratios. Another factor might be that high emission nations have comparatively high marginal costs of pollution and correspondingly more pronounced resultant consequences of environmental damage. Political collaboration between nations may also reduce carbon dioxide emissions by making it accessible for the dissemination of government decisions, such as those promoting energy conservation or technological advancements for environmental protection, as well as by providing the required technical support. This is also consistent with the viewpoint of Environmental Monitoring Technology (EMT), which asserts that technological innovation-driven environmental legislation might reduce environmental deterioration (Q. Zhu et al., 2011).

The outcomes of the QARDL study, as reported by Ahmed et al. (2019), revealed that the influence of political and social globalization is negligible at the lower to lower-middle quantiles of the distribution. The fact that this analysis identified a substantial adverse effect in the upper-middle and upper quantiles implied that political and social globalization might actually serve to lessen the degree of environmental deterioration in the economy of Malaysia. Overall, the evidence demonstrated that globalization—both social and political—is what eventually leads to a reduction in ecological footprint, whereas globalization—both overall and economic—is what causes an increase in environmental degradation. Furthermore, according to some experts, the effects of globalization on the environment depend on a variety of factors. For example, Rudolph and Figge (2017) reported that particular aspects of globalization have varying effects on the environment after investigating how it affected the ecological footprint in 146 nations between 1981 and 2009. and Economic and social globalization would result in higher carbon dioxide emissions, according to Destek, Ulucak, and Dogan (2018), whereas political globalization would result in lower carbon dioxide emissions.

Figure 6.1 shows the distributions of the coefficients of all the independent and control variables across the quantile distribution of CFP and CO_2. Here, the vertical axis indicates the coefficients of the explanatory variables, and the horizontal axis indicates the quantile distribution. The blue lines indicate the quantile distribution for CFP, and the red lines indicate the quantile distribution for CO_2. It makes sense, given these numbers, to compare the CFP and CO_2 levels for each related variable.

Figure 8.1. Distributions of the coefficients of all the independent and control variables across quantile distribution of CFP and CO_2



Source: Author's Illustration

6.2.6.3. The Effects of Human Capital on the Environment

The very noteworthy findings are that human capital has a long-term, significant strong negative correlation with environmental degradation measured by education, schooling years and percentages of return from education encompassing primary, secondary, and tertiary levels. The estimated values for human capital on CFP are -6.894, -2.376, -1.618, -1.552, -1.765, -1.069, -1.089, -0.978, and -0.519, and they are negative across all observed quantiles, including the 20th, 30th, 40th, 50th, 60th, 70th, 80th, and 90th quantiles respectively (Table 6.7). Additionally, it is noted that each and every one of the projected values is highly statistically significant. In addition, Table 6.8 shows that the effects of human capital on CO_2 are all negative, with the exception of the 40th, 50th, and 70th quantiles, where they are merely statistically insignificant. This might be because, after few years, the impacts of schooling will start to appear. A unit growth in human capital would in fact, cause carbon dioxide to drop by around 12%, 7%, 5%, 3%, 5%, 5%, 1%, 3%, and 3%, accordingly. The studies of Bilgili et al. (2020) in Turkey, Bano et al. (2018) in Pakistan, Jahanger (2022) in 78 developing countries, and Solomon P Nathaniel, Nwulu, and Bekun (2021) in LACC all provide support for this finding. This result contrasts with those of Halliru et al. (2020), who discovered a favorable relationship between human capital and environmental damage in West African nations.

The findings suggest that increasing human capital will contribute to lowering carbon emissions since its negative and significant coefficients are rational and compelling. Therefore, human capital is already significantly contributing to environmental quality in Asian nations. Asian nations have been striving to strengthen human capital by high-quality schooling and environmental consciousness in recent years. For energy conservation, resource efficiency, innovation, and environmental preservation, educated and skilled human capital will possess a stronger propensity for renewable energy. This relates to the preceding research of Bano et al. (2018) and Zafar et al. (2019). In other words, if individuals, workers, and communities are educated properly, they will be more efficient and have a greater capacity to comprehend the value of environmental quality, which will assist to decrease energy usage and limit the increase of carbon emissions.

Human capital may also be detrimental to the environment if individuals have lower levels of education than they have now. They would not be able to employ newer energy-saving technology, would not comprehend environmental legislation, would not know how to preserve the environment, and will also be lower efficient in terms of economic progress. Ineffective government policies and inadequate household incomes might be other contributing factors. This shows that human capital improvement is crucial for protecting the environment, and Asian nations must accelerate it to get a higher level of environmental conservation.

6.2.6.4. The Effects of Health Expenditure on the Environment

The continued COVID-19 epidemic has turned the legislative attention back to the fundamentals of healthcare systems throughout the world. Understanding the correlation of health expenditures with environmental consequences is crucial for developing a healthcare system that is ecologically sustainable. In order to investigate the implications of healthcare spending on environmental sustainability in Asian countries, this research re-launched the panel data.

The impacts of current health expenditure (CHE) are positive for the 10th to 30th quantiles on CFP and the 10th quantile on CO_2, according to the quantile regression outcomes presented in Table 6.7 and Table 6.8; however, these impacts are statistically insignificant. Additionally, from the 40th to the 90th quantiles of the CFP, the estimated values of CHE are found to be negative. The values, however, are -0.018, -0.051, -0.240, -0.240, -0.276, -0.266, and the 20th to 90th quantiles on CO_2 are -0.124, -0.218, -0.218, -0.152, -0.195, -0.165, -0.166, -0.240, correspondingly. However, the 20th, 30th, 60th to 90th quantiles of CO_2 (considering the 60th to 90th quartiles of CO_2 data) and the 60th to 90th quantiles of CFP are highly significant at the 1% and 5% levels.

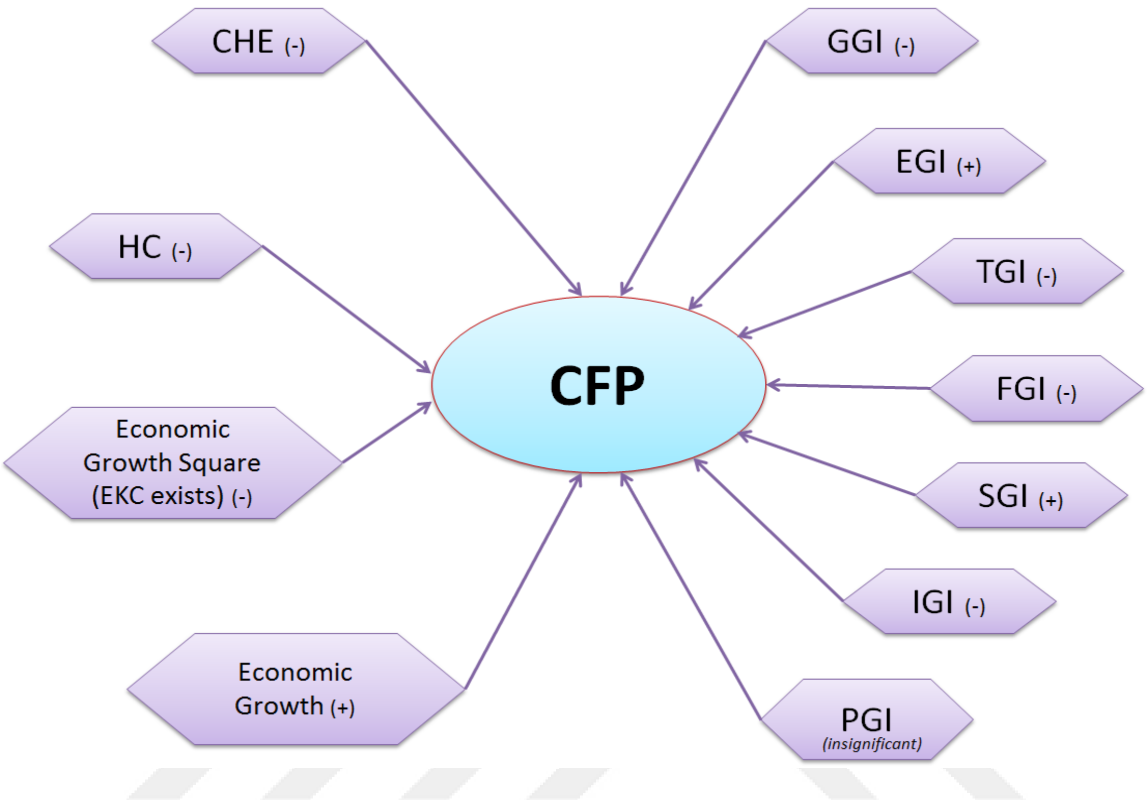
Moreover, the influence of CHE on CFP and CO_2 is notably significant for upper quantiles but not significant for lower and middle quantiles. The assumption that while both CFP and CO_2 emissions are below a particular level, the healthcare system is also undeveloped, and as a result, the healthcare sector's part of CFP and CO_2 emission is likewise minimal or insignificant, offers one of the possible justifications (Bilgili et al., 2021). The quantile regression findings of this research demonstrate that the increase in CHE has a detrimental impact on both CFP and CO_2 emissions. One argument that supports CFP and CO_2 emission efficiencies is the fact that greater levels of CHE are connected with both. Additionally, the current healthcare budget enhances the quality of the air in Asia by reducing CFP and CO_2 emissions. Environmental quality could be more positively impacted by healthcare costs than by other costs, such as healthcare goods, supplies, and medical services. CFP and CO_2 emissions can indeed be significantly decreased by current healthcare expenditure. The CFP and CO_2 emissions in Asia could go down as a result. The quantile regression study shows that in a few Asian nations, the reduction of carbon emissions was significantly influenced by the current state of healthcare.

According to Z. Wang et al. (2019), there is a significant correlation between Pakistan's environment, healthcare expenditure, and economic progress. With the exception of the lower quantiles, the observations support the obtained outcomes for the upper quantiles of this research. For the member states of MENA, Sileem (2016) explored the connection between environmental deterioration and healthcare expenses. The research indicates that carbon dioxide emissions are a contributing factor to the rise in healthcare costs.

For five Asian nations, Qureshi et al. (2015) investigated the trends of healthcare spending and environmental measures. Their findings concur with those of this research. According to this research, the quality of the environment in Asia will improve once healthcare expenditure rises. A number of literature also support the aspects of this investigation (Apergis et al., 2020; Atuahene et al., 2020; Chaabouni et al., 2016; Ghorashi & Rad, 2017; S. Zaidi & Saidi, 2018). Furthermore, during the past 20 years, Asian nations have raised their demands for higher healthcare spending. For example, over the last ten years, medical issues and services in South Asia (Sri Lanka, Pakistan, India, Bangladesh, Nepal, and Bhutan) have progressed despite being relatively substandard (Chin et al., 2017). Over 95% of people in China, Japan, Singapore, Thailand, and South Korea have access to healthcare. In order to attain universal health coverage (UHC) within five years, Indonesia began implementing the UHC program in 2014 (Evans et al., 2016). While compared to A. Khan et al. (2020), who discovered a positive correlation between carbon dioxide and healthcare expenses for BRI member states, the findings of this study show distinct indicators. He also provided evidence of the variations in performance across levels and across nations.

The overall findings of this research demonstrate that various dimensions of globalization have a strong, significant relationship with the control variables, such as GDP, GDP square, human capital, and CHE on CFP and CO_2 emission in the selected Asian countries in the time span between 2000 and 2017 by utilizing panel quantile regression. According to this analysis, globalization could have both positive and negative consequences on environmental quality depending on its dimensions and sub-dimensions. This is mentionable that general globalization, financial globalization, trade globalization, interpersonal globalization, and the control variables, including GDP square, human capital, and current health expenditure, are contributing factors to lowering carbon footprint and carbon dioxide emission, suggesting that these variables minimize environmental degradation.

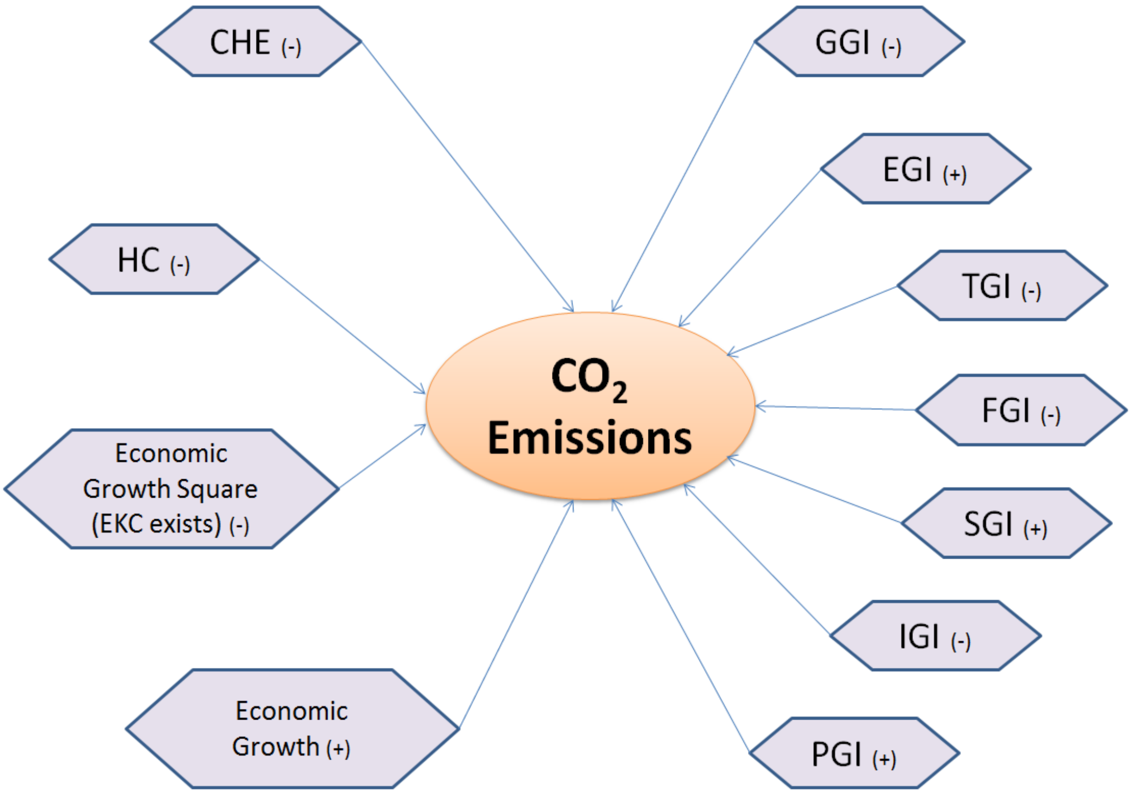
Figure 8.2. Visual representation of the long-run correlation between CFP and all other analyzed variables



Source: Author's Illustratıon

The fact that social and economic globalization, along with the control variable GDP, all induce increased carbon footprint and carbon dioxide emissions suggests that these aspects have a negative impact on the environment. Political globalization has a negligible impact on the carbon footprint; however, it does have a positive impact on carbon dioxide emissions in Asia. In addition, panel quantile regression was employed in the present study to examine the environmental Kuznets curve in Asian economies. The findings revealed that while economic growth is positive and significant, its square is negative and significant, providing an inverted U-shaped curve for Asia. The outcomes additionally support the idea that while the chosen variables first contribute to a rise in environmental degradation, but after reaching a certain point, they eventually began to reduce pollution levels in Asia. Considering that Asian nations must choose from growing globalization for certain candidate variables and limiting globalization for other candidate variables, even if both situations are significant, these outcomes appear highly justifiable and logical. Governments and regulatory authorities should, therefore, precisely set into implementation the policies relating to the aforementioned challenge.

Figure 8.3. Visual representation of the long-run correlation between CO_2 and all other analyzed variables



Source: Author's Illustratıon

CHAPTER 7
CONCLUSIONS AND RECOMMENDATIONS

7.1.Conclusion

Throughout the world, people are becoming more and more concerned about the environment. Likewise, countries from different geographical positions in the world are integrating more and more due to globalization. Considering these changes, a number of comparative international investigations concentrate on the environmental consequences due to different aspects of globalization. Earlier conceptions and investigations, however, have not taken into account these potentially linked mechanisms and conditions, and as a result, they have not examined the level to which the dimensions and sub-dimensions of globalization affect personal environmental concern. The objective of this analysis is to further research and discussion on these concerns and enhance the comprehension of the wider aspects and systemic connections that influence attitudes toward the environment. To confront the environmental challenges and meet the SDGs, different multinational summits have been convened. The CFP and CO_2 emissions, however, are still rising in developing countries despite the Kyoto Protocol and Paris Conference's efforts to reduce emissions. To determine the sources of environmental deterioration and to apply new policy measures, additional research is therefore essential. This research examines the effects of globalization on mainly two indicators of environmental degradation for Asian countries, namely CFP and CO_2 emissions. There are both developed and developing countries in Asia, each with varying degrees of political and socioeconomic advancement. The research concentrated on Asian countries because of their economic interconnectedness, rapid economic growth, climate change, and global warming, which intensify many of Asia's environmental concerns.

The Environment Kuznets Curve (EKC) theory is employed in this research to assess how globalization has affected the environmental quality in Asian countries. This research is distinctive in several aspects. Two major climate-related measures, CFP and CO_2, were selected as target variables for this analysis, and the responses of these variables to other globalization indices were examined using two alternative econometric models. This study used the cross-section dependence test, Kao cointegration test, homogeneity test, second-generation unit root test, and panel quantile regression approaches to examine the Asian panel data for the twenty-two selected countries between 2000 and 2017. To fulfill the targets of this research, the QREG technique has been used. The QREG validates the effects of different quantiles on CFP and CO_2 emissions across all globalization-related dimensions and sub-dimensions. Thus, a more comprehensive interpretation is presented of the overall dependence of globalization on environment. Observations from the QREG reveal an inverted U-shaped correlation between GDP per capita and CFP as well as CO_2 emissions in Asia, validating the EKC hypothesis. According to empirical findings, environmental pollution decreases as the income levels of the panel Asian countries increase. This EKC hypothesis indicates that a country may develop without compromising environmental conditions if the EKC reasoning is valid (Mohapatra et al., 2016). For the growth of their economies, a number of these countries are reliant upon fossil fuels. In order to lower their CFP over a larger period of time, these economies must implement institutional reforms due to the rising CO_2 levels in the respective countries. Economic progress is reliant on less expensive fossil fuels, although it is acknowledged that more efforts have to be undertaken to make the transition to a reduced carbon-based economy. For the economies of the Asian countries, there exists a balancing between economic growth and preserving a long-term, ecologically friendly, stable economic growth route.

The research reaches certain quite realistic findings that as economic, social, and political globalization rise, environmental deterioration tends to increase, denoting that these are the principal causes of environmental degradation for the selected samples. This was figured out by taking into account the correlation among the overall measures of globalization (along with its dimensions and sub-dimensions), CFP, and CO_2 emissions. In contrast, improving these aspects increases environmental performance in the specified Asian countries since the trade, financial, and interpersonal globalization have the highest detrimental effects on the environment. The estimate is in line with the hypotheses that these aspects of globalization have a crucial impact on environmental performance. However, the sub-dimensions of economic globalization, including trade and financial globalization encourage investments in eco-friendly policies and green industries. The outcomes of this research are contradictory since economic globalization promotes environmentally harmful industries and hence increases environmental deterioration. The prior findings could be the outcome of the connections that exist between economic globalization and economic growth. After reaching a specific benchmark of per capita income levels or economic growth, economies become aware of the negative impacts of globalization and attempt to reduce their carbon emissions as they advance toward greater developmental stages by implementing different strategies, including the export-led growth strategy.

To participate in social globalization, individuals use planes to fly overseas, or they communicate online or over the phone with international friends. As a result, the country's CFP and CO_2 emissions began to rise. Interpersonal globalization, on the other hand, would result in a higher exchange of information and technology between individuals of one country and outsiders. Additionally, increased interpersonal globalization results in more convenient interactions between local residents and visitors. Interpersonal globalization would also increase the transfer of human capital, information, and technology among the host nation as well as other nations, affording the government more ability to improve its environmental quality. It increases people's access to knowledge on environmental preservation, encouraging residents to care more about environmental issues on a worldwide scale and increasing pressure on countries to uphold environmental protection laws (You & Lv, 2018).

The tendency of emerging nations to implement more stringent environmental laws on themselves as income rises with trade leads to the adoption of environmentally-friendly production patterns, which reduces pollution as well as promotes competitiveness (Mani & Wheeler, 1998; Porter & Van der Linde, 1995). There exists no social or political accord regarding how to regulate and who would restrict carbon emissions since there are interest conflicts throughout countries due to social and political disparities throughout various demographic groups in respective societies and geographies in Asian countries. Despite extensive discussions and attempts to develop a consensus program, these social and political obligations to reduce carbon emissions appear to be in a state of uncertainty. Addressing and solving these issues has become the duty of the entire humankind in order to ensure a sustainable environment for all future living creatures on the planet. Furthermore, the quantile regression estimations of this research yield inconclusive results. The outcomes indicated that Asia's environmental quality would continue to degrade as economic growth and globalization have continued to rise. Therefore, the state authorities should concentrate on implementing effective environmental regulations to reduce the detrimental impact of globalization on environmental quality.

Asia's per capita income is increasing due to globalization, which also leads to technological advancement and a reduction in the pace of environmental deterioration. Environmental deterioration tends to increase at low-income levels because individuals are ready to endure more environmental deterioration in return for more consumption. In contrast, when a society raises its standard of living via the process of globalization, its residents deserve improved ecological conditions. It is evidenced that both social and environmental circumstances have improved in Asia as a result of globalization. Nevertheless, Asia must engage more actively in the practice of economic unification with its regional trading allies by decreasing or abolishing trade barriers for the existing trend of globalization to be long-term viable. A sustainable ecosystem can be achieved by the application of carbon taxes for pollution-creating firms, stringent environmental regulations, tariffs on obsolete technologies (through trade), monitoring of deforestation, and controlling of waste generation. Sustainability in the social and environmental spheres is a prerequisite for the long-term viability of globalization, which benefits a nation's economic growth. Hence, state authorities should prioritize enhancing environmental protection and lowering toxic emissions. Environmental deterioration, decreasing pressure on the environment, and biodiversity loss in developing countries are the common obligations of both developed and developing countries.

Furthermore, it seems that globalization benefits the nations more with strong human capital and increased healthcare spending because these nations can keep improving other crucial health-related factors, including environmental preservation, schooling, technical knowledge, as well as their health systems. Human capital and health expenditure have a negative and statistically significant relationship with the environment, which suggests that these factors help to minimize environmental deterioration. These findings demonstrate that globalization facilitates nations with greater levels of human capital, healthcare, and improved environmental condition by reducing the volume of CFP and CO_2 emissions in Asia.

The key findings of this research about how human capital affects environmental quality are promising, and resolving these globalization-related concerns by enrolling in educational and training programs would assist to create more productive and competent workers in the long term. In order to introduce new technology in a professional manner and lower carbon emissions in Asia, training and skilled workers are crucial. As a result of the increasing population and increased awareness of health concerns, it is also predicted that the healthcare technology sector in Asia would be the second-largest healthcare marketplace in the world (GBP International, 2019). In addition, there has been a noticeable growth in the necessity for healthcare services in Asia. Hence, this research demonstrates unique perspectives on the impact of current health spending on environmental deterioration. Additionally, the findings suggest that Asian countries require more natural resources to maintain their current level of prosperity than their existing biocapacity.

7.2. Policy Recommendations

The impacts of national policy reforms might transcend international boundaries as a result of the increased interdependence within countries resulting from globalization. This can make it more challenging to adopt environmental policy into practice. The research findings suggest a number of crucial policy implications that might assist the decision-makers, law enforcement officials, and government representatives of these Asian nations in reducing the negative effects of environmental degradation. The following are the associated policy recommendations:

a) Realizing that globalization is crucial to environmental protection, authorities may employ it to promote the concept, specifically through environmental globalization, which can facilitate the structuring of economic processes or global commerce led by economic, financial, and trade globalization. Additionally, these globalization processes have the potential to improve the environmental condition through structural economic change and the implementation of cleaner and more advanced technologies, particularly in developed countries having rigorous environmental regulations. As a result of inadequate environmental regulations in low- and middle-income countries, foreign investment inflows, on the other hand, cause an environmental race to the bottom. The flexibility of states to execute environmental policy has also allegedly been hindered by international trade accords. It is frequently argued that in WTO disputes, concerns about free trade take priority over environmental considerations. Due to various concerns about losing out to other competing countries in the global marketplace, authorities can yield to pressure to relax environmental regulations.

b) State authorities should step up efforts to promote interactions between national and foreign societies in order to raise residents' awareness of environmental preservation, considering that sustainable development is commonly recognized on a global scale. It is important to improve cross-national social connections, and environmental consciousness should be emphasized through national media. In order to support sustainable development in these states, policymakers should also promote environmentally friendly technology by community awareness programs on environmental safety. Additionally, considering the benefits of increased globalization for improving environmental quality, governments that value improved environmental performance should take steps to manage Covid-19 and promote the value of globalization for environmental preservation. This can completely improve the scenario of the global environment, despite the anti-globalization attitude and the post-Covid-19 situation. Moreover, the negative environmental consequences of FDI or international trade may be brought about by the relocated environmental pollution from developed countries. State authorities should be aware of trade and foreign direct investment activities that might affect the environment while taking part in globalization processes. States have the option of imposing an additional tax on these goods or services to support environmental preservation. The European Union has recommended that countries can impose carbon taxes on importers of goods that have negative environmental consequences depending on the amount of carbon emissions produced in the manufacturing stage.

c) To ensure sustainable development, the green economy must be given higher priority. The green economy has the potential to partially offset the deleterious effects of economic growth on environmental concerns, despite the fact that economic growth could intensify global warming by increasing CFP and CO_2 emissions. The state authorities should establish an equilibrium between economic growth and environmental preservation depending on the green economy idea. All the selected Asian countries should participate in the process of globalization since a high degree of globalization is advantageous for carbon emission reduction, and there is an inverted-U-shaped correlation between globalization, CFP, and CO_2 emissions.

d) The process of globalization may help the national economy by introducing more environmentally friendly cutting-edge manufacturing technologies and skilled human resources. Asian economic growth depends on the contribution of human capital to environmental protection. The estimated outcome showed that investing in human capital may significantly reduce CFP and CO_2 emissions. Hence, it is suggested that the government should pay more attention to policy-making and invest in both public and private education, as well as encourage companies to execute environmental protection laws through using environmentally friendly manufacturing strategies and educating employees on cutting-edge technologies that promote economic growth and reduce carbon emissions.

e) This research implies financing health expenditures with alternative resources, such as environmentally friendly technology that cause minimal pollution. It is crucial for policymakers to balance the development of human capital and technological advancement with the allocation of healthcare expenditures to ensure public health. It goes without saying that advances in human well-being will contribute to economic growth.

f) To inspire scientists to produce innovative low-carbon technologies, companies, as well as other parties, must be driven to incorporate such low-carbon-emitting alternatives. To achieve this, policymakers must implement strict regulatory, taxing, and monetary incentive arrangements. In addition to encouraging the establishment of new industries that serve economic and ecological sustainability, these efforts will concurrently stimulate the demand for innovations. Taxation on CO_2 emissions could be enacted by the developing country authorities, which is a proven approach to reducing carbon emissions in countries having flexible environmental policies. Workshops, conferences, and seminars arranged by societies and governments in emerging economies might be fruitful in raising public consciousness regarding CO_2 emissions.

g) The CO_2 emission limits for industry should be implemented through a carrot and stick strategy. This includes implementing organizational transformations to systematically track and report on CO_2 emissions so that prevailing strategies and policies may be adjusted as needed to guarantee CO_2 emission goals are fulfilled by all economic stakeholders. The Chinese administration, for instance, was troubled about the rising CO_2 emissions brought on by the country's swift industrialization over the past forty years. To minimize China's carbon footprint, a number of the aforementioned steps were adopted. Using the emission levels of 2005 as a baseline, these policies aim to reduce carbon emissions by 60% to 65% by 2030 (Averchenkova et al., 2016). Different analyses have demonstrated that such organizational reforms have caused CO_2 emissions to stabilize despite continuing fast economic growth and industrial development (Guan et al., 2018; S. Yu et al., 2018). To control the pollution level and contribute to keep the worldwide average temperature under 1.5 °C, the state authorities must reinforce the entities that implement environmental accords and laws like the Paris Agreement and the Kyoto Protocol.

7.3. Limitations and Future Research Directions

Even though this analysis relates to a number of social science research fields, such as globalization, sustainable development, and environmental social science, it is important to note that this work could have limitations that might be explored in future research. Despite the fact that the KOF index used in this research gives equal weight to economic, social, and political globalization when determining the overall globalization level. Various countries could have varying weights for these aspects depending on their economic, social, or political advancement. Whenever more specific information on the weight of various countries is acquired, this key issue should be studied further. The fact that this research considers several selected Asian countries into account means that some of its outcomes might not be applied to other countries. Furthermore, in the future, a larger sample size could be used to explore the effects of globalization on CFP and CO_2 emissions, along with considering other relevant variables and applying alternative approaches.

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