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Decarbonizing the Future: A Critical Review of Green Energy, Financial Inclusion and Trade Openness on CO2 Emissions

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Abstract
In the context of developing economies, this education aims to investigate the lessons from works on financial inclusion, trade openness, uncertainty in economic policy, and green energy with regard to CO2 emissions. This work investigates and summarizes the body of the subject has been studied both theoretically and empirically. First, an outline of Pakistan's financial inclusion, trade openness, uncertainties surrounding economic policy, use of green energy, and CO2 emissions is drawn. Second, the literature is located by utilizing the theoretical and empirical knowledge that can be discovered in published works. Additionally, the theoretical methods used in this article to describe how these approaches operate were made clearer. Third, this paper suggests three useful areas for more investigation. In order to make a significant contribution to the field of financial inclusion, trade openness, economic policy uncertainty, green energy, and CO2 emissions, this paper critically analyzes and synthesizes the body of existing literature on these topics.
Keywords: Economic policy uncertainty, financial inclusion, trade openness, green energy, CO2 emission

1. Introduction

An important and challenging aspect of growth is financial development. A crucial part of the financial development is financial presence, which supports the growth of financial institutions and industries. After a study identified financial exclusion as a primary contributor to poverty in the early 2000s, the idea of financial inclusion emerged. The significance of environmental stability has increased, and numerous governments have pledged to allocate funds towards achieving these goals (Huang et al., 2024; Hakim Ali et al., 2021). The recognition that preserving economic growth necessitates concurrent environmental quality preservation and protection underscores the need of declining greenhouse gas emissions, especially CO2. Error - mostly from undefined bug growth devoid of simultaneously ensuring ecological preservation, according to the 2030 Sustainable growth Goals (SDG) framework of the United Nations (Naz et al., 2022; Awan et al., 2023; Maqsood1 et al., 2023; Farhadi & Zaho, 2024; Tawari, 2024).

The most difficult global issues at the moment are greenhouse gas (GHG)-induced environmental harm and climate change. According to this perspective, governments around the world have turned to renewable energy sources that reduce greenhouse gas emissions and have also backed initiatives to grow renewable energy bases in an effort to prevent eco-friendly degradation. Economic activity and the combustion of fossil fuels have an important effect on CO2 emissions. Prior research has demonstrated a noteworthy correlation between environmental indices and income, where income is commonly quantified by GDP per capita (Chaudhary et al., 2023; Ullah & Ali, 2024; Ur Rahman & Bakar, 2018; Zhao et al., 2023; Roussel & Audi, 2024).

We employ the Real prices for the economy-wide energy price index and, in contrast to earlier studies, we apply a new and wider ratio of price effect. Accordingly, in the EKC showing, we account for both the revenue outcome and the price impact. The US is one of the main CO2 emitters in the world, and these metrics should be strongly correlated with the country's CO2 emissions Trade between the EU and its geographically close trading partners as well as the global market increased as a result of this liberalization (Hafiza et al., 2022; Info, 2022; Ullah et al., 2023; Rehman & Ahmad, 2024). Made goods make up the majority of Tunisia's exports. For instance, manufactured goods accounted for 77% of Tunisia's exports to the EU in 2017 whereas energy-consuming commodities including machinery and automobiles made up 41.1% of imports. Additionally, foreign investment finds rising trade openness to be fascinating (Zulfiqar et al., 2022; Dawood et al., 2023; Saluy & Nuryanto, 2023; Investment et al., 2022; Imran et al., 2023).

According to theory, polluting industries in developed nations incur higher costs as a result of restrictive environmental regulations; as a result, they relocate their polluting production processes to developing nations, where they can take advantage of lax environmental regulations and inexpensive labor costs. However, by implementing the superior and domestic standards for technology in the industrialized world, the foreign company could enhance good environmental benefits. Conversely, easier access to financial services supports and encourages industrial and manufacturing processes, which may lead to increased CO2 emissions and, ultimately, global warming (Javaid et al., 2023; Shahzadi et al., 2023; Zahra et al., 2023; Kilenthong & Komain, 2023). The ability to buy energy-intensive consumer goods like air conditioners, refrigerators, and automobiles—whose use carries a serious environmental risk due to increasing greenhouse gas (GHG) emissions—is another benefit of greater financial inclusion. Financial systems that are inclusive also encourage economic activity, which in turn increases the demand for energy sources that are harmful and hence raises greenhouse gas emissions (Qureshi et al., 2022; Wang & Manopimoke, 2023; Limjaroenrat & Ramanust, 2023).

The most active and rapidly expanding region in the globe is Asia. The region continues to face a major problem in the form of financial exclusion, despite notable advancements in financial inclusion. With no bank account, no formal job, and insufficient ability to engage in paid labor activities both online and offline, roughly a billion individuals do not have access to official banking institutions. Furthermore, according to reports, only roughly one-third of businesses consume advances or credit lines, the most popular forms of outside funding, and only approximately 27% of persons in emerging A formal financial institution has accounts with Asian countries. A comprehensive strategy to support financial inclusion is probably a workable answer for Asia, given the significant intra- significant regional disparities between countries (Rahman & Bakar, 2019; Singh & Kumar, 2023).

The World Bank defines financial inclusion as people and companies having access to a broad range of financial products and services that meet their requirements in an affordable, sustainable, responsible, and long-term way.

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According some examples of these services and goods are outflows, exchanges, savings, loans, insurance, and transfers of funds. In conclusion, by giving everyone access to these financial services, it is thought that expanding their availability can spur economic growth and lessen income inequality. Because of this, a nation's high degree of financial inclusivity could be seen as an indication of its stability (Imran et al., 2024; Abro et al., 2024; Shahid et al., 2024). Ensuring greater economic growth through financial inclusion is crucial is therefore impossible to exaggerate. Concurrently, the noteworthy function that financial inclusion performs is probably going to affect environmental quality in supporting economic growth. Increased financial inclusion, for example, might lead to increased gross fixed capital formation, which might increase the need for energy resources and eventually deteriorate environmental quality because energy consumption releases emissions into the atmosphere. The consequences of global financial development on the environment have been extensively studied, but the influence of financial inclusion on environmental quality has lately come up for consideration.

2. Literature Review

2.1. Green energy

The findings of the research, which show a causal association between real GDP, CO2 emissions, and vigor feasting, vary from nation to nation and based on the technique employed. It is challenging to summarize these differences succinctly. The literature has three different types of findings overall. First, research indicates that energy consumption and/or GDP can be Granger-caused by CO2 emissions. For instance, the following studies found this relationship: These findings suggest that economic expansion is correlated with increased CO2 emissions (Shahzadi, Sheikh, et al., 2023; Imran et al., 2022; Minhas et al., 2024).

2.2. Economic Policy uncertainty

Empirical studies examining the through outcomes of economic uncertainty on ecofriendly quality are scarce. As an illustration, described how (EPU), which is associated with an upsurge in financial, fiscal, and governmental restrictions, affects the excellence of the environment in which people and organizations operate. Empirical study indicates that stronger EPU influences the tourism sector, financial development, innovations, company level capital investment, firm profits, and working investment. outlined how uncertainty in economic decision-making policies are viewed as important factors in the modern, international society. According the government's direct policies have an impact on carbon dioxide emissions and can either exacerbate or prevent environmental harm (Imran et al., 2021; Shahid, 2024; Song et al., 2024).

2.3. Trade openness

According to Grossman and Krueger (1991) and 1996, trade liberalization has an impact on the nonlinear link between income and pollutant emissions. By applying the Ordinary Least Square (OLS), Fixed Effects (FE), and Generalized Method of Movement (GMM) approaches, a mixed panel of Organization for Economic Cooperation and Development (OECD) and non-OECD countries examined the factors influencing different pollution emissions. They discovered that trade openness positively affects all of the emissions under investigation. The EKC hypothesis in Turkey and included commerce with other countries in the CO2 emissions per capita model (Bilal, n.d.) His findings support the EKC hypothesis, Furthermore, he observes that the relationship between trade openness and CO2 emissions in Sri Lanka from 1960 to 2006 is influenced positively by energy consumption and foreign trade; additionally, Granger interconnection is found between income and energy consumption and CO2 emissions per capita, but not from foreign trade using functional tests like cointegration and Granger causality? He continued by explaining how economic growth is the cause of both trade openness and investment. looked at the triangle connected to economic growth, CO2 emissions, and trade openness in Tunisia between 1961 and 2005. As to their testimony, trade liberalization has both immediate and long-term favorable impacts on carbon dioxide emissions, along with long-term adverse indirect consequences (Tabassum et al., 2023; Shahid et al., 2023; Ahmad Shahid et al., 2023).

2.4. Financial Inclusion

Several research accepted to observe the constituents of carbon dioxide emissions in the US. The EKC model includes a number of additional parameters in addition to the price and income effects. The EKC model now includes additional constraints related to financial expansion, To, (FDI), and urban population at this point, we analyze the articles that have applied time-series methods and limit our attention to the US situation paper provides an extensive overview of related material on various nations (Irfan et al., 2023; Ullah et al., 2023). We also examine the studies that highlight the total amount of CO2 emissions in the US at the national level. Keep in mind that a large number of research also concentrate on data at the regional level in the US. For instance, the authors of exhibit the lack of statistical significance of the revenue impact under these circumstances. Nevertheless, the price differential devours a major impression on the amount of CO2 emissions in the US between 1960 and 2000. The authors also demonstrate for the first time that income is not a significant factor in driving CO2 emissions, using data for the years 1960 to 2007. Nuclear energy has the potential to drastically reduce CO2 emissions, whereas renewable energy has little bearing on US carbon emissions (Rahman et al., 2022; Li et al., 2022; A. U. Shahid et al., 2022).

3. Methodology

The present investigation employed the prose appraisal technique, as delineated, in accordance with the principles of systematic literature review, to compile and evaluate pertinent sources of information. In order to conduct a comprehensive and critical study of the earlier works, the author provides a critical review form that tackles several crucial elements, such as the paper's emphasis, bibliographic details, theory utilized (where appropriate), and research philosophy. important conclusions, methods, and definitions of green energy, trade policy uncertainty, financial inclusion, and trade openness (Ur Rahman & Bakar, 2018) Along with them, it covers the domain of dependent variables. This allowed the researcher to find the most pertinent papers on financial inclusion, trade uncertainty, openness, and green energy three references four sources: Google Scholar; a thorough, multidisciplinary bibliography covering financial Books, commentaries, executive abstracts, were among the criteria used by the author to select the literature for this review; for instance, papers that did not address trade openness, financial inclusion, economic policy uncertainty, or green energy were excluded (T. A. Shahid, 2023). They were not conceptual or empirical, which is another reason they were disregarded.

After duplication, the author discovered nearly 600 items in entire. The author checked the technique, heading, and abstract of respectively work as needed to determine its applicability.

4. Conclusion

Examining the findings critically reveals that, when weighed against the total worth of financial inclusion, trade openness, economic policy uncertainty, and green energy, both positive and negative effects are clearly discernible. What's really interesting is that both findings individually close the gap in the literature. Trade openness, renewable energy, financial inclusion, and uncertain economic policies are thus factors that are still being debated and the subject of extensive research. Research has revealed that the unique economic, financial, and technological conditions of the host nations have a mixed bag of good and negative effects on economic growth, including some substantial. The information on financial inclusion, trade openness, renewable energy, and policy uncertainty in the economy with regard to CO2 emissions will grow as a result of this study. Additionally, it will look into how these factors affect factor productivity and CO2 emissions in Pakistan. The current study attempted to link important concepts from the literature with contributions that were pertinent to the subject. Moreover, there is a deficiency in the variables' investigation in this study. Therefore, the study's main objective is to provide a concise and comprehensive summary of earlier research on financial inclusion, trade openness, the uncertainty of economic policy.

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