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Nexus of economic diversification, institutional quality, and co2 emissions: Evidence from emerging economies

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Abstract

Emerging economies are under immense pressure to lessen their emissions of CO_2. This study intends to assess the effect of economic diversification on emissions of CO_2 empirically. Additionally, the study examines how several aspects of institutional quality—economic, political, and legal—modify the connection between economic diversification and CO_2 emissions. The study uses the full economic diversification index data, which includes product, trade, and government revenue diversification indicators, and a sample of emerging economies for the years 2000–2020. The findings posit that economic diversification contributes positively to emissions of CO_2 . The results also elucidate that institutional quality plays a significant role in the linkage of CO_2 emissions and economic diversification. The interaction between institutional quality indices and economic diversification shows that the mutual effect of these two variables is effective in stimulating CO_2 emissions. The empirical outcomes suggest innovative policies for cleaner production. The results suggest the imperative policy recommendations for regulators and policymakers that economic diversification doesn't undermine carbon emissions but exacerbates them.

Keywords: Economic Diversification; Institutional quality; CO_2 emissions; Emerging Economies

1. Introduction

Global warming is an issue that all nations, regardless of wealth, must address. An increasing number of natural disasters, such as strong storms, rising sea levels, and harsh weather, are a result of it. International organizations are trying to lower emissions of greenhouse gases to reduce the global warming effects by setting targets (Yuan, 2021). To minimize the global warming effects, for instance, the United Nations (UN) highlights the necessity of collaboration and agreements

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between governments. Research institutes and researchers are working to resolve global warming problems and uncover variables that are sabotaging the environment (Shazad et al., 2020).

In the literature of environmental economics, economic activity is identified as the primary cause of environmental degradation. To understand the linkages between CO_2 emissions, trade considerations, and economic growth, researchers are working to find a solution. The variable that is tested the most in the literature is trade volume, which includes imports, exports, and/or trade openness (Caglar et al., 2022). This is because increased commercial activity raises the need for energy significantly, which might result in environmental deterioration. Nonetheless, some academics have suggested recently that apart from trade volume diversification of products escalates trade activity that results in higher CO_2 emissions (Matallah, 2020).

One of the most important factors in research on international trade is import product diversification, which can significantly boost economic growth. The level of development of a nation determines the extent of the impact. For instance, in the development early phases, a country may choose to focus on manufacturing sectors that produce a lot of pollution, like metal and cement, to attain higher growth by producing more products, which increases the energy demand (Abid et al.,2016). The energy consumption and scale, structure, and labor insensitivity of these businesses can lead to a rise in environmental pollution, but when economic development reaches a certain point, these nations move to less harmful businesses. As a result of this process, developed nations specialize in clean industrial products, or highly advanced and technologically complicated products that are essential for lowering CO_2 emissions (Mania, 2019). On the contrary developing economies are relying less on clean energy and are less advanced technologically economic diversification enhances the emissions of CO_2.

Furthermore, complying with environmental standards takes a significant amount of resources in wealthy nations. As a result, rich nations typically focus on producing commodities with lower pollution levels, whereas importing items with higher pollution levels from developing economies is preferred (Cole, 2004). In this way, the environment of developed nations may benefit from the diversification of foreign products. The scenario in developing nations is distinct. Improving energy efficiency is among developing nations' top priorities. However, industrialized nations are typically the ones to lead the way in technical advancements that boost energy efficiency. Thus, the transfer of new technologies from industrialized to underdeveloped nations is more crucial (Wang et al., 2023).

The literature has looked into determinants of CO_2 emissions and investigated some of the factors like trade openness, imports, exports, and product diversification(Abid et al.,2016; Mania,2019; Caglar et al.,2022; Wang et al.,2023; Shahzad et al.,2020; Yuan,2021). There is a lack of breadth in considering a comprehensive economic diversification index that encompasses product, revenue, and trade diversification. Dogan et al. (2020) highlight the need to look at the diversification of the economy from multiple approaches apart from a single approach like product diversification. This research also investigates the institution's role in economic diversification and

environmental degradation. Some studies investigate the institutional quality role in controlling environmental hazards (Ibrahim & law, 2016; Ali et al., 2019; Yang et al., 2022; Yuan et al., 2022). This study extends the literature by investigating the institutional quality moderating role of the nexus of EDI and carbon emission.

The connection between economic diversification and carbon emissions are two competing theories. One is the pollution heaven hypothesis. According to this theory, when businesses from major industrialized nations set up production plants abroad, they usually choose areas where labor and resources are the most economical, with the main goal being to acquire the necessary raw materials and land. These sites are usually found in developing nations with relatively cheap labor and resources and laxer environmental restrictions (Kearsley & Riddel, 2010).

As a result, businesses that make investments abroad frequently move to nations with the least stringent environmental regulations or the least stringent enforcement (Solarin et al., 2017). The results of the study show that as a result of globalization, some nations with laxer regulations and weaker environmental protection requirements have grown more alluring to businesses looking to relocate their operations and investments abroad, which has led to a worsening of environmental pollution in those countries. According to the Economic Kuznets Curve, a nation's pollution level tends to rise as it develops economically. The opposite of the pollution haven hypothesis, the second idea is known as the pollution halo hypothesis (Ahmad et al., 2021). This theory states that multinational firms have created increasingly sophisticated environmental protection technology, and these innovations spread throughout the procedure of foreign investment, which results in advancements in regional environmental protection norms and technologies. The ecosystem of the host nation may benefit from this (Duan & Jiang, 2021).

The above discussion elucidates that the goal of the paper is to examine the economic diversification index effect on CO_2 emissions by employing a sample of developing economies during the period 2000 to 2020. Several studies have investigated the determinants of environmental degradation, however, there are scant studies related to the interplay of economic diversification and institutional quality on environmental problems. This research adds to the literature in the following ways. Firstly, the study investigates the effect of the economic diversification index (EDI) on the CO_2 emissions in emerging economies as most of the studies focused on trade openness, product diversification, and growth, and less importance is extended to the broad dimension of economic diversification index. Secondly, the research explores the role of institutional qualities that entail economic, political, and legal institutional qualities on the linkage of EDI and CO_2 emissions. Thirdly, the study explores this issue in developing economies as CO_2 emissions of developing economies surpass in comparison to developed economies. The findings of the study provide useful insights in formulating the policies that linked the EDI issues, institutional quality, and CO_2 emissions.

The rest of the paper proceeds as follows. Section 2 depicts the data and empirical methods. Section 4 elucidates the main findings, and Section 5 sheds light on the conclusion.

2. Research Methodology

2.1 Description of the data

The data comprise a sample of twenty countries from emerging economies. The countries in the sample are Pakistan, Bangladesh, India, Sri Lanka, Nepal, Vietnam, Cambodia, Indonesia, Malaysia, Thailand, Philippines, China, Bahrain, Oman, Qatar, Saudi Arabia, UAE, Kuwait, Azerbaijan, Kazakhstan, and Kyrgyzstan. Most of the countries are excluded from the sample of emerging economies based on non-availability of data. The countries in the emerging economies are taken according to the bifurcations of the world economic outlook.

2.2 Dependent Variable

Each nation's total carbon emissions (CO_2) are our dependent variable. (CO_2) emission is measured as CO_2 emissions metrics tons per capita (Dogan et al.,2020).

2.3 Independent Variable

This study measures economic diversification in three dimensions namely product diversification, trade diversification, and government revenue diversification. The product diversification category looks at the economic diversification among commodity and non-commodity goods, sectors, and services. Trade diversification looks at the diversification of the export basket, and does not favor only domestic activity and production. Government revenue diversification entails diversification in multiple resources rather than restraining revenue sources.

2.4 Moderator Variable

Institutional quality is a moderating variable in the study. The variable is frequently used in the literature to investigate how institutional quality affects the performance of businesses that are not financial as well as those that are. The problem lies in the fact that there are several approaches to measuring institutional quality, and various authors have used different definitions and proxies to do so (Chikalipah, 2017; Vanroose and D'Espallier, 2013; Tchakoute-Tchuigoua, 2014; Afrifa et al.,2022; Chang, 2023). Two primary concerns are raised by the differences in the definitions. First of all, it promotes cherry-picking and a subjective approach, where authors utilize different definitions to estimate institutional excellence and accomplish their goals. Second, one measure looks into how one dimension affects output. Thus, the definitions cluster is appropriate to evaluate the effect of institutional quality dimensions on the nexus of economic diversification and CO_2.

This study builds on the work of Jellema & Ronald (2011), Li & Sun (2017), and Chang (2023) by addressing the shortcomings of the earlier research and creating an institutional quality index that incorporates legal, economic, and political aspects by employing principal component analysis (PCA). By determining the linear combinations, the PCA embodies all changes in the institutional quality variables (Afrifa et al., 2022). The dataset is reduced to lower dimensions while maintaining a large amount of information from the original set because of this efficient and straightforward approach. Additionally, it helps to lessen the modeling's multicollinearity issue

(Chuc et al., 2022). Creating an index has the added advantage of capturing each institutional variable in several dimensions. The following is the process for creating the index. First, the existing literature is used to determine the suitable institutional quality metric for each of the factors. Second, PCA with varimax rotation is used in the study for all institutional variable measures. The first principal component is used in the research, following the PCA, to depict each of the institution variables. The study incorporates factor loadings of 0.30 or higher, following earlier research findings.

Drawing from prior research (Chikalipah, 2017; Vanroose and D'Espallier, 2013; Tchakoute-Tchuigoua, 2014; Afrifa et al., 2022; Chang, 2023), this study builds the institutional quality index by incorporating characteristics related to legal, economic, and political establishments. The selected legal institutional quality variables are regulatory quality (RQ), rule of law (RL), property rights (PR), protection of property rights (PPR), impartial courts (IC), and judicial independence (JI). These are based on the body of existing literature (Vanroose and D'Espallier, 2013; Tchakoute-Tchuigoua, 2014; Barry & Tacneng, 2014; Chikalipah, 2017; Matemilola, 2019; Karmani & Boussaada,2021; Afrifa & Agyapong,2022; Ahmed et al.,2022; Tehulu,2021; Chang,2023). Business regulations (BR), investment freedom (IF), and business freedom (BF) are the characteristics that determine the quality of an economic entity. Government effectiveness (GE), control of corruption (CC), and political stability (PS) are the variables that measure the quality of political institutions. The sources and full description of the institutional quality variables are given in Table 2

Table 1: Description of the Variables

Name of Variable	Definition of Variable	Source
Economic Diversification Index(EDI)	EDI entails three dimensions production, trade, and government revenue	Global Economic Diversification Index Indicators
CO_2 emissions	Emissions of CO_2 metrics tons per capita	World Development Indicators
IQ	Institutional quality that entails economic, political, and legal institutional Qualities	Self Constructued (PCA)
GDP growth	GDP per capita growth rate of the country	World Development Indicators
Urbanization	Urban Population (% of total population)	World Development Indicators
Population	Population Total	World Development Indicators
Financial Development	The index evaluates the performance of the financial institutions and the market in terms of depth, efficiency, and accessibility.	IMF

2.5 Control Variables

The research selected four control variables that include GDP growth, urbanization, population, and financial development. Population is an imperative factor in emissions of carbon (York et al., 2003). Energy consumption and carbon emissions are significantly impacted by changes in the number and composition of the population (Ribeiro et al., 2019). The population variable in this study is the entire population of the nation. There is an impact on carbon emissions by changes in energy consumption patterns brought about by urbanization (Luqman et al., 2023). Urbanization raises living standards, which in turn causes a rise in energy consumption (Li, Li, & Wang, 2022). However, urbanization can also encourage the growth of service sectors with low emissions. The variable of urbanization level is measured as the ratio of the population living in urban areas to the overall population.

Table 2: Variables and their definitions

Abbreviations	Institutional Quality	Variables Definition	Source
		Legal Institutional Quality Dimensions	
RL	Rule of Law	Depicts agent's perception to have confidence and follow society's rule, more specifically the contract enforcement quality, the police, property rights, and the courts, as well as the crime and violence likelihood.	World Governance Indicators
RQ	Regulatory Quality	Reflects the government's ability to formulate and implement sound regulations and policies that stimulate and support private sector development.	World Governance Indicators
PR	Property Rights	Property rights evaluate a country's legal framework that permits individuals to hold, acquire, and utilize private property and how these rights are protected by pertinent laws that are effectively enforced by the government.	Heritage Foundation
PPR	Protection of Property Rights	Protection of property rights is the component that assesses property rights and how they are clearly explained and well protected by law.	Fraser Institute
JI	Judicial Independence	Judicial Independence measures the freedom from political members of citizens, government, or firm influences.	Fraser Institute
IC	Impartial Courts	The Country's legal framework to settle disputes of private businesses and challenge the government actions legality and inefficiency of the regulations	Fraser Institute
		Economic Institutional Quality Dimensions	
BF	Business Freedom	Business freedom measures the extent to which infrastructure environments and regulations of the country constrain the efficiency of business operations. The quantitative score is constructed from a collection of factors that affect the ease of operating, starting, and closing a business.	Heritage Foundation
IF	Investment Freedom	Investment freedom measures the restrictions on the investment capital flow. Firms and individuals can move their resources from specific activities without restrictions and impediments across the country's borders and internally as well.	Heritage Foundation
BR	Business Regulations	Business regulations are designed to cumulate the score on how bureaucratic procedures and regulations restrain entry.	Fraser Institute

		Political Institutional Quality Dimensions	
PS	Political Stability	Political Stability measures insights of the probability of political instability that includes terrorism.	World Governance Indicator
CC	Control of Corruption	Reflects the perception that for gaining private benefits public power is exercised, including both petty and grand corruption forms, as well as capture of state by private interests and elites.	World Governance Indicator
GE	Government Effectiveness	Reflects the public services quality, the civil service quality and freedom from political pressures, implementation quality and policy formulation, and the government's commitment and credibility to such policies.	World Governance Indicator

2.6 Empirical specification of the model:

The research employs the following models of regression for delineating the effect of the Economic Diversification Index(EDI), and institutional quality on CO_2.

2.6.1.Economic Diversification Index(EDI) and CO_2:

$$CO2_{it} = \alpha + \beta_1 CO2_{it-1} + \beta_2 EDI_{it} + \beta_3 GDPgrowth_{it} + \beta_4 POP_{it} + \beta_5 URB_{it} + \beta_6 FD_{it} + \\ + \varepsilon_{it} \quad (1)$$

The aforementioned model is used to test hypothesis 1, the notations i and t indicate the country and time and $CO2_{it}$ is the measure of the $CO2$ of the i_{th} country at time t. $CO2_{it-1}$show one period lag,EDI_{it} measures the economic diversification of the country. POP_{it} is the population of the country, URB_{it} is the percentage of the urban population in total population, and FD_{it} is the financial development. GDP growth is gross domestic growth. Table 1 depicts a detailed description of the variables.

2.6.2 Economic Diversification Index (EDI), Institutional Quality (IQ) and CO_2 :

$$CO2_{it} = \alpha + \beta_1 CO2_{it-1} + \beta_2 EDI_{it} + \beta_3 IQ_{it} + \beta_4 IQ_{it} * EDI_{it} + \beta_3 GDPgrowth_{it} + \beta_4 POP_{it} + \\ \beta_5 URB_{it} + \beta_6 FD_{it} + + \varepsilon_{it} \quad (2)$$

The model mentioned above is used to test hypothesis 2, the notations i and t indicate the country and time and $CO2_{it}$ is the measure of the $CO2$ of i_{th} country at time t. $CO2_{it-1}$show one period lag of the dependent variable,EDI_{it} is the independent variable that measures the economic diversification of the country, IQ_{it} is the institutional quality of i_{th} country at time t, $IQ_{it} * EDI_{it}$ is the interaction term to analyze the impact of IQ on the nexus of EDI and $CO2$, POP_{it} is the population of the country, URB_{it} is the urban population percentage in total population, and FD_{it}

is the financial development. GDP growth is gross domestic growth. Table 1 depicts a detailed variables description.

3. Empirical results and discussions

The primary findings of the research are presented in this section. Table 3 shows the descriptive statistics. Tables 4 & 5 show the outcomes of the regression analysis.

Table 3: Descriptive Statistics

Variable	Obs	Mean	Std. dev	Min	Max
CO_2	420	8.759	10.851	0.098	47.657
EDI	420	94.738	9.933	75.010	137.700
IQ	420	0.0834	0.668	-2.469	2.848
GDPGrowth	420	5.330	3.476	-6.596	8.256
Urbanization	420	3.857	0.541	2.595	4.605
Population	420	17.195	1.884	13.378	21.067
FD	420	0.325	0.057	0.234	0.418

Note: This table reports the descriptive statistics of the dependent variable (CO_2), and the explanatory variables (EDI & IQ). The basic statistics include mean, min, max, and SD values.

The EDI of the emerging economies in the sample hovers from 75.010 to 137.700. The mean value of EDI depicts that the countries in the emerging economies are well diversified economically. CO_2 emissions values hover from 0.098 to 47.657.IQ value ranges from -2.469 to 2.848 with the mean value of 0.0834 depicting that most of the countries are not having strong institutional quality. The mean value of GDP reveals that emerging economies are growing in terms of GDP.

The results for Equation 1 are shown in Table 4. By suggesting that there is no association between the instruments and the error term, the insignificant Sargan test demonstrates the correctness of the models. This indicates that the models are devoid of over-identification and properly described. Additionally, the model's estimator's consistency is demonstrated by the Arellano Bond AR (2) insignificant values, which indicate that there is no autocorrelation and the null hypothesis is not rejected. The findings show that economic diversification is stimulating CO_2 emissions.

The results depict that there is a significant positive effect on CO_2 emissions. The predicted EDI coefficients for EDI are positive and significant, indicating clearly that rising EDI may lead to higher carbon emissions. To be more precise, a one percent increase in EDI will increase emissions of carbon by 0.1060% respectively. The results endorse the findings of the previous

research of Shazad & Lv et al.(2021) According to earlier research, broadening diversification involves more than just exporting more goods and trade diversification (Hausmann et al., 2005). Usually, there is a need to favor technology which could end in fewer emissions of carbon. The study's findings demonstrate how important it is to introduce technological advancements for reducing carbon emissions.

Control variables demonstrate that the population (POP) significantly positively affects CO_2. An increase in CO_2 emissions from human activity is a direct outcome of population growth. Population growth is associated with various factors such as increased energy demand, industrial output, altered land usage, and elevated living standards. These factors all necessitate energy consumption, which in turn produces greenhouse gas emissions, mostly CO_2 (Alam et al., 2016). However, when the population grows, there is a greater need for food and water supplies, which leads to increased land usage and resource extraction. These activities may also raise carbon emissions (Fan et al., 2021). Urban population leads to an increase in carbon emissions. It has been demonstrated that urbanization increases resource and energy consumption (Wang et al., 2022).

Table 4: Main Results: Economic Diversification Index (EDI) & CO_2

		GMM Model-1	
Dependent variable	CO_2		
	Coefficient	*SE*	*t-Value*
Constant	27.436***	3.536	7.76
$CO_{2\ (t-1)}$	0.847***	0.293	2.89
EDI	0.106**	0.050	2.12
POP	1.059***	0.198	5.33
URP	1.658**	0.620	2.67
FD	0.039	1.336	0.03
GDPGrowth	0.011	0.015	0.76
	Model fitness results		
Arellano-Bond AR (2)	0.232		
Sargan test	0.617		

Note: CO_2 is carbon emission, EDI is economic diversification index, POP is population, URP is % of urban population, FD is financial development, and GDP is gross domestic product.*, **, and, ***depict significance at 10%, 5% and 1 % respectively.

The outcomes of EDI, IQ, and the CO_2 of emerging economies are displayed in Table 5. The lack of serial correlation and the instruments' validity is supported by the insignificant probability of the AR (2) and Sargan tests. The results show that IQ has a significant positive effect on the nexus of EDI and CO_2 emissions. The findings depict that good institutional quality facilitates diversifying the economies in terms of trade, product, and revenue resulting in enhanced emissions of CO2. Urban population and population exert a positive significant effect on carbon

dioxide emissions. The sprawling population leads to demand and consumption escalation that eventually enhances CO_2 emissions.

Table 5: Economic Diversification Index, Institutional Quality (IQ) & CO2

	GMM Model-2		
Dependent variable	CO_2		
	Coefficient	*SE*	*t-Value*
Constant	27.422***	3.569	7.68
$CO_{2\ (t-1)}$	0.848***	0.085	9.97
EDI	0.179**	0.076	2.34
POP	1.054***	0.202	5.21
URP	1.675***	0.628	2.67
FD	0.017	0.425	0.04
GDPGrowth	0.008	0.015	0.56
IQ	0.293***	0.111	2.65
IQ*EDI	0.617**	0.294	2.10
	Model fitness results		
Arellano-Bond AR (2)	0.239		
Sargan test	0.327		

Note: CO_2 is carbon emission, EDI is economic diversification index, POP is Population, URP is % of urban population, FD is financial development, GDP is gross domestic product, and IQ is institutional quality.*, **, and, ***depict significance at 10%, 5% and 1 % respectively.

5. Conclusion and implications

The baseline regression reveals that economic diversification has a significant and positive effect on carbon emissions. The findings depict that diversification has a positive effect on CO_2 emissions. The institutional quality exerts a positive effect on the relationship between EDI and CO_2 emissions. The institutional quality triggers the diversification of economies which eventually enhance carbon emissions. Overall empirical results indicated that economic diversification significantly raises carbon emissions in developing economies.

The research has implications that the renewable energy use is crucial in slowing the carbon emissions increase in these economies. Given these empirical findings, it is significant to highlight that, in the recent past, industrialized economies have been able to reduce their proportion of global emissions primarily through the use of renewable energy. The reason for this could be that products that require more energy during the production process are not being imported by developing

nations. To counteract the rise in carbon emissions, developing economies should strive to increase the proportion of renewable energy sources.

Developing economy policymakers should cogitate on the matter to design laws. to accelerate the installation of renewable energy facilities. Carbon emissions are decreased in addition to replacing fossil fuel energy as the proportion of renewable energy in overall energy use rises. The research put forward the future directions of identifying the effect of different technological changes in terms of renewable energy that happened during the time 2000-2020.

References

Abid, M. (2016). Impact of economic, financial, and institutional factors on CO2 emissions: Evidence from Sub-Saharan Africa economies. *Utilities Policy*, *41*, 85–94. https://doi.org/10.1016/j.jup.2016.06.009

Ahmed, F., Kousar, S., Pervaiz, A., & Shabbir, A. (2022). Do institutional quality and financial development affect sustainable economic growth? Evidence from South Asian countries. *Borsa Istanbul Review*, *22*(1), 189–196. https://doi.org/10.1016/j.bir.2021.03.005

Ahmed, F., Kousar, S., Pervaiz, A., & Ramos-Requena, J. P. (2020). Financial Development, Institutional Quality, and Environmental Degradation Nexus: New Evidence from Asymmetric ARDL Co-Integration Approach. *Sustainability 2020, Vol. 12, Page 7812*, *12*(18), 7812. https://doi.org/10.3390/SU12187812

Ahmad, M., Jabeen, G., & Wu, Y. (2021). Heterogeneity of pollution haven/halo hypothesis and environmental Kuznets curve hypothesis across development levels of Chinese provinces. Journal of Cleaner Production, 285, 124898.

Alam, M. M., Murad, M. W., Noman, A. H. M., & Ozturk, I. (2016). Relationships among carbon emissions, economic growth, energy consumption and population growth: Testing environmental Kuznets curve hypothesisfor Brazil, China, India and Indonesia. *Ecological Indicators*, 70,466–479.

Ali, H. S., Zeqiraj, V., Lin, W. L., Law, S. H., Yusop, Z., Bare, U. A. A., & Chin, L. (2019). Does quality institutions promote environmental quality? *Environmental Science and Pollution Research*, *26*(11), 10446–10456. https://doi.org/10.1007/s11356-019-04670-9

Afrifa, G. A., Gyapong, E., & Zalata, A. M. (2019). Buffer capital, loan portfolio quality and the performance of microfinance institutions: A global analysis. *Journal of Financial Stability*, *44*. https://doi.org/10.1016/J.JFS.2019.100691

Barry, T. A., & Tacneng, R. (2014). The impact of governance and institutional quality on MFI outreach and financial performance in Sub-Saharan Africa. *World Development*, *58*, 1–20. https://doi.org/10.1016/j.worlddev.2013.12.006

Caglar, A. E., Zafar, M. W., Bekun, F. V., & Mert, M. (2022). Determinants of CO2 emissions in the BRICS economies: The role of partnerships investment in energy and economic complexity. *Sustainable Energy Technologies and Assessments*, *51*(December 2021), 101907. https://doi.org/10.1016/j.seta.2021.10190.

Chang, C. C. (2023). The impact of quality of institutions on firm performance: A global analysis. *International Review of Economics and Finance*, *83*(October 2022), 694–716. https://doi.org/10.1016/j.iref.2022.10.002

Chikalipah, S. (2017). Institutional Environment and Microfinance Performance in Sub-Saharan

Africa. *African Development Review*, *29*(1), 16–27. https://doi.org/10.1111/1467-8268.12235.

Chikalipah, S. (2020). The pyrrhic victory of FinTech and its implications for achieving the Sustainable Development Goals: evidence from fieldwork in rural Zambia. *World Journal of Science, Technology and Sustainable Development*, *17*(4), 329–340. https://doi.org/10.1108/WJSTSD-06-2020-0058.

Doğan, B., Driha, O. M., Balsalobre Lorente, D., & Shahzad, U. (2021). The mitigating effects of economic complexity and renewable energy on carbon emissions in developed countries. *Sustainable Development*, *29*(1), 1–12. https://doi.org/10.1002/sd.2125

Duan, Y., & Jiang, X. (2021). Pollution haven or pollution halo? A Reevaluation on the role of multinational enterprises in global CO2 emissions.Energy Economics, 97, 105181.

Fan, J., Zhou, L., Zhang, Y., Shao, S., & Ma, M. (2021). How does population aging affect household carbon emissions? Evidence from Chinese urban and rural areas. *Energy Economics,* 100, 105356.

Hausmann, R., Hwang, J., & Rodrik, D. (2005). What you export matters?*Journal of Economic Growth*, 12, 1–25.

Ibrahim, M. H., & Law, S. H. (2016). Institutional quality and CO2 emission–trade relations: Evidence from Sub-Saharan Africa. *South African Journal of Economics*, *84*(2), 323–340. https://doi.org/10.1111/saje.12095

Karmani, M., & Boussaada, R. (2021). Corporate social responsibility and firm performance: does institutional quality matter? *Journal of Applied Accounting Research*, *22*(4), 641–662. https://doi.org/10.1108/JAAR-07-2020-0153

Li, R., Li, L., & Wang, Q. (2022). The impact of energy efficiency on carbon emissions: Evidence from the transportation sector in Chinese 30 provinces.*Sustainable Cities and Society*, 82, 103880. https://doi.org/10.1016/j.scs.2022.103880

Luqman, M., Rayner, P. J., & Gurney, K. R. (2023). On the impact of urbanization on CO_2 emissions. *Urban Sustainability*, 3(1), 6. https://doi.org/10.1038/s42949-023-00084-2

Mania, E. (2020). Export Diversification and CO2 Emissions: An Augmented Environmental Kuznets Curve. *Journal of International Development*, *32*(2), 168–185. https://doi.org/10.1002/jid.3441

Ribeiro, H. V., Rybski, D., & Kropp, J. P. (2019). Effects of changing population or density on urban carbon dioxide emissions. Nature Communications, 10(1), 3204. https://doi.org/10.1038/s41467-019-11184-y

Shahzad, U., Ferraz, D., Doğan, B., & Aparecida do Nascimento Rebelatto, D. (2020). Export product diversification and CO2 emissions: Contextual evidences from developing and developed economies. *Journal of Cleaner Production*, *276*. https://doi.org/10.1016/j.jclepro.2020.124146

Solarin, S. A., Al-Mulali, U., Musah, I., & Ozturk, I. (2017). Investigating the pollution haven hypothesis in Ghana: An empirical investigation. Energy, 124, 706–719.

Tehulu, T. A., & Tehulu, T. A. (2021). Development in Practice Do location and legal status matter in microfinance institutions ' performance ? Evidence from sub-Saharan Africa Do location and legal status matter in micro finance institutions '. *Development in Practice*, *31*(3), 404–420https://doi.org/10.1080/09614524.2020.1853060

Vanroose, A., & D'Espallier, B. (2013). Do microfinance institutions accomplish their mission? Evidence from the relationship between traditional financial sector development and microfinance institutions' outreach and performance. *Applied Economics*, *45*(15), 1965–1982.

https://doi.org/10.1080/00036846.2011.641932

Wang, Q., Wang, X., & Li, R. (2022). Does urbanization redefine the environmental Kuznets curve? An empirical analysis of 134 countries. *Sustainable Cities and Society*, 76, 103382. https://doi.org/10.1016/j.scs.2021.103382.

York, R., Rosa, E. A., & Dietz, T. (2003). STIRPAT, IPAT and ImPACT: Analytic tools for unpacking the driving forces of environmental impacts.*Ecological Economics*, 46, 351–365.

Yang, B., Ali, M., Hashmi, S. H., & Jahanger, A. (2022). Do Income Inequality and Institutional Quality affect CO2 Emissions in Developing Economies? *Environmental Science and Pollution Research*, *29*(28), 42720–42741. https://doi.org/10.1007/s11356-021-18278-5

Yuan, B., Li, C., Yin, H., & Zeng, M. (2022). Green innovation and China's CO2 emissions–the moderating effect of institutional quality. *Journal of Environmental Planning and Management*, *65*(5), 877–906. https://doi.org/10.1080/09640568.2021.1915260