


THE RELATIONSHIP BETWEEN FINANCIAL DEVELOPMENT AND CARBON EMISSIONS: A SYSTEMATIC REVIEW

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ARTICLE INFO	ABSTRACT
<p>Article history:</p> <p>Received 14 April 2023</p> <p>Accepted 13 July 2023</p>	<p>Purpose: This paper aims to review and analyze the prior research on the relationship between financial development and carbon emissions. As the financial sector develops and the economies grow, carbon emissions are expected to increase. Therefore, it is necessary to identify and understand the factors that contribute to this relationship.</p>
<p>Keywords:</p> <p>Financial Development; Carbon Emissions; Environmental Kuznets Curve; Developed Countries; Developing Countries; Environmental Performance.</p>	<p>Theoretical framework: Recent studies indicate that financial development facilitates and expands businesses, which may cause an increase in carbon emissions; on the other hand, sustainable development of the financial sector may lead to lower carbon emissions through eco-friendly investments.</p>
	<p>Design/Methodology/Approach: This study will employ a systematic literature review to investigate the relationship between financial development and carbon emissions and analyze how developing and developed countries differ concerning these two factors.</p> <p>Findings: The result showed that empirical studies have produced various, frequently contradicting findings and conclusions. Some studies show a strong positive correlation between financial development, environmental performance indices, and economic growth, while others find a more nuanced correlation.</p> <p>Research, practical & social implications: This study might stimulate additional investigation into green financial development and emission reductions through green investments. Findings could aid in adjusting policies to account for disparities between developed and developing countries' financial-emission relationships. Green financial instruments might encourage eco-investments and reduce emissions. The social advantages include helping to reduce gaps by providing resources and expertise to poorer nations, promoting sustainability, and contributing to climate solutions.</p> <p>Originality/Value: This research thoroughly assesses and analyzes prior research on the relationship between financial development and carbon emissions. Particularly in the context of developed and emerging countries, the study helps to investigate and comprehend the elements contributing to this relationship.</p> <p>Doi: https://doi.org/10.26668/businessreview/2023.v8i7.2718</p>

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A RELAÇÃO ENTRE DESENVOLVIMENTO FINANCEIRO E EMISSÕES DE CARBONO: UMA REVISÃO SISTEMÁTICA

RESUMO

Objetivo: O presente artigo tem como objetivo rever e analisar a pesquisa anterior sobre a relação entre desenvolvimento financeiro e emissões de carbono. À medida que o setor financeiro se desenvolve e as economias crescem, as emissões de carbono deverão aumentar. Portanto, é necessário identificar e entender os fatores que contribuem para essa relação.

Quadro teórico: Estudos recentes indicam que o desenvolvimento financeiro facilita e expande as empresas, o que pode causar um aumento das emissões de carbono; por outro lado, o desenvolvimento sustentável do setor financeiro pode levar a uma redução das emissões de carbono através de investimentos ecológicos.

Design/Methodologia/Abordagem: Este estudo empregará uma revisão sistemática da literatura para investigar a relação entre desenvolvimento financeiro e emissões de carbono e analisar como os países em desenvolvimento e desenvolvidos diferem em relação a esses dois fatores.

Conclusões: O resultado mostrou que estudos empíricos produziram vários achados e conclusões frequentemente contraditórios. Alguns estudos mostram uma forte correlação positiva entre desenvolvimento financeiro, índices de desempenho ambiental e crescimento econômico, enquanto outros encontram uma correlação mais matizada.

Investigação, implicações práticas e sociais: Este estudo pode estimular uma investigação adicional sobre o desenvolvimento financeiro verde e a redução de emissões através de investimentos verdes. As descobertas poderiam ajudar na adaptação das políticas para ter em conta as disparidades entre as relações financeiras-emissões dos países desenvolvidos e dos países em desenvolvimento. Os instrumentos financeiros ecológicos podem incentivar os investimentos ecológicos e reduzir as emissões. As vantagens sociais incluem ajudar a reduzir as lacunas, fornecendo recursos e experiência para as nações mais pobres, promovendo a sustentabilidade e contribuindo para as soluções climáticas.

Originalidade/Valor: Esta pesquisa avalia e analisa minuciosamente a pesquisa anterior sobre a relação entre o desenvolvimento financeiro e as emissões de carbono. Particularmente no contexto de países desenvolvidos e emergentes, o estudo ajuda a investigar e compreender os elementos que contribuem para essa relação.

Palavras-chave: Desenvolvimento Financeiro, Emissões de Carbono, Curva de Kuznets Ambientais, Países Desenvolvidos, Países em Desenvolvimento, Desempenho Ambiental.

LA RELACIÓN ENTRE EL DESARROLLO FINANCIERO Y LAS EMISIONES DE CARBONO: UN EXAMEN SISTEMÁTICO

RESUMEN

Objetivo: Este artículo tiene como objetivo revisar y analizar la investigación previa sobre la relación entre el desarrollo financiero y las emisiones de carbono. A medida que el sector financiero se desarrolle y las economías crezcan, las emisiones de carbono aumentarán. Por lo tanto, es necesario identificar y comprender los factores que contribuyen a esta relación.

Marco teórico: Estudios recientes indican que el desarrollo financiero facilita y amplía las empresas, lo que puede causar un aumento de las emisiones de carbono; por otra parte, el desarrollo sostenible del sector financiero puede conducir a una reducción de las emisiones de carbono mediante inversiones ecológicas.

Diseño/Methodología/Enfoque: Este estudio empleará un examen sistemático de la literatura para investigar la relación entre el desarrollo financiero y las emisiones de carbono y analizar cómo difieren los países en desarrollo y los países desarrollados de estos dos factores.

Conclusiones: El resultado mostró que los estudios empíricos producían varias conclusiones y conclusiones a menudo contradictorias. Algunos estudios muestran una fuerte correlación positiva entre el desarrollo financiero, los índices de comportamiento ambiental y el crecimiento económico, mientras que otros encuentran una correlación más matizada.

Investigación, implicaciones prácticas y sociales: Este estudio puede estimular nuevas investigaciones sobre el desarrollo financiero ecológico y la reducción de las emisiones a través de inversiones ecológicas. Los descubrimientos podrían ayudar a adaptar las políticas para tener en cuenta las disparidades entre las relaciones financieras y de emisiones entre los países desarrollados y los países en desarrollo. Los instrumentos financieros ecológicos pueden alentar la inversión ecológica y reducir las emisiones. Las ventajas sociales incluyen ayudar a reducir las brechas proporcionando recursos y experiencia a las naciones más pobres, promoviendo la sostenibilidad y contribuyendo a las soluciones climáticas.

Originalidad/Valor: Esta investigación evalúa y analiza cuidadosamente las investigaciones previas sobre la relación entre el desarrollo financiero y las emisiones de carbono. En particular en el contexto de los países

desarrollados y emergentes, el estudio ayuda a investigar y comprender los elementos que contribuyen a esta relación.

Palabras clave: Desarrollo Financiero, Emisiones de Carbono, Curva Ambiental de Kuznet, Países Desarrollados, Países en Desarrollo, Desempeño Ambiental.

INTRODUCTION

Environmental issues are now widely recognized as a severe threat to human health. One of the most controversial and intensely contested topics is carbon emissions, which are regarded to be a substantial factor in human-caused global warming (Ahmad & Khattak, 2020; Fallahi, 2020). Experts and decision-makers are focusing on minimizing carbon emissions due to worldwide environmental protection legislation that can obstruct economic progress (Zafar, 2019). As a result, how the environment is treated is greatly influenced by financial development (Sanderson, 2019). Sustainable development—the development of action plans and strategies—has been given priority globally since the United Nations Conference on Environment and Development in 1992, and it is widely acknowledged that environmental protection and economic development must be coordinated and constantly evolving. Despite global attention, carbon emissions continue to rise, reaching a record-breaking high of 33 billion tonnes in 2021 (International Energy Agency, 2021).

The term “environmental performance” has become widely used due to the increased attention devoted to sustainable development. The severity of environmental problems varies among developed and developing economies, and both are looking for ways to finance their development objectives by growing the financial sector (Thin et al., 2022). The complexity of environmental factors, including water, air, soil, and biodiversity, which must be incorporated into a complete framework, makes it difficult to measure the effect of financial development and economic growth on environmental performance. Additionally, any composite index of a country's environmental performance should capture the national efforts made to protect the natural environment to be relevant for environmental analysts and policymakers.

This study will cover only some of the 22 environmental indicators that comprise the Environmental Performance Index (EPI) created by Yale University and Columbia University (Neagu et al. 2017). Instead, the focus will be on examining the relationship between environmental performance and financial development by examining certain variables that serve as indicators of the environment. This review will include studies investigating this relationship in both developed and developing countries, emphasizing measurable outcomes linked to environmental policy goals.

LITERATURE REVIEW

A Review on the Relationship between Financial Development and Carbon Emissions

Economists have differing views on the effect of financial development on carbon emissions. While some economists believe that financial development will result in more carbon emissions, others contend it may have the opposite effect. According to a third set of experts, there is no connection between financial development and carbon emissions (Wen, 2022). Prior studies on the relationship between financial growth and carbon emissions have produced mixed results. Financial growth, for instance, can reduce emissions by giving local companies financial support for eco-friendly technologies (Yuxiang & Chen, 2019). Financial resources for green production technology are also made available to local enterprises by the financial sector (Frankel & Rose, 2002). According to the literature on financial sector efficiency, a bank's primary duties include managing resources, serving as an intermediary between surplus and deficit agents (savers and investors), and managing labour and capital (Gomes et al., 2017). As a result, the financial sector is crucial to the sustainable growth of every nation (Batten & Vo, 2019).

On the other hand, financial development can harm the environment by promoting industrialization, which increases carbon emissions and soil degradation. (Zhang, 2011). Crude oil is the primary energy source worldwide and is the backbone and engine of industrialized nations, driving economic growth, and macroeconomic changes in both exporting and importing nations are mainly due to changes in oil prices (Mehmood et al., 2021). However, crude oil is the main contributor to carbon emissions. According to the Energy Commission, industrial energy consumption accounts for about half of the world's total energy usage (IEA, 2023). In both rich and developing countries, financial development and carbon emissions increased between 1999 and 2013, according to the study (Shoaib, 2020). Additionally, there is a direct relationship between financial development and carbon emissions.

The Kuznets curve suggests that as nations industrialize, environmental degradation initially increases but eventually slows down (COLE et al., 1997). This curve indicates the relationship between economic and environmental development (Karsch, 2019). The relationship between financial development and carbon emissions is complicated, with research shifting towards examining how financial development impacts environmental performance since Grossman and Krueger's 1991 study. (Tamazian et al., 2009) found evidence of an adverse association between financial development and carbon dioxide emissions. However, if new technologies are successful, the economy can grow balanced while improving environmental

quality, as demonstrated by a turning point in this curve (Rubio et al., 2009). In 11 European economies in the post-transition era, a study (Bayar et al., 2020) examined the relationship and discovered a negative correlation between financial development and environmental degradation. Hence, the debate over the relationship between financial growth and environmental sustainability is still ongoing and needs more study.

Environmental Performance, Economic Growth, and Financial Development in Developed Countries

According to the literature, financial development in developed countries stimulated economic growth, support the switch to renewable energy sources, lowered carbon emissions, and enhance environmental conditions. Countries' Strategies for sustainable finance can assist in achieving the SDGs by promoting financial inclusion, conflict resolution, and financial stability (Ziolo et al., 2021).

The development of the financial sector might reduce poverty and fosters financial stability through funding firms, fostering innovation, and creating jobs. Policymakers can support innovative financial products, enhance regulation, and encourage public-private collaborations to advance sustainable finance policies (Ahmed et al., 2015). The financial sector can contribute to sustainable development and improve the environment by doing so.

(Khan et al., 2021) investigated the relationship between Economic growth, renewable energy consumption, non-renewable energy consumption, labor, and capital in thirty-eight International Energy Agency (IEA) countries. From 1995 to 2015, using advanced econometric techniques, including cross-section dependence (CD) and second-generation unit root tests. The study found that the energy transition hurts host nation growth. In contrast, it has a favorable effect on sustainability, energy consumption, labor, and capital. Long-term and short-term growth are both impacted by economic sustainability, but only long-term growth is impacted by energy transitions. The IEA should encourage R&D, remove subsidies for non-renewable energy sources, handle carbon costs, and create green polices.

(Salari et al., 2021) employ various static (OLS) and dynamic estimation models (GMM) to examine the relationship between CO₂ emissions, energy consumption, and economic growth in the USA from 1997 to 2016. According to this study, different sources of energy use have varying effects on CO₂ emissions, with renewables reducing emissions while non-renewables raise them. The initial rise and subsequent decline in GDP and pollution across US states provide evidence for the Environmental Kuznets Curve. These results are robust and

applicable across states and models, providing valuable insights for policymakers aiming to reduce state-level emissions.

Using the local linear dummy variable estimate (LLDVE), (Ivanovski et al., 2021) examined the connections between economic growth, non-renewable energy usage, and their effects on one another in OECD nations from 1990 to 2015. The study found that the consumption of renewable and non-renewable energy and economic growth in OECD countries had a non-linear and unstable connection, with non-renewable energy contributing more to growth than renewable energy. Both energy sources, however, support economic growth in non-OECD nations, raising the possibility that emerging economies may switch to renewables.

Overall, the literature on developed countries provides insights into various variables that relate between financial development and emissions. Furthermore, Financial development in developed countries can stimulate economic growth, support the transition to renewable energy sources, lower carbon emissions, and improve environmental conditions. These objectives can be achieved through sustainable finance policies that promote financial inclusion, conflict resolution, and financial stability. However, these goals may differ from those of developing countries, which prioritize economic growth over reducing carbon emissions. Major industrialized countries, previously responsible for global environmental pollution, are now seeking solutions to shift towards clean energy and reduce carbon emissions.

Environmental Performance, Economic Growth, and Financial Development in Developing Countries

The relationship between financial development and carbon emissions in developing countries appears to have different frameworks and determinants than that of developed countries. The nature and structure of the developing economy also vary, which leads to a difference in the degree of efficiency of the financial sector and the degree of its development. Many studies have dealt with the relationship between financial development and carbon emissions in developing economies. Tabel (1) refers to studies examining the relationship between economic growth, renewable and non-renewable energy consumption, and environmental performance in developing countries.

Table (1): a literature review of the relationship between financial development and the environment in developing countries

Study	Country	Time	Variables	Tool	Finding
Gyimah et al. (2022)	Developing countries	From 1990 to 2015	renewable energy, GDP, foreign direct investment, gross capital formation, and trade	Granger causality and mediation models	Renewable energy boosts economic growth. Thus, renewable energy usage boosts economic growth. Their study found that renewable energy should be prioritized for economic prosperity.
Steve et al. (2022)	East, Central, and West sub-Saharan Africa	From 1990 to 2018	Renewable energy consumption on economic growth	The CCEMG and Dumitrescu-Hurlin Granger causality test	Contrary to predictions, the CCEMG found that renewable energy slowed economic growth in East, West, and Central Africa. The growth hypothesis for East and West Africa and the feedback hypothesis for Central Africa, respectively, were supported by the Granger causality test. Overall, the study recommends that authorities prioritize raising the use of renewable energy in Sub-Saharan Africa to promote economic growth.
Rehman et al. (2022)	Pakistan	From 1975 to 2019	Economic growth, fossil fuel energy output, nuclear electricity production, and renewable energy	The linear autoregressive distributed lag technique	In long-term the fossil fuel and renewable energy, CO2 emissions, and GDP per capita positively affect economic development, while electricity, nuclear power, and energy use harm it. In the short term, these factors impact economic growth similarly, but electricity consumption, nuclear electricity, and energy use negatively impact growth.
Hosan et al. (2022)	Developing countries	From 1995 to 2018	The demographic dividend, digital innovation, energy intensity, and sustainable economic growth	Advanced econometric approaches and panel estimations	In contrast to urbanization, capital formation, and industrialization, the study showed a positive association between sustainable economic growth, energy intensity, and economic sustainability. According to the study, the energy sector will perform better economically in the digital economy if it uses the demographic dividend and digital innovation.
Saadaoui and Chtourou (2022)	Tunisia	From 1984 to 2017	Institutional quality, financial development, economic growth, and renewable energy	ARDL model	According to the study, financial development negatively affects the use of renewable energy, demonstrating the necessity for sustainable financial systems. However, it was discovered that institutional quality and economic growth favourably impact the use of renewable energy. The nonlinear Granger causality test revealed that renewable energy benefits the economy and institutions.

Bibi and Li (2022)	Pakistan		Financial development, renewable energy, economic growth, capital, and labor	Using a nonlinear autoregressive distributed lag model,	This study found that renewable energy consumption has a positive and significant effect on economic growth in both the short and long periods, while financial development has a significant, asymmetric, and positive effect in the short run but a negative effect in the long run
Kirikkaleli et al. (2022)	Chile		Financial development and renewable energy use affect consumption-based CO2 emissions	(ARDL) bounds, modified ordinary least square (FMOLS), dynamic ordinary least square (DOLS), and gradual shift causality tests	The data show that Chile's consumer-based carbon emissions are reducing due to financial growth and renewable energy use, while rising due to economic expansion and electricity use. The gradual shift causality test matches ARDL, FMOLS, and DOLS estimators.
Cao et al. (2022)	South Asian nations	From 1980 to 2018	Energy use, financial development, and environmentally friendly economic growth	An autoregressive distributive lag (ARDL) model and WDI panel data	This research shows that financial development drives economic growth in several south Asian economies. Energy consumption boosts sustainable environmental and economic growth,
Zahoor et al. (2022)	China	From 1970 to 2016	Renewable energy investment, financial development, and environmental sustainability	Structural break unit root tests, completely modified least square, dynamic least square, and robust least square multiple regressions	The study shows that investments in renewable energy can decrease China's CO2 emissions and ecological footprint while boosting the economy. However, economic growth, urbanization, and financial expansion increase CO2 emissions and ecological impact.
Majeed et al., 2020	Pakistan		Financial development and carbon emissions	Nonlinear autoregressive distributed lag (NARDL) model	Shows that there is a long-term association between financial development and carbon emissions
Abbasi et al. (2021)	Pakistan	From 1972 to 2018	Energy consumption, industrial growth, urbanization, and carbon emissions	ARDL models	According to the study, whereas carbon emissions and urbanization have immediate benefits for economic growth, energy consumption and industrial expansion provide both immediate and long-term benefits
Saidi and Mbarek (2017)	Emerging economies	From 1990 to 2013.	Financial development, income, trade openness, urbanization, and carbon dioxide emissions	Time series analysis	Financial development in emerging economies slows down environmental degradation. This indicates that by implementing financial reforms, financial development can be used as a tool to maintain the clean environment that has been deteriorated
Ye Y et al., (2021)	Malaysia	From 1987 to 2020	Financial development and environmental sustainability	the Auto Regressive Distributed Lag (ARDL)	financial development is environmentally favorable. Financial development contributed to environmental sustainability
Ren et al. (2022)	26 Chinese provinces	from 1995 to 2017	Energy consumption and economic growth	Using the local linear dummy variable estimation (LLDVE) method	The inverted U-shaped association between energy consumption and economic growth over time seen in the study suggests that, up to a degree, energy consumption

					stimulates economic expansion. According to the findings, energy efficiency should be prioritized in high-carbon development zones, whereas low-carbon
Musah et al., (2022)		1990 to 2016	financial development and environmental sustainability	Panel data	There is a direct causal correlation between population growth, financial development, and carbon emissions.
Bist (2018)	16 low-income countries	From 1995 to 2014	financial development and economic growth	Using panel unit root and panel cointegration analysis	According to the research, most countries' economic growth is positively impacted by their financial development. This emphasizes the significance of regulations that support the expansion of the financial sector and the private sector.
Charfeddine and Kahia (2019)	In 24 MENA countries	From 1980 and 2015	Financial markets and renewable energy on CO2 emissions and economic growth	A panel vector autoregressive (PVAR)	According to the study, the consumption of renewable energy and the expansion of the financial sector had little impact on CO2 emissions and economic development.
Kizito et al., (2020)	58 economies			Common correlated effect (CCE) and the dynamic panel generalized method of moments (GMM) estimators	Found that financial prosperity lowers countries' rates of pollution, financial development has a long-run negative impact on carbon emissions, implying that financial development minimizes environmental degradation.
Hooda, S. K., & Yadav, S. (2023).			ESG ratings and green finance	The systematic literature review (SLR)	The study recommends transitioning to a low-carbon industry, with sustainable finance playing a critical role in making this transition possible
Bang, N, et all (2023)	Vietnam	From January to February 2023.		It used qualitative and quantitative methods. Quantitative research was carried out from January to February 2023. The authors used structural equation model analysis to test the fit of models with SPSS 20.0 and Amos.	Their findings suggest that banking technology has a significant impact on both green banking and the green economy. The study also identified additional factors, such as financial capacity, supporting policies, legal frameworks, and state regulations, that are crucial for the development of green banking in Vietnam.

Source: Authors Contributions

In summary, the literature review applying on developing countries highlights the complex relationship between financial development and the environment in these nations. There are varying findings across studies, with some indicating that renewable energy usage boosts economic growth, while others find that it slows it down. Financial development is found to have both positive and negative effects on economic growth and environmental sustainability. The research suggests that energy consumption and industrial expansion provide both immediate and long-term benefits to economic growth, but also lead to increased carbon emissions and environmental degradation. Overall, the literature points to the need for sustainable financial systems and policies that balance economic growth with environmental sustainability in developing countries.

CONCLUSION

The dynamics of the relationship between the financial system and the real economy, as well as how the financial system benefits the actual economy, are still up for question (Sawyer, 2022). This is because there are numerous elements, such as technology, growth in capital flows, economic and financial integration, crises, etc., that contribute to financial globalization (Lane & Milesi-Ferretti, 2008). On the other hand, there is a significant dependency between the financial sector and crises (Rupeika-Apoga, 2010). The study (Subbarao, 2020) on the significance of developing and reforming the financial industry also supported this. Where, the financial sector disruptions during the 2008 global financial crisis contributed to the Great Financial Crisis that occurred in 2007. Liberalized financial markets in emerging nations also fell short of giving the vast majority of people and businesses access to financial services (Culpeper, 2012). The key findings of the study are outlined as follows:

- This study's main objective is to investigate the connection between economic growth and carbon emissions. For both financial and economic progress, this is a crucial goal.
- To comprehend the effects of financial development and carbon emissions, the study analyses theoretical and applied literature.
- This review illustrates that the economic activity and carbon emissions are both directly impacted by financial development.
- Understanding the complex relationship between financial development and carbon emissions might help provide economic and environmental strategies that are more successful.

- It is crucial to consider any potential detrimental effects of financial growth strategies on other sectors. Other parts of the economy may suffer as a result of financial development and its harmful influences on the environment.
- More research needs to improve understanding of the complex relationship between financial development and carbon emissions. More quantitative studies are needed, especially in developing countries like Jordan, which are strongly affected by environmental damage and climate change.
- Research findings cannot be generalized across countries; the relationship between financial development and carbon emissions differs between developed and developing countries.

In conclusion, our study shows that economic activity is a key relationship connecting financial development and carbon emissions. However, the nature of this relationship varies greatly across developed and developing countries and is dependent on a country's level of development.

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