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How Does Global Environmental Condition Evolve under Green Finance, Oil Price Shocks, and Geopolitical Risk?

Author: Dr. Mustafa Tevfik Kartal

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About the author:

- Dr. Mustafa Tevfik Kartal is an Associate Professor of Finance and Banking at the European University of Lefke in Northern Cyprus/Türkiye and a Research Fellow of GUST Center for Sustainable Development at Gulf University for Science and Technology. His research primarily explores finance, economics, energy, and environmental issues.
- Dr. Kartal earned his Ph.D. in Banking from Marmara University, İstanbul, Türkiye.

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Highlights:

- *Recent energy crises have been significantly influenced by geopolitical risk stemming from international conflicts.*
- *Global green bond issuances reached $619.9 billion in 2023, reflecting substantial growth in green finance (Statista, 2024).*
- *The interconnected effects of energy prices, geopolitical risk, and green bonds on environmental sustainability have been extensively analyzed.*
- *The effect of these factors on CO2 emissions is dynamic, varying across time frames and frequencies.*
- *Policy Implications: Policymakers need to adopt comprehensive monitoring mechanisms to assess the influence of these key factors on environmental outcomes. This involves analyzing emissions at both aggregated and disaggregated levels while accounting for country-specific differences. Such efforts are crucial to mitigate the adverse effects of energy price shocks and geopolitical risk while maximizing the benefits of green bonds.*

How Does Global Environmental Condition Evolve under Green Finance, Oil Price Shocks, and Geopolitical Risk?

Over the past several decades, the urgency to address environmental challenges has intensified, driven by increasing awareness of climate change and its adverse effects. Policymakers, researchers, and societies worldwide are striving to better understand the factors contributing to environmental degradation. The accelerating rise in global carbon dioxide (CO2) emissions, largely attributed to human activities, has brought the issue to the forefront of international discourse (Energy Institute, 2024). In response, the academic and policy spheres have focused on identifying both the root causes of environmental degradation and viable solutions to reverse these trends.

Recent studies have explored a diverse array of factors influencing CO2 emissions. Among the most significant are green finance initiatives (Fu et al., 2023), fluctuations in oil prices (Kartal et al., 2024), and geopolitical risk (Lee et al., 2021). These elements are pivotal in shaping global energy consumption patterns and environmental policies. Green bonds, as a prominent tool in green finance, have been instrumental in funding environmentally sustainable projects. Meanwhile, crude oil prices and geopolitical tensions remain critical in determining energy security and consumption trends.

Understanding Green Bonds, Oil Prices, and Geopolitical Risk

Green Bonds: A Tool for Decarbonization

Green bonds represent a transformative financial instrument aimed at supporting large-scale eco-friendly projects. By channeling resources into clean energy, sustainable infrastructure, and energy efficiency initiatives, green bonds may have a significant role in declining CO2 emissions. Their issuance has surged in recent years, highlighting a growing commitment from governments and private entities to combat climate change. But, their effects are often influenced by broader economic and geopolitical contexts. For example, while the issuances of green bonds aim to support clean energy utilization further, however, economic concerns related to ensuring energy security under the recent energy crisis may require reliance on fossil fuel sources for a while to mitigate geopolitical risk on energy supply risk as in the case in Germany.

Crude Oil Prices: A Persistent Driver of Emissions

Despite advancements in clean energy technologies, crude oil continues to dominate the global energy mix. Fluctuations in oil prices significantly affect energy production and consumption patterns. For instance, low oil prices often lead to increased fossil fuel consumption, whereas high oil prices may incentivize investments in clean energy. However, the relationship between oil prices and CO2 emissions is complex and subject to various economic and geopolitical factors. For instance, in a politically unstable environment, where geopolitical risk is higher, the use of oil as an energy source can be increased by focusing on energy supply and security perspectives without caring about the price level. Hence, the relationship between oil prices and CO2 emissions may have a varying structure under the moderating effect of various factors with a contingent approach.

Geopolitical Risk: Shaping Energy and Environmental Policies

Geopolitical risk including conflicts and political instability have far-reaching implications for energy markets and environmental sustainability. This risk often disrupts energy supply chains, prompting shifts in energy consumption patterns. Heightened geopolitical tensions (e.g., Syria war, Disputes in the East China Sea, Russia-Ukraine war) may lead to increased reliance on domestic fossil fuels, thereby exacerbating CO2 emissions. Conversely, geopolitically stable times without geopolitical tensions, conflicts, and wars can facilitate international cooperation on climate initiatives.

Empirical Insights on CO2 Emissions

Recent empirical studies (e.g., Kartal et al., 2024) have investigated the interplay between green bonds, oil prices, and geopolitical risk in influencing CO2 emissions. These studies reveal several critical insights:

Dynamic and Nonlinear Relationships:
The effects of these factors (i.e., green bonds, oil price, & geopolitical risk) on CO2 emissions are not uniform over time. Instead, it exhibits dynamic and nonlinear characteristics, varying across short, medium, and long-term horizons. For instance, while green bonds may lead to immediate reductions in emissions through the utilization of targeted clean energy investments, their long-term effectiveness depends on the sustained support of policymakers. Especially, ensuring a harmonization between energy, environment, and economy-related policies is highly critical to making the changes in green bonds, oil prices, and geopolitical risk beneficial for countries and the globe. Through providing continuous and long-term support as well as considering the varying dynamic and nonlinear effects, policymakers can benefit from the factors considered in environmental planning. In this way, policymakers can achieve some Sustainable Development Goals (SDGs), such as climate action (SDG 13) by ensuring clean energy (SDG 7).

Sectoral and Geographic Variations:
The effects of green bonds, oil prices, and geopolitical risk differ across economic sectors and geographic regions. For example, the industrial and transportation sectors may respond differently to fluctuations in oil prices or changes in geopolitical stability. Similarly, the effectiveness of green finance initiatives varies between developed and developing countries. Therefore, policymakers across the world and countries should consider this determination (i.e., differentiating effects across the economic sectors) in reshaping climate-related action plans to include sector-specified measures. In this way, policymakers can ensure the achievement of SDGs 7 and 13 in benefiting from well restructured actions plans related to environmental and energy policies.

Interconnected Effects:
The combined influence of these factors often amplifies or offsets their individual effects. For instance, rising geopolitical risk may undermine the environmental benefits of green bonds by increasing reliance on fossil fuels. Another example may be that declining oil prices could enhance the effect of green finance by reducing the cost of clean energy technologies. That is why because alternative cost/return of clean energy investments with regard to fossil fuel ones may be decreasing in this case, and there will not be a competition for green bond issuers to obtain a much higher level of return. Accordingly, it is critically important for policymakers to consider not only the effects of the selected factors but also it is required to consider the moderating effect of other factors as well as the combined effect of the factors in a single economic territory. Hence, it is possible to make some negatively effective factors on the environmental quality progress put into a positive way to

preserve the environment. This can be also beneficial in the achievement of SDGs 7 and 13.

Policy Recommendations

Given the complexities outlined above, a multifaceted policy approach is essential to address the challenges of environmental degradation. The following policy recommendations are proposed:

Integrated Policy Frameworks
Policymakers must adopt an integrated approach to evaluate the combined effects of green bonds, oil prices, and geopolitical risk. This involves considering their interactions and potential trade-offs. For example, policies promoting green finance should account for the disruptive effects of geopolitical instability on investment flows.

Dynamic Monitoring Mechanisms
The dynamic nature of these factors necessitates continuous monitoring to track their effect on CO2 emissions. Policymakers should develop mechanisms to assess changes in emissions across different time horizons. This will enable timely interventions to address emerging trends and prevent delays in mitigating adverse outcomes.

Comprehensive Emissions Analysis
It is crucial to analyze emissions data at both aggregated and disaggregated levels. Sector-specific monitoring can identify shifts in emissions patterns that may be obscured in aggregated data. For instance, while global emissions may appear stable, certain sectors could experience significant increases, warranting targeted policy responses.

Addressing Negative Externalities
Some factors, such as rising oil prices or geopolitical risk, may counteract efforts to reduce emissions. Policymakers should mitigate these externalities by implementing measures such as tax incentives for clean energy or subsidies to offset the costs of green technologies. Additionally, revenues generated from high oil prices could be allocated to clean energy funds, accelerating the transition to sustainable energy systems.

Promoting International Cooperation
Ensuring collaboration between countries and international institutions is highly critical because environmental problems have not only a country-based but also a global structure. Worldwide policymakers should work together to align green finance initiatives, stabilize energy markets, and reduce geopolitical tensions. Such efforts can enhance the effectiveness of national policies and foster a coordinated response to climate change.

With the consideration and application of the above-explained policy recommendations, policymakers may restructure their energy, environment, and economy-related policies into more beneficial pathways. In this context, policymakers of the world and countries can benefit from the changes in green bonds, oil prices, and geopolitical risk to ensure lower use of fossil fuels, support the increase in clean energy utilization through the issuance of green bond allocated to install large-scale clean energy projects, therefore contributing to lower CO2 emissions, and preserving environmental quality. Hence, the related parties can make their regulation areas much greener and more eco-friendly, which would have a significant impact on climate change and the achievement of SDGs, especially SDGs 13 and 7.

Conclusion

The global environmental landscape is shaped by the complex interplay of green finance, oil price fluctuations, and geopolitical risk. While these factors hold significant potential to influence CO2 emissions, their effects are neither

straightforward nor consistent. By adopting comprehensive and dynamic policy frameworks, governments can better manage these interdependencies and enhance the effectiveness of their climate strategies. Ultimately, a collaborative and proactive approach is highly necessary to mitigate environmental degradation, slow the progression of climate change, and ensure a sustainable future for humanity. Policymakers must prioritize integrated solutions, continuous monitoring, and international cooperation to address these pressing challenges effectively.

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