POLICY Brief

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The Nexus among Globalization, Natural Resources Rent, and Energy Consumption for Environmental Sustainability in Ethiopia

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Executive Summary

This study examined the effect of natural resource rents, political globalization, economic globalization, and renewable energy consumption on the ecological footprint in the presence of population growth, industrialization, urbanization, and economic growth using annual data spanning from 1971-2018. It was found that industrialization, urbanization, renewable energy consumption, political globalization, and natural resources rents deteriorate environmental sustainability by increasing ecological footprint while, economic globalization reduces the ecological footprint. Thus, government should develop a resource use plan and policy mainly for the non-renewable ones to ensure the optimal extraction of these resources.

1. Introduction

Currently, we are in a world where human populations are more crowded, more consuming, more connected, and in many parts, more diverse than at any time in history. According to the projection by the United Nations, the world's population is expected to increase by 2 billion in the next 30 years and reach 9.7 billion in 2050 wherein the majority of the increment is expected from sub-Saharan Africa (SSA) (UN, 2019)[4].

Alongside the global population increment, global energy consumption has dramatically increased in recent years and is projected to continue to increase. For example, consumption of renewable energy is expected to reach 161 exajoules by 2050 which is significant increment compared to the amount in 2000. According to the US Energy Information Administration (EIA), world energy consumption is expected to grow by nearly 50% between 2018 and 2050, wherein the significant increment is expected from non-OECD countries. Of the total increment in energy consumption worldwide, renewable energy is the fastest-growing source, with a 3.1% growth per year between 2018 and 2050 (EIA, 2019[5]).

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[4] UN DESA, 2019. Growing at a slower pace, world population is expected to reach 9.7 billion in 2050 and could peak at nearly 11 billion around 2100 | UN DESA | United Nations Department of Economic and Social Affairs

[5] EIA, 2019. Today in Energy, accessed online from https://www.eia.gov/todayinenergy/detail.php?id=41433#

There are two strands of literature regarding the relationship between energy and the environment. The first group of literature focuses on overall energy consumption and examines the relationship between energy and the environment under the Environmental Kuznets Curve (EKC) framework (Yusu, 2014; Dogan & Seker, 2016; Franco *et al*., 2017). Many of these studies have obtained the finding that energy consumption negatively affects environmental sustainability. The second strand of literature investigated the relationship between disaggregated energy consumption and environmental sustainability indicators (Destek & Sinha, 2020; Ulucak & Khan, 2020). The results of these empirical studies vary depending on the type of environmental sustainability indicator and empirical model employed.

The discussion over the relationship between globalization and the environment started in the 1970s and is still a burning issue in the literature (Muradian & Martinez-Alier, 2001). Globalization, measured in the KOF globalization index[6] can promote environmental quality through the use of environment-friendly technologies and structural transformation, which in turn improve the environment. On the other hand, growing opportunities created through globalization may induce countries to export more, which would increase the production of goods at the expense of the environment (Ahmed *et al.,* 2019). Studies show that globalization has significant environmental consequences, which are difficult to specify (Managi *et al*., 2009; Shahbaz *et al*., 2018b). As a result, studies that attempted to examine the impact of globalization on environmental sustainability from a consensus perspective do not exist, and no conclusions can be derived from these empirical studies.

The relationship between natural resources rent and environmental degradation has important environmental implications. However, this domain is insufficiently investigated, and the empirical findings are inconclusive. Significant economic growth, along with rapid urbanization and industrialization, has increased the extraction and consumption of natural resources in many developing countries (for instance, see Bekun *et al.*,2019; Balsalobre-Lorente *et al*., 2018; Pao and Tsai, 2010; Wu *et al.*, 2017; and Kwakwa *et al*., 2018). Findings of these studies show that natural resource depletion negatively affects the environment and has severe environmental concerns.

2. Rationale of the Action

As indicated in the previous section, there is no consensus about the negative, positive, significant, or relationship between globalization, energy consumption, natural resource rent and the environment across countries. This calls for an in-depth country-specific study to infer proper policy implications. Accordingly, this study explores the nexus between globalization, energy consumption, natural resource rent and the environment in Ethiopia using ecological footprint as indicator of environmental sustainingly. Ethiopia is a good case study because the country is the second-largest populous country and one of the fastest-growing economies in Africa.

In this regard, the contributions of the current study to the related stock of literature are based on the following three foundations: First, to the best of the authors' knowledge, there are no previous studies in Ethiopia that used ecological footprint as a proxy for environmental quality. The ecological footprint is a comprehensive indicator of environmental sustainability and effectively captures environmental degradation (Ahmed et al., 2021; Saqib & Benhmad, 2021). Second, the study considered the role of economic and political globalization and natural resource rents as determinants of environmental sustainability, which are rarely considered in the energy consumption-environmental sustainability nexus. Previous studies used partial indicators like trade openness and FDI as proxies for economic globalization, which could not show the full picture of its effect on environmental sustainability. Moreover, the effects of political globalization and natural resource rents on environmental sustainability have not been examined so far. Third, unlike previous, this study employed a novel estimation technique, that was the dynamic ARDL simulation model, to examine a dynamic relationship between globalization, energy consumption, natural resource extraction, and environmental sustainability.

3. Results and Discussion

It was found that economic growth has a statistically significant positive effect on environmental sustainability of the county. More specifically, a 1% increment in economic growth increases the ecological footprint by 1.87% in Ethiopia during the study period. This implies that economic growth is one of the major factors that adversely affect environmental sustainability in the country.

[6] See https://ethz.ch/content/dam/ethz/special-interest/dual/kof-dam/documents/Globalization/2021/KOFGI_2021_method.pdf for a detailed methodological procedures used in calculation of the KOF globalization index.

The Ethiopian economy is the fastest growing in Africa over the last two decades. The rise in economic growth resulted in an increase in economic activity (the scale effect of globalization). The increase in production and consumption levels stimulated consumption of energy in every sector of the economy which on the other hand has resulted in increment of the country's ecological footprint. The positive relationship between economic growth and ecological footprint is also attributed to the lax environmental regulations and commitment in countries like Ethiopia. At an early stage of development, economic growth takes place at the cost of environmental sustainability

The relationship between economic growth squared and ecological footprint is negative and statistically significant. Specifically, a 1% upsurge in economic growth resulted in about a 0.4% reduction in ecological footprint in Ethiopia during the study period. The positive relationship between economic growth and ecological footprint and the negative relationship between economic growth squared and ecological footprint confirms the validity of the EKC hypothesis in Ethiopia. The inverted U-shaped relationship between economic growth and EF implies that economic growth starts to be a panacea for environmental sustainability once a certain income level is attained, and countries could start paying due attention to environmental sustainability.

Economic globalization and ecological footprint were found to have a negative relationship. This finding is in line with the "markets for the global environment" hypothesis. More specifically, the finding promotes technology transfer and diffusion of clean production technologies, as argued by Rudolph and Figge (2017). The technology transfer and diffusion instigated by economic globalization encourage developing countries to leapfrog less efficient production processes. Moreover, economic globalization ignites structural transformation (Ahmed *et al*., 2021) in a way that ensures environmental sustainability.

Political globalization has a positive and statistically significant coefficient, indicating that it increases ecological footprint in Ethiopia during the study period. The finding corroborates the "global environmental governance failure" hypothesis, which argues that weak political integration and the absence of efficient institutions fail to govern global ecological issues. Besides, Rudolph and Figge (2017) argued that a lack of transparency, democracy, and accountability results in global governance failure. All these factors make investment goals outweigh environmentally sustainable consumption, production, and trade.

Natural resource rents have a positive and statistically significant effect on the ecological footprint in Ethiopia. This means that higher natural resource rents encourage countries to overuse natural resources, which deteriorates environmental quality. The positive effect of natural resource rents on the ecological footprint in Ethiopia is also attributed to the growing economic activities that stimulate industrialization, urbanization, and agricultural expansion. The rate of natural resource depletion increases due to increasing economic activities like agriculture, deforestation, and mining, which generate harmful waste. Natural resource consumption through agriculture, deforestation, and mining influences the environment because it degrades biocapacity. Unsustainable natural resource consumption increases dependency on imported fossil fuel, which is hazardous to the environment.

Renewable energy consumption increases ecological footprint. The positive effect of renewable energy consumption on the EF in Ethiopia might be attributed to different factors. First, for renewable energy consumption to improve environmental sustainability, its share of the total energy consumption of the country should be large (Danish et al., 2019), which is not the case in Ethiopia, wherein biomass dominates the energy consumption mix. Second, renewable energy consumption does not guarantee improvement in environmental sustainability. According to Nguyen and Kakinaka (2019), the effect of renewable energy consumption depends on the country's development stage. For low-income countries like Ethiopia, renewable energy consumption detrimentally affects ecological footprint as renewable energy policies are not strong. Third, energy efficiency in Ethiopia is low.

4. Policy Recommendations

Based on the findings of the study, the following recommendations are derived:

- Ethiopia should create a balance between promoting economic growth and ecological footprint if the country needs to ensure environmental sustainability.
- The effective policy to keep a balance between maintaining high levels of economic growth and EF is to make the environmental rules and regulations more stringent, promote a fossil-fuel-free economy, and increase energy efficiency.

- Since energy is a key driver for economic activities, the manufacturing, and industrialization processes of the country should upgrade the clean technology and processes for the production of goods and services.
- Ethiopia needs to have a strong policy that safeguards the optimal extraction of natural resources. The EFCC needs to improve the level of environmental monitoring and enforcement mechanisms.
- Ethiopia should upgrade the technology and processes for the production of renewable energy. The use of energy-efficient technology should accompany this in producing and consuming renewable energy sources to make the production and consumption of renewable energy sources more environmentally friendly.
- Given the population pressure in the country, it is imperative to utilize the country's energy sources based on the country's overall development strategy. In this regard, developing the culture of renewable energy entrepreneurship in higher institutions in the country is helpful in the efficient utilization of energy resources.
- The government of Ethiopia should enhance economic globalization by increasing the number of agreements like FDI and enhancing market integration with its regional trading partners to improve environmental sustainability.
- The detrimental effect of political globalization on the ecological footprint in Ethiopia can be abated by ensuring that political globalization helps to access knowledge, monitoring systems, and global institutions that build institutional capacity for environmental regulations and negotiations.

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