Chapter 10
Economic Growth, Energy Consumption, and Carbon Emissions: The Case of Nigeria

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ABSTRACT

This chapter examines the interactions among energy consumption, economic growth, and carbon emissions in Nigeria for the period 1971-2018. The study adopts time-varying parameter vector auto regression (TVP-VAR) to explore the dynamic effects among the variables of interest. After analyzing the statistical properties of the data with Markov chain Monte Carlo (MCMC), a causal relationship between energy consumption and economic growth was found. It is also found that the environmental Kuznets curve (EKC) hypothesis is valid for Nigeria. It implies that as the economy of Nigeria grew, emissions were reduced. It is recommended that the Nigerian government should continue pursuing emissions reduction policies, such as the nationally determined contributions (NDCs), and should also ensure the appropriate energy mix to enhance industrialization drive and improve environmental quality.

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INTRODUCTION

Environmental and energy economics have gained a lot of attention due to climate change from equivalent carbon emissions. Energy use is essential for growth; however, there is a dire consequence of the resultant emissions of greenhouse gases (GHGs), which are detrimental to the environment and human health (Appiah, 2018). Nigeria is the largest producer of crude oil in Africa (ECP, 2021). The country consumes 428,000 barrels of oil daily with a teeming population of over 200 million people. Nigeria is the world's 17th highest emitter of greenhouse gases and second to South Africa in the African continent (EIA, 2019). The critical issue is that Nigeria, with the largest population in Africa, is an emerging economy that needs more energy consumption for its industrialization drive. Thus, expectedly, there could be emissions in an energy-driven economy, implying either a cost or benefit. When emissions impose costs on the environment and the society, it connotes a negative environmental externality (Faiyetole, 2015). Emissions stem heavily from energy use and could impose unintended economic costs in pollution and consequential environmental hazards.

Most studies on CO_2 emissions and economic growth relationships aim to verify and estimate the existence or not of the environmental Kuznets curve hypothesis or describe the short-run and long-run equilibrium relationships among emissions, economic growth, energy consumption, population growth, and others (Kaika & Zervas, 2013; Dinda, 2004; Dritsaki, & Dritsaki, 2014; Grossman & Kruger, 1995).

Based on those as mentioned earlier, the purpose of this study is to evaluate for the validity or otherwise of the EKC hypothesis in Nigeria, being an emerging economy, producer and consumers of fossil fuels, such as oil, coal, and gas, which have a very high propensity for carbon emission. Thus, this study is relevant at this present time because of the global shift from fossil fuel to renewable energy use. Secondly, the Paris Agreement (2015) of the United Nations framework convention on climate change (UNFCCC) has committed the industrialized countries and oil-producing countries and, in fact, nations worldwide through the NDCs, to limit the emissions target from 2^{o}C to 1.5^{o}C warming above the pre-industrial level. The study adopts the Bayesian time-varying VAR method developed by Kim & Nelson (1999), Primiceri (2005), and Nakajima (2011) as opposed to previous studies, such as Alkhathlan *et al.* (2012), Aiyetan & Olomola (2017), Işık *et al.* (2019) and Khan *et al.* (2020) that have used the traditional VAR.

LITERATURE REVIEW

The controversial EKC is a hypothesized relationship between various indicators of environmental degradation and income per capita. Typical EKC shows that environmental degradation increases in the early stages of economic growth, but beyond some levels of income per capita of economic growth, the trend reverses, leading to an environmental improvement (Stern, 2004; Cole *et al*., 1997; Grossman & Kruger, 1995). At these points, societies are environmentally aware, and countries can implement costly mitigative strategies, such as acquiring expensive technology for emission mitigation (Faiyetole, 2018; Faiyetole & Adesina, 2017; Kaika & Zervas, 2013; Dinda, 2004; Dritsaki & Dritsaki, 2014; Grossman & Kruger, 1995). The EKC is based on the hypothesis of a U-inverted relationship between emissions and income levels (Kuznets, 1955). It implies that plotting an environmental impact indicator (CO_2 per capita) against a function of income (GDP per capita) should follow an inverted-U or N-shaped curve (Panayotou, 2003, 1997; Moomaw & Unruh, 1997).