Socio-Economic Determinants of Cooking Energy Patterns in a Developing Economy: What do Nigerian Data Show?

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Abstract: The Nigerian energy sector (especially the cooking energy) has for decades suffered from crisis and paradox despite Nigeria's rich energy resource endowments. The practice of linear fuel switching can only be found among the very wealthy and also among the few people on the average income level who want to copy the consumption pattern of the rich. The latter, in the process, end up adopting every new energy technology in vogue. This, no doubt, has resulted in a trend in the use of cooking energy among households in the country. This study, therefore, examines the factors that determine cooking energy patterns in Nigeria. The result of the Auto-Regressive Distributed Lag (ARDL) estimation shows that in the short run, cost, income, subsidy, and previous level of demand are the significant determinants of cooking energy patterns while in the long run, kerosene price, income and population are the significant determinants. The study concludes that the prevalent energy use pattern in Nigeria is more of fuel stacking than the linear progression as stipulated by the energy ladder. This also has some implications on the environment.

Keywords: Socio-Economic, Determinants, Energy, Pattern

Introduction

Energy demand is a derived demand. This is because energy sources like fossil fuel, gas, coal electricity, etc., are input factors that can combine with capital to provide a certain amount of services like steam production, driving of certain industrial process and provision of transportation services (Medlock 2009). It is also used by households for heating, cooking, and other domestic purposes. The quantity of energy consumed per period of time is a function of the efficiency of the energy, the frequency of use of installed capital or technology, and the intensity of operation (Medlock 2009). Furthermore, the structure of the economy and technology is viewed to be the critical determinant of energy demand. Each of these influences the energy intensity at the macro level. According to Medlock (2009), energy intensity is the quantity of energy consumed per unit of economic output.

More than 3 billion people utilize energy for varying purposes (WHO 2006). This is not unconnected with its essentiality in virtually every sector of the economy of the world. For many decades, users of energy at the household level have alternated their use of energy. This rises due to social, economic, and environmental reasons, giving rise to the transition from the use of one form of energy source to another, a concept popularly referred to as the "energy ladder"(Masera, Saatkamp, and Kammen 2000; Orji et al. 2021). It has been observed that households are not consistent in the energy ladder but rather what holds is that they often return to the consumption of commodities earlier neglected (fuel switching or stacking) or adopt multiple cooking strategies (Ogwu 2021). Stacking here means the act of people adopting

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COMMON GROUND

different energy technologies for cooking and heating purposes. Various factors, such as price instability, supply uncertainty, and the level of income, have been blamed as being responsible for this (Ogwu 2021; Masera, Saatkamp, and Kammen 2000). In many countries the situation is known as multiple cooking strategies (Masera, Saatkamp, and Kammen 2000).

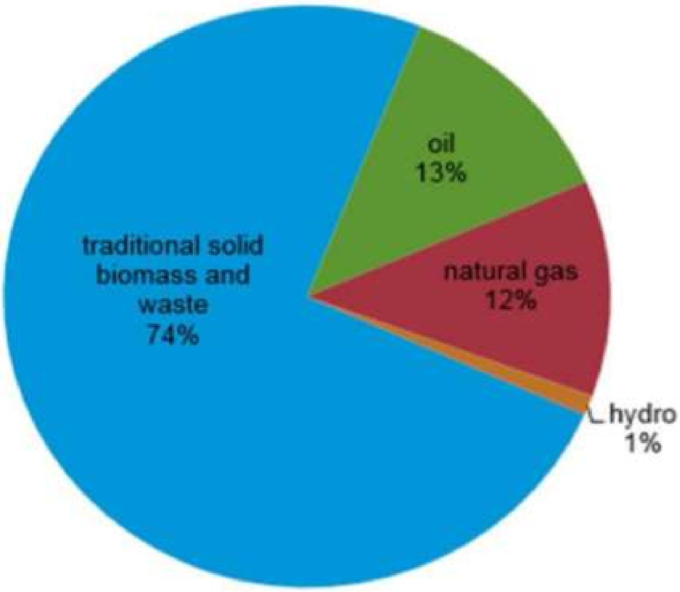

Figure 1: Nigeria's Total Primary Energy Consumption
[Note: Nigeria Also Consumes a Small Amount of Coal]
Source: U.S. Energy Information Administration

As shown in Figure 1, the major cooking fuels in Nigeria are fuel wood and kerosene, which constantly face supply difficulties, instabilities in price; and imposes safety, environmental, and health challenges on the population (Ohimain 2012). This is obvious despite Nigeria's growing energy resource reserve base, which, as shown in Table 1, includes 36.2 billion barrels of crude oil, 5,000 billion m^3 of natural gas, 2.7 billion tons of ignite and coal, 31 billion barrels of tar sand, with a total of 14,250 kW of hydro power and 13,071,464 ha^b of fuel wood. Animal waste and crop residual are 61 and 83 million tons/yearly, respectively. Daily solar is estimated at 3.5 to $7 kWh/m^2$ and yearly average wind of 2 to 4 m/s with a height of 10 meters.

Table 1: Nigeria's Growing Resource Reserve Base

Resources	***Value***	***Unit***
Crude oil	36.2 billion	Barrels
Natural gas	5 trillion	Cubic metre (m^3)
Coal and Ignite	2.7 billion	Tons
Tar sand	31 billion	barrels at oil equivalent
Hydro Power	14,250	kilowatts (kW)
Fuel wood	13,071,464	Hectare (ha^b)
Animal waste	61 million	Tons
Crop residual	83 million	Tons
Solar	3.5-7	Kilowatts per hour per square metres (kWh/m^2 daily)
Wind	2-4	Meter per second (m/s yearly average)

Source: Orji et al.