



# Impact of Informal Sector on Multidimensional Poverty in Nigeria

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**Abstract:** The informal sector is key in employment and income generation, which impact poverty alleviation, particularly in developing countries such as Nigeria, where it contributes significantly to the economy. This study aimed to investigate the informal sector (INF) and other economic factors that affect Nigeria's Multidimensional Poverty Index (MPI) indicators, including primary school enrollment (PSE), infant mortality rate (IMR), and cooking fuel (FUC) usage. Methods: It uses econometric models to analyze the long-run and short-run impacts of economic and social variables on MPI indicators using Autoregressive Distributive Lag. Results: Findings reveals a negative relationship between the INF and PSE, suggesting economic pressures hindering educational access. Per capita income (PCI) correlates negatively with PSE, highlighting economic equity challenges. Government spending on social and community services (GSCEX) positively affects PSE, while IMR is impeded by INF and PCI. FUC is positively influenced by GSCEX and INLR, however, negatively impacted by PCI and INF. Conclusion: The study suggests the need to provide policies that discourage informal sector activities in order to increase PSE, FUC, and reduce IMR both in the short- and long-run.

**Keywords:** MPI, Informal Sector, Government Spending

**JEL Classification:** I32, I21, H50

## 1. Introduction

The Informal sector of the economy has been argued to have contributed greatly to employment and income generation, in an attempt to reduce poverty, especially in developing countries. The activities of this sector are unregulated by the authorities,

thereby operating outside of the formal economy or labor market. The informal sector is frequently linked to extremely low and unstable pay as well as significant levels of (working) poverty (Chhachhi *et al.*, 2014). The informal sector is critical in the context of poverty for several reasons including the source of livelihood, provision of employment for vulnerable groups, and source of income for health and education among others.

Workers in the Informal sector are sometime labeled as "vulnerable" and "unproductive," also recognised as people trapped in a poverty cycle. They, include domestic aides, cleaners, street hawkers, etc., are often face with significant financial difficulties. This experience comes from the risky nature of their work, the lack of job and workplace protections, and the irregular income that describes informal job. Approximately 80% of the 839 million working poor people in developing nations who make less than \$2 per day make their living in the informal sector. (Rogan and Cichello, 2017). The Structural Adjustment Programme (SAP) of the 80s and 90s which was imposed on developing economies by the Bretton Woods institutions ignored the informal sector, which might contribute to their bad success record in the African countries. The Nigerian economy is characterized by both formal and informal sectors, with the informal sector contributing little or nothing to the government revenue (NSIWC, 2013), and increasing in times of crisis, exclusion & excessive regulation.

The scale of the informal sector, for example, varies greatly, with the size ranging from a low of 20 to 25 percent in Mauritius, South Africa, and Namibia to a high of 50 to 65 percent in Benin, Tanzania, and Nigeria, according to a recent research by the International Monetary Fund (IMF) (IMF, 2017). The incorporation of previously underreported sectors such as the informal sector, telecommunications, and entertainment, made Nigeria's GDP to become the largest in Africa in 2014 when it was rebased. This rebasing increased Nigeria's GDP from approximately \$270 billion to \$510 billion, surpassing South Africa and making Nigeria the 26th largest economy in the world at that time. (Bello, 2017). In Nigeria, the informal sector's share of GDP varied from 53.6 to 77.2% between 1970 and 2010, with an average of 64.6%. In 2010, the informal sector accounted for three-quarters of GDP. According to NBS estimates, there were over 17 million businesses in the informal sector, which made a significant contribution to job creation. Approximately 1.41 million jobs were created between July 2012 and June 2014, with the informal sector accounting for 57% of these jobs, the formal economy

for 40%, and the public sector for only 74,400 (3%). (NBS, 2016; Bello, 2017). Between 2018 and 2019, the informal sector's contribution to GDP in Nigeria was 55% and 67% respectively (Ifechi-fred, 2023). Nigeria informal economy in 2019 was valued at N40,181.29 billion, while the formal economy was N72,094.08 billion. Considering that the informal economy in Nigeria accounts for between 54% and 56% of the GDP, there is need for measures that will identify and boost the sector for substantially rely on it subsistence. With about 37.5 million workers in the informal sector in 2019, it assists in creating income, providing employment possibilities, and served as safety net for people facing challenges to formal employment. In 2020, the informal sector contributes to about 80% employment in Nigeria's and above 40% of its GDP.

Indicators such as lack of education, health care, low living condition are use as measures to determine people that are multidimensional poverty. These indicators contribute to money-metric poverty headcount of people living below \$2.15 a day. Significant population in Nigeria are affected by MP, showing that a large percentage of Nigerians suffer from various forms of denials at the same time. The Nigeria MPI of 0.257 indicates that about 25% of all potential denials are experienced by the poor people in the economy (NBS, 2022).

The Global Multidimensional Poverty Index 2023 release, reports that 1.1 billion people out of a global population of 6.1 billion live in acute multidimensional poverty. The multidimensional poverty index (MPI) report of 2022 revealed that about 62.9% (133 million) of Nigerians population, are multidimensionally poor. This implies that this population are facing deprivations in at least 26% of weighted indicators or above one dimension. This figure translates to about 18% of the world's population. About 534 million of this population lives in Sub-Saharan Africa, which has the highest concentration of multidimensionally poor individuals. The world statistic indicates that in 389 million people South Asia are multidimensional poor, being the second-largest number of people in multidimensional poverty, hence, contributing significantly to the global poverty. Worldwide, the countries of South Asia and Sub-Saharan Africa are collectively responsible for over half of all people who live in multidimensional poverty. That means that these two regions are home to more than 83% of the world's multidimensionally impoverished. This stark concentration highlights the geographic inequality in poverty distribution and emphasizes the need for targeted interventions in these areas. (UNDP, 2023).

The World Bank and the United Nations have made efforts to end poverty for everyone by 2030, which is part of the sustainable development goals (SDGs). The government has at various levels been blamed for growing poverty in their countries. However, some of the governments have made considerable efforts to end poverty. In Nigeria, for example, several policies and programs have been implemented to reduce poverty, and which outcomes have seen little or no impact on the target populace (Ogwumike, 2002; Umo, 2012; Oyedele, 2020).

To earn a living, some of the citizens ventured into informal activities inform as self-employment, employment in informal organizations, and rendering of skilled and unskilled labor. Some scholars support formalizing the informal sector, while others contend that there is an ideal degree of informality that maximizes welfare as a whole (La Porta and Shleifer, 2014; Williams *et al.*, 2015; Chen and Carré, 2020; Aberra, 2022). Additionally, other economists share a more pessimistic viewpoint, contending that the informal economy both contributes to and perpetuates poverty and that informality has no positive impact on reducing it (Loayza, 2018; Chen, 2016; Ulysea, 2020; Medina and Schneider, 2018). However, the majority of the literature takes a more upbeat stance and finds that there is a beneficial relationship between reducing poverty and informality (Williams *et al.* 2015; Chen and Carré, 2020; Alkire and Jahan, 2018). While there is literature on the informal sector's role in poverty reduction, there is a lack of nuanced understanding of how the informal sector impacts poverty in Nigeria in recent times. This study is carried out to empirically examine the impact of the informal sector on the three MPI dimensions of health, education, and standard of living in Nigeria.

## **2. Literature Review**

### ***2.1. Conceptual Review***

The informal economy is strenuous to measure, with farming accounting for a sizeable portion of informality, including both marketable agricultural sales and subsistence farming. According to Banerjee and Duflo (2011), a notable portion similarly begins from self-employed hawkers who make almost subsistence wages, at least in terms of employment. Conversely, numerous forms of informality are obvious even in more substantial enterprises which employ workforce, including repair shops, factories that produce furniture or metal, or transportation companies. According to Loayza (2016), informality is the set of businesses, labourers, and

activities which do not follow the rules of law or norms of the contemporary economy.

## ***2.2. Consequence of Informal Sector***

In the economy, informality affects businesses and employees in both positive and negative ways (Schneider and Enste, 2000). Positively, informal sector businesses benefit from flexibility in hiring practices, site selection, resource management, and market competitiveness. Additionally, they create jobs, particularly in recessionary times (Fiess *et al.*, 2007; Loayza and Rigolini, 2011; Kose *et al.*, forthcoming). Nonetheless, they have a dearth of legal protection and state-provided services, which results in a significant degree of inefficiency (La Porta and Shleifer 2014).

Poor operational conditions and inadequate access to social protection are common issues faced by workers in informal employment. According to Oviedo *et al.* (2009), it is illustrated by the potential for unpaid wages, overtime, terminations of employment without reason or notice, hazardous work conditions, and unavailability of benefits such as health and unemployment insurance or retirement pensions and gratuities. Informal economy is fragile to tax evasion; for example, Danquah and Osei-Assibey (2018) reported that Ghana has a tax gap of about 70%. In general, informality can great negative externalities such as unhappiness among greater both employee and employer.

## ***2.3. Causes of Informal Sector***

Two primary schools of thinking can be used to explain the complicated phenomenon of informality (Schneider and Enste 2000; Loayza 2016). According to the first school, underdevelopment—which stems from low worker and company productivity as a result of structural factors including low education, a lack of physical capital, and sociodemographic variables—is the cause of informality. Increased in productivities from labour and business should guide policies aiming at decreasing informality (ILO, 2018; La Porta and Shleifer, 2014). According to the second school of thought, informality caused from poor governance, making businesses to operate in the informal sector, when the advantages of using public services provided to formal corporations outweigh the costs of adhering to rules (De Soto, 1988; Djankov *et al.*, 2002).

Both theories are effective, however, informality should be deemed as intricate occurrence with several contributing factors. An economy's increase of informality

might be occasioned by multiple factors, such as inadequate governance and economic development. The global link between informality and per capita income specifies that economies with lesser economic development naturally have greater informality. However, some economies have much rising informality as expected based on GDP per capita, revealing that informality is induced by many unique elements associated with the effectiveness of the political and regulatory systems as well as economic development.

#### ***2.4. Multidimensional Poverty Index as Measure of Poverty***

MPI is one of the globally established means for measuring dire multidimensional poverty adopted in more than 100 developing economies, which was first established in 2010 by Human Development Report Office (HDRO) and Oxford Poverty and Human Development Initiative (OPHI) (Alkire and Santos, 2010). It measures connected deprivations across indicators related to SDGs 1, 2, 3, 4, 6, 7, and 11, and improves SDG 1, “ending poverty in all its manifestations worldwide”.

A tool called the Global MPI monitors ten indices of deprivation, such as standard of living, health, and education as shown in Figure 1 below. If a child is stunted, underweight has died within the last five years, is not attending school until the age of completion, or has not had a household member finish six years of education, then that home or individual is considered deprived. Power, potable water, sanitary facilities, cooking fuel, and substantial building materials are classified as basic resources that are taken into account as deprivation. Within each dimension, every indicator related to the standard of living has a weigh of 1/18, while those related to health and education weigh has a 1/6 each. The total of all the weighted deprivations a person experiences is their deprivation score. The total of all the weighted deprivations a person experiences is their deprivation score. A person is classified as multidimensionally poor by the global MPI if their deprivation score is equal to or more than 1/3.

The MPI values are obtained by multiplying the incidence (H), which is the percentage of individuals living in multidimensional poverty, by the intensity of poverty (A), which is the average deprivation score among those who are multidimensionally poor. MPI is equal to  $H \times A$ . Higher values of the MPI indicate higher levels of poverty; the range is 0 to 1. Reduced poverty rates or fewer deprivations experienced by the poor lead to a reduction in global MPI values. All

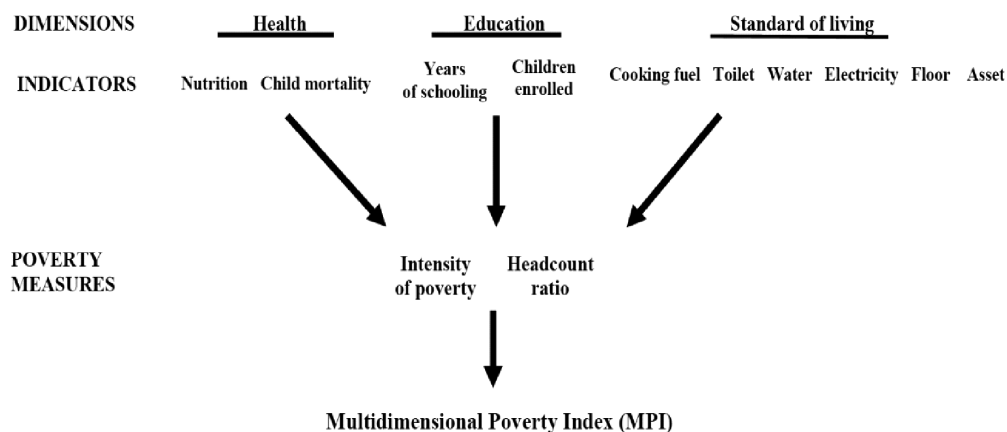


Figure 1: MPI Basic Needs

Source: Pettinger (2019).

of the indicators' exact definitions, any adjustments made for a particular nation, and the computer code that was used to determine the global MPI value for each nation are accessible online. The global MPI supplements the worldwide \$2.15 per day poverty rate by identifying the poor, their type of poverty (their deprivation profile), and their level of poverty (their deprivation score). This helps to highlight interconnected nonmonetary deprivations (UNDP, 2023).

All economic activity by workers and economic units that are not covered by formal arrangements is collectively referred to as the "informal economy," which is a global phenomenon (ILO, 2018). Two new concepts, informal market economy and informal entrepreneurship, have been presented by the International Labour Organization (ILO) recently. The informal sector has long been recognized as a major employer in developing nations and a source of income for those on the margins in industrialized economies (ILO, 2021). Feige (2016) offers a taxonomy based on non-compliant behaviors, emphasizing that all behaviors in unobserved economies have the characteristics of noncompliance and unobservability. He depicts informal economies as those defying laws that governs the production and distribution of goods and services, unaccounted economies as those where the added informal value came from violations of national income accounting rules, and formal economies as those maintains labour market regulations such as minimum wages, working conditions, social security, unemployment benefits, and disability benefits.

### ***2.5. Review of Economic Theory Supporting the Impact of the Informal Sector on Poverty***

The dual economy theory, which was first postulated by Sir Arthur Lewis in the 1950s (Lewis, 1954), forms a background for understanding the economic structure in developing economies. He identifies two economies sectors, which includes the modern or formal sector, characterized by greater productivity, advanced technology, improved wages, and more formal labour conditions; and the traditional or informal sector, made up of labour-intensive, with low-productivity activities, which are mostly unregulated and untaxed. The theory further suggests that the surplus labour from the traditional or informal sector can be progressively engaged by the increasing modern or formal sector, resulting to economic development and poverty reduction. The formal sector, typified by rising productivity and capital intensity, enhancing economic growth, which can lead to wage increment, hence, benefiting workers and their families. Diversification of the economy, and reduction on traditional agricultural activities dependency, are decisive for the stabilisation of the economy and promoting sustainable growth. Critics believe that the informal sector should not be seen as a residual or transitory occurrence but should be supported and integrated instead of merely aiming on its formalization. Less developed nations frequently have dual economies, with one sector serving the domestic market and another the international export one. A World Bank assessment of sectoral growth in Zimbabwe, Ghana, and Côte d'Ivoire since 1965, however, showed evidence that a simple dual economy model was false and that, to achieve optimum economic growth, policymakers should prioritize both industrial development and agriculture and services (Blunch and Verner, 1999). Relying on this theory, Clement (2015) investigated the symmetry between formal and informal economies since the 1940s, mainly on the historical and theoretical foundations of this dualism. He opined that the informal sector continues owing to a dualistic institutional background that disregards some social groups, resulting to their exclusion from formal economic activities. According to the paper macroeconomic conditions and microeconomic conditions influence participation in the informal sector of the economy. The paper acknowledges the differences between voluntary and involuntary informality, highlighting the importance of understanding the complexities of informality and its implications for economic development and poverty reduction in developing countries.



The human capital theory (HCT), developed by Gary Becker (Becker, 1975) and Theodore Schultz (Schultz, 1961), submit that funding of education and skills may cause surge in individual's productivity and income. Workers in the informal sector, usually have lower education and lesser skills than their counterparts in the formal sector, hence, limiting their productivity and earning capacity, prolonging poverty. The theory believes that enhancing access to education and skill training can enhance the skills of workers in the informal sector, which will eventually qualify them for a greater productivity and transition to wages-jobs in the formal sector. Additionally, the theory supposes that intellectual and human capital are considered as renewable productivity sources, and institutions make efforts to nurture these sources to improve their innovations or creativities. HCT is comparable to the endogenous growth model  $Y = AK$  (where  $Y = AK$  is a measure for capital ( $K$ ) efficiency apply in output production ( $A$ ), using a more production processes ( $A$ ), such technology or skills to increase output based on a given capital.) or the  $AK$  model (Romer, 1994). Oppositions to this theory opined that HC should not be deemed as a factor of production, since the theory depends on the hypothesis that human beings are rational expectators. Critiques from sociologists and anthropologists opined that the HCT theory provides easy principles, which cannot be impartially measured accompanied with individual productivity differences which are systematically confined to justify for disparity in income. Practical proof reveals that each additional schooling year might significantly increase individual's earning potential (Juhn *et al.*, 1993; Grossman and Helpman, 1994b). Additionally, Ridhwan *et al.* (2020) observed that health outcomes are closely associated with the growth in the economy, while Olopade (2019) observed that investments in HC revealed significant impacts on poverty reduction. HCT concentration on education, healthcare services enhancement, and the integration of HC development programmes can lead to a better productivity and increase earning expectation of individuals. Increase in investments on the other hand can contributes to enhancement of economic outcomes, leading to the breaking the poverty cycle.

The structuralist approach theory (SAT), advanced by Alejandro Portes and Manuel Castells (Castells and Portes, 1989), refers informal sector to an essential part of the economy, which exist with the formal sector. They opined that informal labourers do face some challenges such as perilous working conditions, absent of social protection, and inadequate access to credit and markets facilities, hence

keep them in the poverty cycle. SAT postulated that policies aimed at bettering the working conditions, offering social protection, and easing access to credit for informal labourers will assist in reducing poverty. It further stresses the reliance among formal and informal sectors, with the informal sector often providing goods and services to the formal sector, hence, acting as a cost-saving mechanism for formal institutions. Economic policies, labor market regulations, and the availability of formal employment opportunities significantly influence the size and nature of the informal sector, with state policies and regulatory environments also playing a role in shaping informality, according to the theory. The suggested strategies for poverty reduction include employment and income generation, enhancing productivity and skills, inclusive economic policies, and addressing structural inequities. Finn (2023), opined that the association between informality and a various of circumstances, including the economy, government, housing, agency, and poverty, are assess by structural theory. He further opined that informality grows naturally via legal background, discussions, and disputes. Smart and Koster (2024) observed that relationships, which are formal and informal coexist, with participation influencing by cultural behaviour and rule internalisation. The magnitude of education also impacts participation in the unorganised labour market.

### ***2.6. Empirical Review***

Secondary education, which link primary school and tertiary education for knowledge and skill acquisition, is also surrounded by informal activities in most developing economies, informal sector provides employment and income in those economy. This according to Odunola & Akinyode (2019), who also found that most people engaged in informal activities around the school environment, mostly in uncontrolled environment where student easily sneak out to patronise food vendors during school hours. The study suggests enforcement of policy to discourage informality around school environment. Increase in years of schooling also increase the chance of gaining employment in the informal sector. This implies that well educated individuals are being employed in the informal sector despite knowledge acquires. This might be because of inefficiency in type and method of teaching to the poor (Nguyen, 2015). While studying how formal education impacts entrepreneurship rates, Alfredo Jiménez *et al.* (2015), found that secondary and tertiary education increases formal enterprises, while decreasing informal enterprises, owing to lack of management skills. Diallo *et al.* (2017) examines

factors and socioeconomic relevance of the sector's informality and found that informal sector disadvantaged development, subsidises unemployment, and source of state's revenue. They opined that improvement in development from informal sector can be achieved through proper management of the sector. In their study on informal sector's impacts on development, Sultana *et al* (2022) found that informal sector is detrimental to development, especially in developing economies. The study recommended the disbandment of informal sectors' activities in the economy, and policies towards integrating the informal economy into the formal economy.

Aronsson *et al.* (2023) studied the health consequences of informal employment among female workers and their children. The study found female worker in informal employment experience worse health outcome compared to those in formal employment, particularly on the areas of antenatal health and child nutritional status. While examining how social health insurance schemes on informal sector worker, Acharya (2013) found a weak relationship between the social health insurance schemes and informal sector workers. Dramani *et al.* (2022) modelled the relationship between informal sector and energy consumption, and found that informal sector adversely relates with energy consumption, while education, job, and FDI are mediums through which the informal sector impacts energy consumption. In a study by Hieu *et al.* (2014) which examines how income from formal and informal sector employment affects poverty found that the rates of poverty increased among informal wage workers, self-employed workers, and subsistence agricultural workers, especially among larger populated household compared less populated households. While examining the impact of information and communication technologies (ICT) on poverty, Westman (2021) found that ICT has insignificant impact on poverty. Ghecham (2017) investigates the effect of the informal sector on income variation, and found that the informal sector plays significant role in reducing income disparity among those in the lowest income brackets, while exacerbate income differences between the highest earners and other groups.

### **3. Methodology**

#### ***3.1. Theoretical Framework***

The theoretical framework in Figure 2 reveals how the informal sector contributes to poverty reduction through the provision of paid employment to the labour force who are unable to find formal or government jobs. It also enables individuals and

household to acquire skills via informal training. Wages and salaries earned from paid employment in the informal sector and profits made from the self-employment in the informal sector can be used to fund education, health, and consumption. hence, reducing poverty.

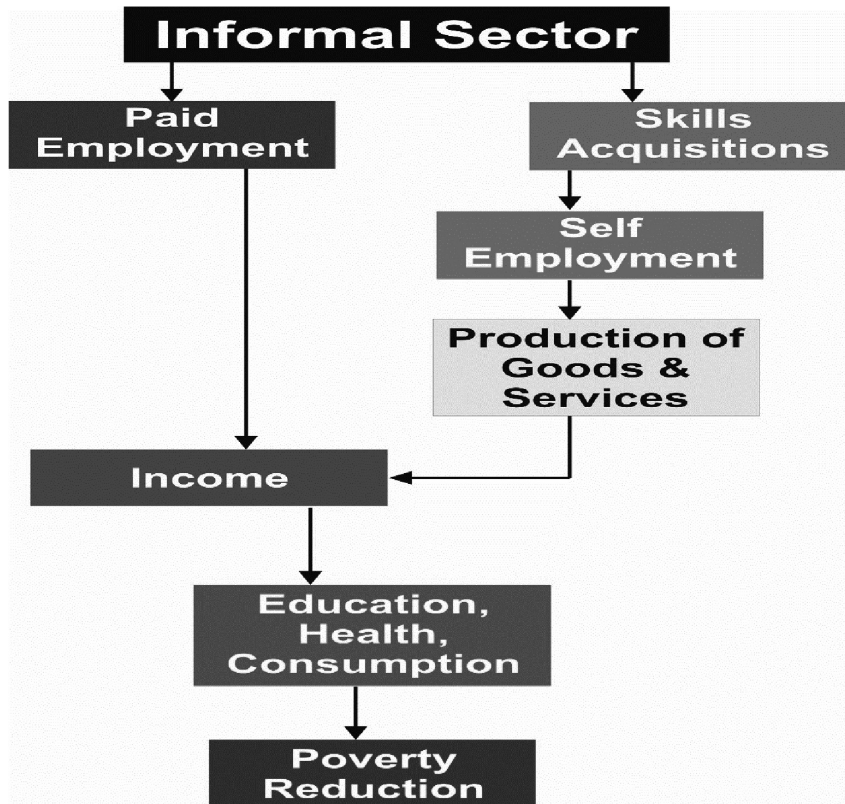


Figure 2: Theoretical Framework for Informal Sector to Poverty Reduction

The instinct behind this theoretical framework is that the informal sector plays a significant role in poverty reduction, through the provision of employment and income generation in the entire economy. This can be evaluated through two major pathways, which include the provision of paid employment and the facilitation of skill acquisition resulting in self-employment. The paid employment segment of the informal sector provide employment, particularly in the developing countries where the formal sector cannot accommodate all labour force. Finally, income generated from these jobs is can then be used for basic expenditures such as education, health, and consumption.

Acquisition of skill is also an important feature of the informal sector, which skills are gotten via apprenticeships, on-the-job training, and informal education means. This lead to self-employment, in which people render services or produce goods, with economic implications, including profits making and human capital investment. This income enables households to provide their basic needs, hence, promoting economic stability and quality of life. Improved spending on education, health, and consumption from acquired skills is expected to assist households accelerates local economies, thereby creating more business opportunities and job creation, which will development the entire economy and reduce poverty in a long-run. This theoretical framework follows the human development put forward by Gary Becker (Becker, 1975) and the dual economy theory of Sir Lewis Author (Lewis, 1954), earlier discussed in this study.

### 3.2. Empirical Models

The empirical models for this study follow the theoretical framework started above. The models indicate that the impact of the informal sector and other control variables such as government transfers, health insurance, access to scholarship and free education, and per capita income can be seen through three major dimensions of MPI which are education, health, and standard of living.

In model (equation) 1, school attainment is used as a proxy for education, in model (equation) 2, the mortality rate is used as a proxy for health, while in model (equation) 3, access to clean water is used as a proxy for standard of living.

$$imr = \beta_0 + \beta_1 inf + \beta_2 pci + \beta_3 gscecx + \beta_4 inlr + \varpi_i \quad (1)$$

$$pse = \alpha_0 + \alpha_1 inf + \alpha_2 pci + \alpha_3 gscecx + \alpha_4 inlr + \varepsilon_i \quad (2)$$

$$fuc = \delta_0 + \delta_1 inf + \delta_2 pci + \delta_3 gscecx + \delta_4 inlr + \eta_i \quad (3)$$

Where *IMR* is infant mortality rate, a proxy for health; *PSE* is primary school enrolment, a proxy for education; *FUC* is cooking fuel, a proxy for standard of living; *INF* is informal sector; *PCI* is per capita income; *GSCCEX* is government expenditure on social and community services; *INLR* is inflation rate;  $\beta_s$ ,  $\alpha_s$ ,  $\delta_s$  are the coefficient of the independent variables,  $\eta$ ,  $\varepsilon$ ,  $\varpi$ , are the error terms in the models.

### 3.3. Source of Data

Data for this study was obtained from different sources. Data on *IMR*, *PSE*, *FUC*, *PCI*, were obtained from the World Bank Databank, data on *GSCCEX*, *INLR*, were

obtained from the Central Bank of Nigeria Statistical Bulletin, while data *INF* was obtained from Schultz *et al.* (2021) published by World Bank.

### 3.4. Models Estimation Methods

The models are estimated using the ARDL regression. This technique was able to handle the concern of endogeneity, such as reverse causality between poverty indicators and the informal sector. Before employing the data, all data were first normalized before being used for the analyses. This was able to transform the data to fit within a specific range. The normalization helps in reducing multicollinearity that might occur among the variables in the models.

## 4. Results Presentation and Discussion of Findings

**Table 1: Unit Root Result**

<i>Variables</i>	<i>ADF Test Statistic</i>	<i>5% Mackinnon Critical Level</i>	<i>Order of Co-integration</i>
PSE	-5.038351	-2.971853	I(1)
IMR	-5.494274	-2.981038	I(2)
FUC	-3.676399	-2.967767	I(0)
INLR	-5.825516	-2.971853	I(1)
PCI	-4.760934	-2.986225	I(2)
GSCEX	-5.096248	-2.971853	I(1)
INFR	-5.160668	-2.971853	I(1)

The Unit root result shows that FUC is stationary at level I(0); PSE, INF, GSCEX, INLR are stationary after the first differencing I(1); while IMR, PCI are stationary after the second differencing I(2). Based on these different levels of stationarities, a co-integration analysis is required to identify long-run relationships between variables. The study therefore proceeded to ARDL long run and bounds test.

**Table 2: Bounds Test Results**

Test Statistic	K = 4	Finite Sample: n=1000		
		Value		
Dependent Variable:		PSE	IMR	FUC
Actual Sample Size		26	27	26
F-statistic		56.83062	3.786639	1154.169
<b>Significance at 5%</b>	<b>I(0)</b>	2.56	2.56	2.56
	I(1)	3.49	3.49	3.49

Table 2 indicates F-statistic of 56.83062, which is higher than the lower bound (I(0)) at 2.56 and the upper bound (I(1)) at 3.49 critical values, at the 5% level of level significance. This indicates an existence of a long-run relationship (cointegration) among the variables included in the model for PSE. In the case of IMR, the F-statistic of 3.786639 is also above the lower bound (I(0)) of 2.56 and the upper bound (I(1)) of 3.49 critical values at the 5% level significance level. This indicates an existence of a long-run relationship (cointegration) among the variables included in the model for IMR is conclusive. Furthermore, the F-statistic of 1154.169 is higher than lower bound (I(0) = 2.56) and the upper bound (I(1) = 3.49) critical values at the 5% level of significance. This reveals the existence of the long-run relationships (cointegration) among the variables used in the model for FUC.

**Table 3: ARDL Long Run Form Results**

Variables	PSE	IMR	FUC
Selected Model	4, 3, 4, 4, 3	3, 1, 0, 0, 2	4, 4, 4, 4, 4
INF	-1.905355 (0.252417) -7.548441**	-1.674632 (3.419122) -0.489784	-0.826648 (0.149434) -5.531848**
PCI	-2.161751 (0.327755) -6.595640**	-5.674636 (9.972506) -0.569028	-0.662798 (0.114345) -5.796467**
GSCEX	0.463386 (0.201651) 2.297957**	7.321777 (12.51525) 0.585029	-0.841517 (0.065586- 12.83069**
INLR	-0.092137 (0.285836) -0.322342	-3.032665 (6.579194) -0.460948	2.272843 (0.100953) 22.51386**
C	2.398088 (0.254785) 9.412222**	2.979952 (5.411647) 0.550655**	1.241465 (0.118068) 10.51484**

*Note:* Values in parentheses are standard deviations, while values with \*\* indicate significant t-values at the 5% significance level.

The long-run findings from the study in column 2, in Table 3 above reveal a negative relationship between the INF and PSE. This implies that if INF is increased by 1%, PSE will reduce by 1.91%. This suggests that the expansion of the informal sector may hinder children's school attendance owing to economic pressures. Findings further show the existence of a strong negative relationship

between PCI and PSE, with a 1% increase in PCI causing a 2.16% decrease in PSE. This counterintuitive result might indicate that the growth in the nation's GDP per capita has failed to trickle down in the economy. Furthermore, the relationship between GSCEX and PSE is positive. This implies that if GSCEX is increase by 1%, PSE is expected to increase by 0.46%. This is because government expenditure on social and committee services will improve access quality of education in the long-run.

In the case of IMR (column 3, Table 3), the relationships are not statistically significant.

Still from Table 3, the long-run finding in column four reveals a negative relationship between the INF and FUC. This implies that if INF is increase by 1%, INF will decrease by 0.83%. This suggests that reliance on INF activities may reduce FUC adoption because of limited access to clean fuel technologies and affordability issues. A 1% increase in PCI results in a 0.66% decrease in FUC, suggesting households may opt for other energy sources owing to higher energy demands not met by clean fuels. GSCEX and FUC relates negatively. Finding reveals that if GSCEX increase by 1%, FUC will decrease by 0.84%. Also from the findings, INFR and FUC are positively related. This means that if INFR is increased by 1%, FUC will increase by 2.27%.

**Table 4: ARDL ECM (Short Run) Results**

<i>Variable</i>	<i>D(PSE)</i>	<i>D(IMR)</i>	<i>D(FUC)</i>
D(PSE(-1))	0.529124 (0.029423) 17.98355**		
D(PSE(-2))	0.399767 (0.025143) 15.89946**		
D(PSE(-3))	0.142035 (0.028624) 4.962095**		
D(IMR(-1))		0.446168 (0.148172) 3.011148**	
D(IMR(-2))		-0.485330 (0.159002) -3.052349**	



<i>Variable</i>	<i>D(PSE)</i>	<i>D(IMR)</i>	<i>D(FUC)</i>
D(FUC(-1))			0.274522 (0.005664) 48.46831**
D(FUC(-2))			-0.119587 (0.004734) -25.26391**
D(FUC(-3))			0.777835 (0.005699) 136.4778**
D(INF)	-0.286205 (0.034400) -8.319863**	0.123438 (0.045673) 2.702666**	-0.725980 (0.005513) -131.6860**
D(INF(-1))	1.087825 (0.061668) 17.63989**		0.070709 (0.006107) 11.57860**
D(INF(-2))	1.161863 (0.039351) 29.52592**		-0.767322 (0.006428) -119.3639**
D(INF(-3))			-0.883382 (0.007122) -124.0437**
D(PCI)	1.547193 (0.106227) 14.56503**		-1.703254 (0.014623) -116.4742**
D(PCI(-1))	1.381728 (0.143366) 9.637787**		-0.789896 (0.022482) -35.13448**
D(PCI(-2))	1.342589 (0.145912) 9.201372**		-1.666148 (0.027231) -61.18472**
D(PCI(-3))	1.860204 (0.111965) 16.61408**		0.537955 (0.021104) 25.49093**
D(GSCEX)	0.927803 (0.061782) 15.01744**		1.604379 (0.011138) 144.0397**
D(GSCEX(-1))	0.803866 (0.047081) 17.07395**		1.157907 (0.007863) 147.2530**
D(GSCEX(-2))	1.212937 (0.056207) 21.57991**		2.600514 (0.014077) 184.7334**

<i>Variable</i>	<i>D(PSE)</i>	<i>D(IMR)</i>	<i>D(FUC)</i>
D(GSCEX(-3))	0.733576 (0.052272) 14.03385**		0.303581 (0.009064) 33.49375**
D(INLR)	0.041176 (0.069213) 0.594917**	-0.112094 (0.045424) -2.467707**	2.632811 (0.012732) 206.7855**
D(INLR(-1))	-0.203862 (0.041584) -4.902430**	0.142691 (0.045670) 3.124397**	-0.529347 (0.007303) -72.48446**
D(INLR(-2))	0.155028 (0.033506) 4.626926**		0.841885 (0.005126) 164.2427**
D(INLR(-3))			0.059915 (0.004250) 14.09806**
COINTEQ(-1)*	-1.086387 (0.036027) -30.15444**	-0.045499 (0.008332) -5.460750**	-1.037229 (0.005088) -203.8384**
R-SQUARED	0.997601	0.833053	0.999953

*Note:* Values in parentheses are standard deviations, while values with \*\* indicate significant t-values at the 5% significance level.

Column 2 in Table 4 reveals the short-run result between PSE and other variables, and its lags. The coefficient of PSE when lagged for 1, 2, and 3 years are positive. A 1% increase in PSE from the previous period will increase the current PSE by 0.529124%, 2 years lagged by 0.40%; and 3 years lagged by 0.14%. INF is negatively related with PSE. This means that if INF increase by 1%, PSE will reduce by 0.286205%. This finding conform with apriori expectation. However, 1 year and 2 years lagged in INF are positively related with PSE. A unit in increase in INF the 1 year and 2 years lagged will increase PSE by 1.087825% and 1.161863%, respectively. These findings implied that short-run dependence on the INF can be disadvantageous, however over time, the skills and income gathered from education might lead to meaningful outcomes. The coefficients of PCI are in current, 1, 2, and 3 years lagged have positive relationships with PSE. A 1% increase in PCI will increase PSE by 1.547193%, 1.381728%, 1.342589%, and 1.860204% respectively. These findings agreed with the our earlier stated apriori expectation. This finding indicates the significant of policies towards increasing income of household through job creation and income redistribution.

The coefficients of GSCEX is positively related with PSE during current year, 1, 2, and 3 years lagged. This implies that if GSCEX is increased by 1%, PSE will increase by 0.927803%, 0.803866%, 1.212937%, and 0.733576%, respectively. This finding reveals the important of public investment in human capital development towards economic growth and poverty reduction. The coefficient INLR at the 1 year lagged has a negative relationship with PSE. A 1% increase in INFR one period ago will reduce PSE by 0.20%. This finding conform with apriori expectation earlier stated. Conversely, the coefficient of INLR when lagged for 2 years is positive. A 1% increase in INFR 2 years ago will increased PSE by 0.16%. This finding failed to conform with apriori expectation earlier stated. The ECM term is significant and negative at 1.0864%, indicating a strong adjustment back to long-run equilibrium. This suggests deviations from equilibrium are corrected by about 108.64% in the next period. The R-squared value of 0.997601 implies that 99.7601% of the variation in FUC, leaving only 0.2399% for the stochastic term.

The results of IMR in column 3, in Table 4 indicate that the 1 year lagged in IMR coefficient of 0.446168 indicates a positive relationship, meaning a 1% increase in the IMR in the previous period raises the current rate by 0.45%. Conversely, the coefficient of 2 years lagged of IMR is negatively related with current IMR, where a 1% increase two periods ago decreases the current rate by about 0.49%. The past IMR's positive impact indicates high rates persist, while the negative impact from two periods ago suggests some correction over time, suggesting interventions may have a delayed effect. The coefficient of INF is 0.123438, indicating a positive relationship between the INF and IMR. A 1% increase in INF activity is associated with a 0.12% increase in IMR. This is because informal sector workers lack adequate access to healthcare service. The coefficient of INFR reveals a negative relationship with IMR, suggesting a 1% increase in INFR reduces IMR by 0.11%. This finding failed to conform with the apriori expectation earlier stated. However, a 1% increase in INFR 1 year lagged increases the current IMR by 0.14%. This suggests that current INFR may reduce IMR because of short-run economic adjustments, while past INFR increases may have longer-term adverse impacts because of reduced real income and healthcare access. The model shows a moderate adjustment back to long-term equilibrium, with deviations from equilibrium corrected by 4.55% in the next period. This suggests the need for sustained policy measures to reduce IMR. The R-squared value of 0.833053 reveals that 83.31% of the variation in

IMR is explained by the model, while the remaining 16.69% is captured by the error term. These are shown in Column 3 in Table 4.3.

In the case of FUC, as indicated in Column 4 in Table 4, the findings reveal that a 1% increase in FUC in the previous period increases current consumption by 0.27%. A negative relationship suggests a decrease in consumption by 0.12% two periods ago. A positive relationship suggests a 0.78% increase three periods ago. The finding shows that clean FUC tends to persist over different lags, with both positive and negative effects, highlighting the dynamic nature of clean fuel consumption over time, with both positive and negative effects indicating corrective mechanisms. The findings further revealed a negative relationship between INF and FUC. A 1% increase in INF will decrease FUC by about 0.73% in the current period; 0.76% during 2 years' periods lagged, and 0.88% during 3 years lagged. However, a 1% increase in INF will increase FUC by 0.07% during a one period lagged. The significant negative coefficients suggest that an increase in INF activity generally decreases FUC, possibly owing to lower incomes or lack of infrastructure. This suggests that INF workers may have less access to clean fuel options owing to lower incomes or lack of infrastructure. The study also found a negative association between PCI and FUC. This implies that if PCI increases by 1%, FUC will decrease by 1.70%. Also, a 1% increase in PCI one period lagged and two periods lagged, will reduce FUC by 0.79% and 1.67%, respectively. In the case of a period lag, a PCI increase of 1% will cause FUC to increase by 0.54%. The dominant negative relationship suggests that as incomes increase, FUC decreases, possibly because of factors such as high-income inequality, poor infrastructure, high initial costs, lack of incentives, and cultural factors. More finding from the study reveals a positive relationship between GSCEX and FUC. A 1% increase in GSCEX will increase FUC by 1.60%. The 1 year, 2 and 3 years lagged values reveals positive relationships with FUC, indicating that when GSCEX is increased by 1%, FUC increase by 1.16%, 2.60%, and 0.30%, respectively. A 1% increase in GSCEX two periods ago increased FUC by 2.60%. A 1% increase in GSCEX three periods ago increased FUC by 0.30%. The positive and significant coefficients suggest that increased GSCEX promotes FUC owing to improved public awareness, enhanced infrastructure, and better accessibility to clean fuels. The relationship between INFR and FUC in the current year, 2 and 3 years lagged are positive. A 1% increase in INFR is expected to increase FUC by 2.63%, 0.84%, and 0.06%, respectively. These findings opposed our apriori expectations and economic theory of demand

and supply. These findings might be occasioned to rising prices, leading to an increase in more fuel consumption owing to changes in prices in related products making clean fuels cheaper. However, in the case of 1 year lagged, the relationship is negative, with a 1% increase in INFR expected to reduce FUC by 0.53%. This finding conformed our apriori expectation and theory of demand and supply. The ECM term indicates significant, with a very high speed of adjustment to long-run equilibrium. This means deviations from equilibrium is corrected by 103.72% in the next period. This suggests that the driving factors of FUC are self-correcting, emphasising the stability of the long-run relationship. The R-squared value of 0.999953 explains 99.99533% of the variation in FUC, leaving only 0.0047% for the stochastic term.

## **5. Conclusion**

This work investigates the impact of informal sector on multidimensional poverty indicators, such as primary school enrolment, infant mortality rate, and cooking fuel in Nigeria. Data for this study were sourced from CBN statistical bulletin and World development indicators between 1986 and 2022. The unit root test findings reveal stationarity of the data at level and first difference. The ARDL findings long-run analyses reveal a negative link between the informal sector, per capita income correlates negatively with primary school enrolment, government spending on social and community services reveal a positive relationship with primary school enrolment. Informal sector and per capita income have negative impact on fuel consumption, while inflation positively impact fuel consumption. The long-run findings conclusion emphasis the complex dynamics between economic factors, government policies, and societal outcomes, revealing some of the challenges caused by expansion of informal sector on education and energy consumption, opposing the expected gains from government spending.

The ARDL findings in the short-run reveal positive relationships between lagged of primary school enrolment, per capita income, and government expenditure on social and community services and primary school enrolment, while inflation rates and informal sector relate negatively with primary school enrolment. The ARDL short-run findings for infant mortality rate revealed that the 1 year lagged has a positive relationship, the 2 years lagged has a negative relationship. Informal sector positively relates with infant mortality rate. The current inflation rate negatively relates with infant mortality rate, while the 1 year lagged positively relates with

infant mortality rate. In the case of fuel consumption, government social and community services expenditure and inflation rate have a positive relationship with fuel consumption, however, per capita income and informal sector negate fuel consumption.

Based on the study findings, the study finally recommends the need to provide policies that discourage informal sector. This is expected increase school enrolments, increase fuel consumption, and reduce infant mortality rates both in the short- and long-run.

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