HOW LARGE IS THE SIZE OF NIGERIA'S INFORMAL ECONOMY? A MIMIC APPROACH

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Abstract

The purpose of this research is to estimate the size and development of the Nigerian informal economy using the MIMIC Model approach as well as the amount of tax revenue government losses every year due to the growth of the informal economy. Findings from the MIMIC model revealed that: the size of the informal economy in Nigeria ranges between 47 and 67 percent from 1970 to 2018, and averages 67 percent of the GDP over the same period; and that the

nation, on average, losses 56 percent of her potential tax revenue yearly to informality, with the estimated tax revenue loss being around ₦3.5 trillion in 2018. The study concludes that regulation burden, unemployment, and institutions are the key drivers of informality in Nigeria.

Keywords: Informal economy, Informality, MIMIC Model, Nigeria, SEM, Tax Revenue Loss

INTRODUCTION

This study aims to innovatively estimate the size of the informal economy of Nigeria using the MIMIC Model and the amount of tax revenue the government loses yearly to the growth in the informal economy. The informal economy continues to grow as several efforts are made by researchers to understand its size, nature, causes, and indicators. Policymakers and other stakeholders are increasingly developing interest in its development and performance mainly because of its role in poverty alleviation, employment generation, government revenue, workings of the economy, among others (Benjamin, Beegle, Recanatini, & Santini, 2014).

Though informal sector plays a prominent role in poverty mitigation, employment generation, creation of a stimulating effect on the formal economy, and acting as the 'last resort' during periods of economic recession and financial crisis, especially in developing and resource-dependent countries like Nigeria, it poses several economic risk and difficulties in the long term (Nguyem, 2019). Aside from making economic policies ineffective by reducing the credibility of the size of the formal economy (which serves as the basis of judging every economy), it creates several tax revenue losses, deepens the labour force unproductivity, and acts as a hindrance to a nation's international competitiveness.

Nguyen (2019) showed that an informal economy size of 17.6 to 36.7 percent of the Gross Domestic Product (GDP) implies an average of 3.5 to 9.8 percent tax revenue loss. This argument has prompted several countries to put a searchlight on the size and performance of their informal economy. The unavailability of official statistics on the size of the informal sector in Nigeria has continued to serve as a limiting factor to several research efforts in the informal sector. And this has made it difficult to understand how monetary and fiscal policies transmit to the informal sector and the implication for the overall health of the nation's economy. Distinguin, Rugemintwari, and Tacneng (2016) showed that it is almost impossible for an economy to achieve long term growth if the bulk of its economic activities are performed outside the regulatory purview (monetary and fiscal policies) and taxation regime. The problem with the high informal sector often experienced by developing countries is that: there is low productivity in the sector; dominated by women, and government policies to improve labour and organisation productivity are often defeated (Garzarelli & Limam, 2019). The poor performance of Nigeria and other African countries in the global supply chain calls for more attention to be paid to the

competitiveness and productivity of the informal sector to increase the nation's export at the international level in particular, and the region's export in general. Hassan and Schneider (2016a) noted that the informal economy promotes: resource distortion; underutilisation; and bias in official data like the unemployment rate and GDP statistics.

Although some literature has attempted to estimate the size of the informal economy in Nigeria, there remain considerable controversies to date as regards the methodologies, approaches, and definition of informality. And every researcher tends to adopt different methods and approaches based on perceived peculiarities to an economy under investigation. To date, only two studies – Ogbuabor & Malaolu (2013) and Oduah (2008), have attempted to estimate the size of the informal economy in Nigeria using the MIMIC approach. While the MIMIC approach arguably remains the most favoured among the indirect approaches adopted in literature, these two studies from Nigeria suffer from possible heteroscedasticity resulting from the estimation techniques adopted. Both studies also neglect the role of institutions in estimating the size of the informal economy. Hassan & Schneider (2016a) made considerable effort to address the issue of heteroscedasticity and institution using panel data from 157 countries. However, the study failed to incorporate some critical variables that drive informality in Nigeria, resulting in the estimation of skewed trends for Nigeria. This study, therefore, seeks to address these two issues and verify the findings of Hassan and Schneider for Nigeria.

The rest of this paper is divided into four sections; section 2 provides theoretical clarification and discussion of the concept. Section 3 discusses the MIMIC Model estimation procedure and justification for the variables included, while section 4 discusses the result of the findings. Section 5 concludes the paper and proffers policy implication.

THEORETICAL REVIEW

Conceptual Clarification

Providing an encompassing definition and boundaries for the informal economy activities is one of the biggest challenges faced by literature attempting to estimate its size. There are several approaches and criteria often employed by researchers to provide a comprehensive definition of the informal sector. But, most studies that used an econometric model in estimating the size of the informal economy often defined the informal economy as all market-based goods and services not included in the official estimates of GDP (Galiani & Weinschelbaum, 2012; Ogbuabor & Malaolu, 2013; Nguyem, 2019).

The International Conference of Labour Statisticians (ICLS) sees the informal economy as that part of production units embedded in the household institutional sector of the System of National Account (SNA), which means that informal sector enterprises are part of the household

enterprises that are unincorporated or quasi-incorporated. The 17th ICLS further noted that informal economy comprises those enterprises that are not registered as legal entities separate from their owners and have no comprehensive statements of accounts that indicate the flows of income (ILO, 2004). They view the informal economy from a legal perspective of the enterprise and statements of accounts. As such, informal economy enterprises do not own assets and liability separately from their owners. In other words, the owners of the enterprises bear all financial risks associated with the businesses. In this form of enterprise, business expenses are often not separated from personal expenses, and business assets like vehicles and buildings are commonly used simultaneously for personal and business purposes. This definition has been criticised on the ground that some informal enterprises are registered as separate entities from their owner but lack comprehensive financial statements, and as such, do not pay taxes, and most have less than five employees.

In general, the informal economy has been defined based on the following categories – size of the enterprise, registration status of the organisation, nature of formal accounting statements, tax payment plan, government regulation of the enterprise. Others include existing social security; access to formal bank credit; mobility of the workplace; sources of income; and legality of economic activities (Benjamin et al., 2012; La Porta & Shleifer, 2014; Nguimkeu, 2014). From reviewed literature, four of these criteria stand out – registration status of the enterprise, size of the enterprise, the existence of formal statements of accounts, and tax payment status.

Registration Status of the Enterprise

The most commonly used criterion for defining whether an enterprise operates in the formal or informal economy is whether the enterprise is registered with a recognised government regulatory agencies like Nigeria's Corporate Affair Commission (CAC) (Farrell, 2004; Dabla-Norris & Inchauste, 2008). It is argued that mere registration of a business without having clear statements of accounts or not fully disclosing the flow of funds does not qualify an enterprise as a corporation (Dabla-Norris & Inchauste, 2008; Galiani & Weinschelbaum, 2012). Similarly, La Porta and Shleifer (2008) noted that registration with government agencies should be supported with other criteria like the size of the workforce in the organisation, whether the firm pays tax to tax authority or not when sampling informal firms.

However, evidence revealed that most researchers, using a direct approach to measure the size of the informal sector, often employ business registration criteria as the major criteria for exclusion, as this is easier to determine than other criteria like complete accounts and size of the corporation (Benjamin et al., 2012). Steel and Snodgrass (2008) noted that if we consider

explicitly registration as informality then it will only be street vendors and household traders that will be regarded as informal firms. Still, most of the so-called informal firms might not even be registered but at the same time pay different categories of tax to the tax authorities either at the local or state level.

Size of the Enterprise

The Size of the employees in the household enterprise is often used by different surveys on the informal sector to determine which enterprise to be included and which should not. Most of the literature that employed size criteria used ten employees as a benchmark (Cunha, 2006; Galiani & Weinschelbaum, 2012). ILO (2004) recommended that a household enterprise should be that firm that has no separate operations different from the owners, which are neither registered with government agencies and have less than ten employees. While most countries have adhered to this recommendation, others decide to choose lower boundaries of say a minimum of five employees as the criteria of the informal sector. The argument is that organisations with small employees rarely have the capacity, skills, and resources to have a clear financial statement that discloses the performance of the business to the tax authority and other statistical or government agencies (Benjamin et al., 2014).

Ulyssea (2010) noted that most countries employ a combination of different criteria to determine informality instead of a single criterion, thereby adjusting the number recommended by the 17th ICLS. For the survey, at country level, there is the decision whether to include activities in the informal sector, as well as unpaid domestic help – including activities of the housewives, activities of individuals with second to third jobs in the informal sector (a common situation in Nigeria), and rural economic activities. This criterion has been critised on the ground that an enterprise might have only two official employees, yet it is registered, have a clear set of financial statements, and pays taxes to the appropriate authority (Benjamin et al., 2012).

Availability of Comprehensive Financial Statement

The unavailability of financial statements of an enterprise, as well as dishonest reporting of true financial position either because of the owner lack of accounting skills, or where the enterprise deliberately declares misleading statements of the business performance to evade tax are primary criteria often used to determine how to categorise an enterprise. Most countries often exclude household enterprises that maintain a set of comprehensive financial statements that are readily available to the tax authority and other statistics agencies from the informal sector, regardless of the number of employees and legal status of the entity (Dabla-Norris & Inchauste, 2008; Ulyssea, 2018).

A study by Benjamin et al (2012) maintained that firms with comprehensive financial statements comply with tax authorities more than those without complete financial statements. The authors maintained that enterprises with honest and thorough financial statements could easily be assessed by the government authorities and mostly enjoy some level of government social securities, notably when the firms are registered with government agencies at any level. Banks and other formal financial institutions are more willing to give credit to firms with adequate financial statements showing the flow of income and expenses and registered with the government compared with those without financial records (Dabla-Norris & Inchauste, 2008). Dabla-Norris & Inchauste (2008) noted that most financial institutions require registration and financial statements as criteria for accessing credit from the bank. Sinha & Christopher (2006), argued that the informal sector is usually the unorganised enterprise without a complete set of accounts, not registered, and lack access to credit for expansion, resulting in their low performance.

Tax Payment Criteria

Some critics of other criteria like size of the firm and legal status argued that even when some of these firms are not registered with the central government, they are oftened registered with the local or state government and remit their tax (Sinha & Christopher, 2006). Steel & Snodgrass (2008) argued that the origin of the concept of the informal sector is to explain the hidden nature of certain enterprises from the tax authority and therefore refute the idea that those who do not register their business should be seen as an informal enterprise, especially when the enterprises pay their taxes to the tax authority. They argued that tax payment should be a major factor when considering whether to classify an enterprise as informal or formal. The authors argued that if the basis of classifying enterprises is whether they are hidden from government revenue agents or not; then most household enterprises cannot be regarded as informal enterprise. This argument has been criticised by literature that paying taxes should never be the primary determinant in classifying informality as a firm without clear financial statements can declare any amount as profit – and pay taxes based on such reported profit – just to escape the tax authority, while failing to provide the tax authority with the true position of the enterprise (Adams, 2008; Benjamin et al., 2012).

From the above, there are no single criteria that can adequately capture the informal economy. For instance, using the size criteria alone might be misleading as there are some enterprises with a small employee of less than five but are registered, have comprehensive statements of financial flows, and pay their taxes as when due. Using employee size, in this instance, might be misleading. Secondly, the registration criteria, as seen above has been

criticized by several authors who argued that some firms might be registered yet have no clear financial statements, no evidence of tax payment, and have less than five employees.

In conclusion, the informal economy is still evolving because of the aforementioned factors. As such, individual nations often considering the peculiarity of the economic structure in deciding which of the criteria to include or exclude in determining enterprises to be classified in the informal economy. For this article, the informal economy consists of all productive economic activities which are not captured in the computation of GDP. This study categorizes household enterprise as an enterprise not registered as a different entity from its owner; having no clear or complete financial statements, and does not pay any corporate or employees income tax to tax authority regardless of its size, location, and access to credit. This study, therefore argues that an enterprise that meets at least two of these criteria would be categorised as an informal enterprise.

Causes of the Informal Sector

The most common causes of informality as identified in the literature reviewed include taxation burden, increased regulation in the formal economy, weak institutions, unemployment, economic crisis, economic size, among others (Farrell, 2004; Ogbuabor & Malaolu, 2013; Schneider, 2015; Nguyem, 2019).

Taxation burden and social security

The most prominent factor often cited by researchers as the leading cause of informality is tax burden and the national social security/welfare system (Cunha, 2006; Schneider et al, 2010; Hassan & Schneider, 2016; Ulyssea, 2018). The idea is that high taxation in the formal sector induces more labour force into the informal sector that is not taxed since higher tax rates result in lower disposable income and lower labour force leisure. Similarly, if the compliance cost (that is, the degree of difficulties in paying the tax) is high, more enterprises will want to remain in the informal economy. While most literature identified tax burden as the major drivers of informality in developed countries, Ogbuabor and Malaolu (2013) noted that the same could not be said of developing countries. They argued that tax burden does not play the most prominent role in explaining the growth of informality in Nigeria, but other factors like unemployment play the most crucial part.

Government regulation and law

Prevailing laws guiding the operations of an enterprise in a country may lead to a decline or growth of informality in a country. Where the process of registering a company or an enterprise

is tasking and time consuming, most enterprises will prefer to remain in the informal economy, irrespective their employees size and financial statements (Buehn & Schneider, 2011). Red tape and the complicated process of formalizing an enterprise discourages some enterprises from formalizing their operations regardless of the disadvantages that come with remaining in the informal economy (Hassan & Schnider, 2016a). Benjamin et al (2014) noted that in most developing countries where formal jobs are not readily available, informality is growing not just because the entrepreneurs do not want to formalize their operations but because the process of registering with the government, transparency in the registration process can be extremely difficult, resulting in their preference to remain in the informal economy.

In Nigeria, but for the recent modification in the process of registering a business with the CAC, registering a business was a herculean task, unlike in western countries where an enterprise can easily register with the regulatory bodies and immediately obtain the certificate of registration (Ogbuabor & Malaolu, 2013; Oduh, 2008).

Institutions and rule of law

Apart from tax burden (incidence of high taxation and multiple taxations), inflexible and difficult regulations that discourage entrepreneurs, the state and the poor quality of the institutions in most developing countries contribute to the rise of the informal sector (Schneider et al, 2010; Benjamin et al., 2012; Nguyem, 2019). Where the rule of law prevails, investors are encouraged to formalize their businesses as property rights are secured, contract rights are based on the law, and employment is mostly based on merit, encouraging formal sector participation by both the employers and the employees. Nguyem (2019) on the size of the informal economy of the Vietnam economy opined that more employers are willing to participate in the formal economy when they have confidence in the government transparency in the tax system, social security, respect for the rule of law as compared to when they do not have confidence in the system. Similarly, weak institutions, high prevalence of corruption, lack of government accountability, and lack of transparency in governance are among the key institutional issues driving the growth of the informal sector. Benjamin et al (2014) shared the view that corrupt government and lack of respect for the rule of law are among the leading causes of informality in Nigeria, especially in the big informal sector enterprise. The authors noted further that informality in Africa is a pointer to systemic failure in governance, noting that most informal enterprises avoid paying taxes on the ground that the governments have failed in their responsibility.

Unemployment and Economic Crisis

A high incidence of employment opportunities in the formal sector has been attributed to the rise in informal sector employment. As such informal sector employment and the informal economy size are inversely correlated with formal sector employment. As such, the higher the formal unemployment rate in a country, the more likely the tendency that the labour force is migrating to the informal economy for livelihood (Fisman & Svensson, 2007). When individuals cannot find a job in the formal economy, they resort to the informal economy for solutions, thereby expanding the informal economy employment. Underemployment in the formal economy also increases the size of the informal sector employment as many employees in the formal economy takes solace in the informal economy to beef-up their earnings at the formal economy (Galiani & Weinschelbaum, 2012; Distinguin et al, 2016; Schneider, 2015). It is almost impossible to list all the causal factors driving informality in Nigeria and anywhere in the world because the issues are dynamic, and several factors are not even observable.

Methods of Estimating Informal Economy

One of the most daunting tasks facing policymakers and academicians for the past five decades is establishing a consensus in measuring the size of the informal economy, given its importance in policy and decision making. Three approaches – direct, indirect, and econometric methods have been developed over the years to measure the informal sector, with each having its fair criticism.

Direct Method

This approach is also referred to as a microeconomics approach because it involves collecting data at a microeconomic level by taking a sample or census of the informal sector enterprises. The approach could be through surveys or tax audits, each having its benefits and criticism.

- ● ***Survey approach*** - is mostly employed by most direct approach studies in estimating the size of the informal economy, especially World Bank projects (Schneider & Buehn, 2016). Benjamin et al (2014) extensively discussed the design, approaches, sample selection, and advantages of survey approach. One particular advantage of the direct method is that it can obtain detailed information with regards to the structure, nature, distribution, and demographic characteristics of the size of the informal economy when compared to other approaches (Benjamin et al., 2014; Schneider & Buehn, 2016). The disadvantage of this approach includes respondent hostility, difficulty to assess the amount of undeclared work, hidden information, the result might be affected by the design of the questionnaire, lack of global consensus on the methodology, and sample

frame, among others. In general, the biggest problem to survey is inconsistent or lack of international comparability of the methods in the survey.

- *__Tax auditing__* - is another direct approach which involves selective check as compared to the amount declared for tax purpose. The challenges with this approach are that it is selective based on available data, and the data only reflects those that the tax authority discovered or that comply with tax irregularly (Hassan & Schneider, 2016a; Nguyem, 2019).

Indirect Approach

This approach is also known as indicators of macroeconomic approach, where researchers often rely on certain macroeconomic variables that indicate the growth of the informal economy (Oduh, 2008; Schneider et al, 2010; Schneider & Buehn, 2016). There are about five identified indicators to this approach which include:

- **Discrepancy approach -** where the difference between the estimate of GNP using both the income method and expenditure method is used to measure the informal economy. Most literature suggests the use of the first discrepancy to capture the informal sector rather than the published discrepancy (Buehn & Schneider, 2012).
- **Difference between the official and actual labour force** - where a decline in the labour force participation in the formal economy is an indication of the growth in the labour force participation in the informal economy. One of its criticisms is that people can be working in the formal economy and still engage in the informal economy, and the difference might be due to other factors (Nguimkeu, 2014; Schneider & Buehn, 2016).
- **Transaction approach**: This is based on the Fisher model of MV=PT. Here the volume of transactions is compared to the official and unofficial GNP, such that the informal economy is estimated as the difference between the nominal GNP and the official GNP (Buehn & Schneider, 2012).
- **Currency demand approach** - an approach that is based on currency demand indicators, such that an increase in currency demand is an indication the informal economy is growing. One issue with this approach is the emphasis on cash transactions. In contrast, an increasing number of informal sector activities in developing countries like Nigeria are not necessarily carried out in cash.
- **Physical input or electricity method:** This entails the use of the difference in the estimate of the electricity consumption and official GDP as the size of the informal sector. Kaufmann-Kaliberda and Lacko have used electricity consumption as an indication of the overall economic activities.

Econometric Method

This method is in response to the defects in the indirect approach, which mostly relies on one indicator to explain the growth of the informal economy even though informality is reflected not only in labour market but also in production and money market (Buehn & Schneider, 2011; Schneider & Buehn, 2016).

The econometric approach is built on the assumption that several factors with multiple indicators cause informality and this approach is referred to as the Multiple Cause Multiple Indicators (MIMIC) approach. The approach involves employing the covariance information in the observable variables for the unobservable, which entails simultaneous specification of factor and structural model linked to the observable variables. Then, a relationship between the observed and the unobserved in a structural model is specified. The unobserved is, therefore, the size of the economy, while the observed are the indicators of the size of the informal economy showing the structural dependence of the informal economy size on the observed variables.

METHODOLOGY

The MIMIC Model

The MIMIC model has two sides – the measurement model and the structural equation model (SEM). While the measurement model is for linking the observed variables (causes) to the unobserved variable (latent), the SEM is used to ascertain the causal relationship among the indicators as depicted in figure 1 below (Lesica, 2011). The intuition is that while the latent variable cannot be observed it can be inferred through the indicators.
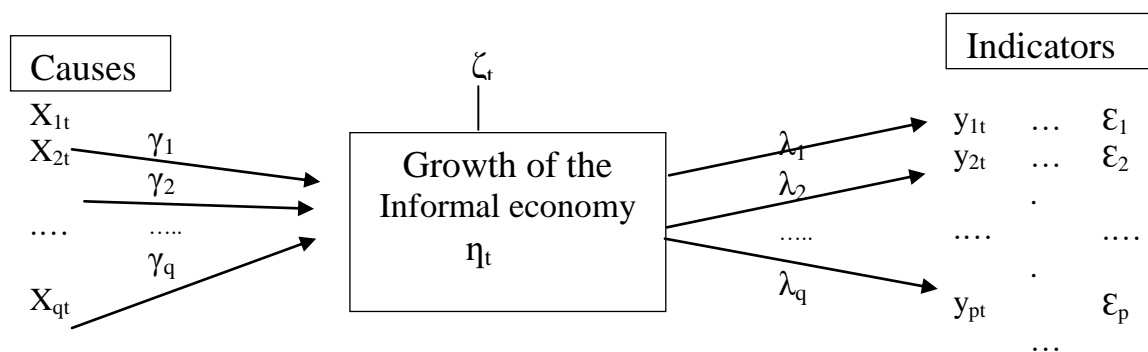

Figure 1: Size of the informal economy

Following the work of Lesisca (2011), Schneider et al (2010), and Nguyem (2019) the relationship can be represented as in equation 1 below:

$$\eta_t = \gamma' x_t + \zeta \qquad\qquad 1$$

Where the vector of the observed variables, x_t $(x_{1t}, x_{2t}, \ldots\ldots x_{qt})$ is a matrix (q*1) and each of the x_t, 1, 2, …Q is causing the informal economy (η_t) to grow. Similarly, γ' $(\gamma_1, \gamma_2, \ldots, \gamma_q)$ represent the vector of the regression coefficient that is linked to a latent variable (informal economy) with its causal variables. While ζ represents the error term of the structural equation model, the model assumes that the variables are a deviation from their means such that the disturbance term ζ does not correlate with the causal variables x_t. As such, $E(\eta_t) = E(x_t) = E(\zeta)$ = 0 and $E(x_t\zeta') = E(\zeta x_t') = 0$. The measurement model, that is, the link between the indicators and the latent variable is given as;

$$y_t = \lambda\eta_t + \mathcal{E}_t \qquad\qquad 2$$

Where $y_t(y_1, y_2, \ldots, y_p)$ represents the vector of indicator variables (p*1); λ represents the regression estimate of changes in the indicators resulting from changes in the latent variable, and $\mathcal{E}_t$ is the disturbance term and is assumed normally distributed. Substituting 1 into 2 gives equation 3 as stated below:

$$y_t = \lambda\gamma' x_t + \lambda\zeta + \mathcal{E}_t \qquad\qquad 3$$

Where the indicator variance is given as;

$$var = (y_t|x_t|) = var\ (\lambda\zeta + \mathcal{E}_t|x_t|) = \lambda\lambda,\psi + \theta \qquad 4$$

Where $\psi = var\ (\zeta)$ and θ = var ($\mathcal{E}$). It is clear from equation 3 above that a numeric estimate for the structural parameter cannot be estimated. As such, a feasible way is to express one parameter relative to the other. If for instance, following the example of Lesisca (2011), suppose we are using two indicators and we set λ =1 in equation 3, then the two indicator variables become;

$$y_{1t} = \gamma x_t + v_t \qquad\qquad 5$$

$$y_{2t} = \lambda_2\gamma x_t + u_t \qquad\qquad 6$$

We can infer that the x_t coefficient in equation 6 is proportional to that of 5 and λ_2 is the degree of proportionality. And γx_t is the expected value of y_{1t}, such that, $E(y_{2t}) = \lambda_2 E(y_{1t})$. Eq6 can be written in equation 7, so that both equations 5 and 7 can be estimated simultaneously using the Generalized Least Squares technique; and the indicator variables are analogous to endogenous variables, while the causal variables are equivalent to an exogenous variable.

$$y_{2t} = \lambda_2 y_{1t} + z_t \qquad\qquad 7$$

Causes and Indicators

As noted earlier, there are two parts to estimating the informal sector using the MIMIC model approach; understanding the factors that drive the size of the informal sector (causes) and the indicators of high informality.

Causal Variables

Tax burden: It is assumed that the higher the tax burden, the higher the incentives to operate in the informal economy to avoid the incidence of paying tax (Ogbuagbor, 2014; Schneider & Buehn, 2016; Nguyem, 2019). While some countries with high tax rates, especially in Europe, still have a low informal economy is attributed to the role of an effective institution, the tax burden will be measured as a percentage of tax revenue to GDP.

Regulatory burden: It is believed that excessive regulation of the private sector leads to high bureaucracy, reduces entrepreneurship entry into the formal sector, and promotes the growth of the informal economy. Most literature proxy regulation burden with government expenditure as a percentage of GDP (Buehn & Schneider, 2012; Schneider, 2015; Nguyem, 2019).

Institution: It is believed that countries with strong institutions – respect for the rule of law, the enforceability of the contracts, property rights, ease of doing business, low corruption indices – have lower informal sector, as entrepreneurs are willing to formalize their processes either because of the consequences of not doing so or because of benefits of being in the formal economy (Hassan & Schneider, 2016b; Nguyem, 2019). This study will use the economic freedom index from the Heritage Foundation to capture the role of institutions, and the higher the index, the lower informality.

Unemployment rate: It is believed that high unemployment in the official economy will induce growth in informal employment, which increases the size of the informal economy. The argument is that as people are unable to find jobs in the formal economy, they turn to the informal economy for sustenance (Ogbuabor & Malaolu, 2013).

Interest rate: It is believed that high interest on bank deposit increases the opportunity cost of holding money in cash. Thus, an increase in the interest rate on deposit induces the economic agent to want to hold less cash to enjoy the benefit of a high-interest rate. Therefore, we expect a negative relationship between the interest rate and informal economy following the work of Ogbuabor & Malaolu (2013).

Indicator Variables

As mentioned earlier, informal economy cannot be measured directly, as such, researchers rely on variables indicating the presence of high informality in an economy (Buehn & Schneider, 2012; Dell'Anno, 2007; Nguyem, 2019).

Official Economy: Many pieces of literature have found negative relationships between the formal economy and informality (Schneider & Buehn, 2016). The intuition is that as more labour forces are joining the unorganised informal economy, the output of the official economy will decline. This study will follow other previous studies on informality and use real GDP as a reference variable in the MIMIC model and assigned -1 to the variable for normalisation process.

Currency in Circulation (CIC): It is believed that majority of the transaction in the informal economy are carried out in cash or money in the current account that is withdrawn at the moment of notice largely because of the intention to hide the transactions from authorities or because the transactions are low, which might require small cash. Following the work of (Dell'Anno, 2007; Ogbuagbor, 2014), this study will employ CIC and expect a positive relationship with informality.

Total Factor Productivity: While most literature often employed labour force participation rate as the third indicator of informality on the assumption that low participation in official labour is an indication of participating in the informal economy. This is not true in most cases, because institutional factors like unemployment benefits might cause individuals to work or not. Similarly, evidence revealed that in some countries like Egypt, there is simultaneous high unemployment in both informal and formal economy which indicates that low labour participation in the official economy does not reflect high involvement in the informal economy (Schneider & Buehn, 2016). This study instead employs total factor productivity as an indication of informality. The intuition is that formalisation encourages technology adoption and employment of skilled labour force in the production process, both of which drive total factor productivity (TFP) upwards (Hussien, 2016; Garzarelli & Limam, 2019). Thus, countries with low TFP tend to have much of their labour force working in the informal sector, with low technology applications and low labour productivity. More so, evidence revealed that Africa exhibits low TFP because of their low skilled labour force, low technology application and has the highest incidence of informality (Hussien, 2016; Schneider & Buehn, 2016; Garzarelli & Limam, 2019).

Data Sources

Data are sourced mainly from the Central Bank of Nigeria Statistical Bulletin (2018). The research source other data like institution variable (economic freedom index) from the Heritage

Foundation website, total factor productivity from the World Bank Development indicator databank. And lastly, tax revenue from the Nigeria Federal Inland Revenue Service (FIRS) website.

ANALYSIS AND DISCUSSION OF FINDINGS

In the preceding section, we discussed the theoretical foundation of the model as well as established the expected relationship between the informal economy and the observed variables. To examine the nature and distribution of the time series, the study started by conducting basic descriptive statistics, as presented in Table 1 below.

Table 1: Descriptive Statistics of the model (E-view Output)

	TAB	REG	INSTT	TFP	UNMP	CPS (N'B)	GDP (N'B)
Mean	12.389	0.1213	50.071	0.9753	7.1285	5.1455	21384.6
Median	10.678	0.0912	47.400	0.6887	6.1000	5.4747	1762.81
Maximum	34.583	0.3046	58.500	2.1677	22.530	10.022	127762.
Minimum	3.5422	0.0008	45.636	0.3007	1.9000	0.3584	42.2000
Std. Dev.	7.5271	0.0865	4.5717	0.5419	4.4153	2.6546	35106.9
Skewness	1.2108	0.8546	0.5341	0.8795	1.4026	0.0410	1.64917
Kurtosis	3.6535	2.6938	1.5994	2.3134	4.9214	1.9967	4.47008
Observations	49	49	49	49	49	49	49

A key observation from the descriptive statistics is that the time series are well behaved. For instance, the mean and median values, except for the GDP, are remarkably close to each other, showing little deviations. This is further confirmed by the skewness values, which lie between 0.5 and 2.5 as Wooldridge (2013) observed that one way to find out whether a time series is well behaved is to look at whether the skewness value falls within the range 0.5 - 2.5.

Table 2: Stationarity Test Using ADF statistics at Trend and Intercept

Variable	ADF @ Level	ADF @ 1st Diff	t-Statistic	Order of integration
Causes				
TAB	-3.842594**	-	-3.508508	I(0)
REG	-5.908820***	-	-3.510740	I(0)
INSTT	-3.737035***	-	-3.506374	I(0)
UNMP	1.692891	-5.653149***	-3.510740	I(1)
INT	-2.208765	-8.819361***	-3.508508	I(1)

Indicator Variables					Table 2…
TFP	-1.157571	-7.814093***	-3.508508	I(1)	
LOG(CIC)	-0.979298	-4.193154***	-3.508508	I(1)	
Log(GDP)	-4.556202****	-	-3.533083	I(0)	

Significance is indicated as follows: ***, ** and * for 1%, 5% and 10% respectively.

The study further tried to determine whether the time series employed in the estimation are stationary and free from unit root, as presented in Table 2 above. Specifically, it was revealed that all the observed variables were stationary either at level or at first difference. Since not all the observed variables are integrated at level, there is need to ascertain the presence of cointegration between the causes variables and GDP, which is the reference indicator variable, using Eagle granger two-step approach following the example of Ogbuabor & Malaolu (2013) and Schneider & Buehn (2016). This is achieved by regressing the causal variable against GDP at their level without including constant to ensure the variables are representation of deviations from their means.

Table 3: ADF Unit Root Tests Result for Residual (U_1)

Variable	Test Statistic	5 % critical value	Order of integration
Long (U_1)	-4.311197**	-3.595026	I(0)

Significance is indicated as follows: ***, ** and * for 1%, 5% and 10% respectively

The next step tests whether the residual (U_1) is integrated at level using Augmented Dickey Fuller. There is co-integration if the null hypothesis is rejected. From the result in Table 4.3, the residual error is stationary at 5% level of significance. This is further affirmed using Johansen cointegration test. Table 4 indicates that the causal variables and the reference indicator have a long-run relationship with two cointegrating vectors.

Table 4: Johansen Cointegration Test Between Causes and GDP

Max Rank	0	1	2
Trace Statistics	129.3217**	74.07471**	40.96592
5% critical value	95.75366	69.81889	47.85613

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

** denotes rejection of the hypothesis at the 0.05 level

Having established the presence of cointegration, we proceeded to estimate the relationship using Generalized Least Square (GLS). While Ogbuabor & Malaolu (2013) used ECM to estimate the relationship, Hassan & Schnider (2016a) used MLE to take care of the problem of endogeneity that ECM suffers from. MLE and GLS are generally equivalent in linear case and often preferred over OLS when the error variances are functionally related to the regression parameters (Carroll & Ruppert, 1982). The authors further noted that when there is a need to protect against possible misspecification of the functional relationship of the error term in the model, GLS is preferred over MLE. Moreso, GLS performed even better when the assumption of homoscedasticity is relaxed, thereby solving the problem of possible heteroscedasticity. This study, therefore, follows (Nguyem, 2019) in using GLS.

Table 5: The MIMIC Model

Variables/ Specification	Coeff.	Remarks
Tax burden (tab)	1.814 (0.648)	Not Significant & expected
Regulation burden (REG)	2.775 (0.011)***	Significant & expected
Institution (INSTT)	0.063 (0.015)***	Significant & unexpected
Unemployment (UNMP)	0.027 (0.002)***	Significant & expected
Interest Rate (INT)	-0.013 (0.084)*	Significant & expected
Indicator Variables		
GDP (economic growth)	-1	
Total Factor Productivity	0.471 (0.001)***	Significant & unexpected
Currency in circulation	0.936 (0.000)***	Significant & expected
GFI	0.9325	
LR statistic	4679.522	
Prob(LR statistic)	0.000000	
Pearson statistic	0.067430	
DF	40	

Significance is indicated as follows: ***, ** and * for 1%, 5% and 10% respectively.

The overall model goodness of fit is estimated at 0.9325, which falls within an acceptable region. Similarly, the LR statistic has a p-value (0.000) lower than a 5% level of significance. This further validates the model's overall fit and stability in estimating the informal economy size.

The Causal Variables

The coefficient of the tax burden of 1.814, though not significant at 5% level of significance, has an expected sign. This implies that tax rate does not necessarily drive informality in Nigeria.

This affirms the findings of Ogbuabor (2014) in the short run. Further evidence that the tax rate in Nigeria is generally low compared to other countries and may not influence informality as in developed countries. Nigeria's Value Added Tax (VAT) was only recently increased from 5% to 7.5% as compared to an average VAT rate of 15% in other African countries (Tonuchi, 2020).

The regulation burden, with a coefficient of 3 2.775, has a p-value of 0.011, indicating that the variable is significant at 5% level. This means that a rise in government regulation burden has the propensity to hinder several informal sector firms from joining the formal economy. The sign conforms with the findings of previous studies (Buehn & Schneider, 2011; Hassan & Schnider, 2016a; Nguyem, 2019).

Unemployment, as expected, has a positive coefficient of 0.027, with a p-value of 0.002. This implies that the variable is significant at a 1% level and that an increase in unemployment rate in the formal economy will result in unemployed individuals turning to the informal economy for solace, thereby driving up informality. This also affirms the findings of Ogbuabor (2014). Theoretically, it is assumed that sound institutions will encourage migration from the informal economy to the formal sector as evidenced by developed countries. The case of high informality in many African countries is attributable, in part, to poor institution quality (Hassan & Schnider, 2016a; Nguyem, 2019). However, the coefficient of the economic freedom index of 0.063 with a p-value of 0.015 is positive, contrary to expectation.

Lastly, the coefficient of interest rate is -0.013 (p-value = 0.08), signifying that a rise in interest rate discourages informality, as more people would prefer to enjoy a high-interest rate on deposit rather than holding cash. As expected, the currency in circulation is a strong indicator of informality in Nigeria, with a p-value of 0.000. This implies that as more technology is adopted in the banking system to reduce cash transactions, informality in Nigeria reduces.

Estimating the Size of the Informal Economy

The MIMIC index used to estimate the size of the informal economy in Nigeria is obtained by multiplying the estimated causal parameters with the corresponding time series variables. Notice that the MIMIC model only produces the index of the trend of the size of the informal economy, telling us only the changes in the informal economy from year to year. However, to calculate the size of the informal economy as a percentage of GDP, a step called benchmarking is required to calibrate this index based on exogenous information about the size of the informal economy. Only those causal variables significant at a 5% level will be used in estimating the size of the informal sector (Nguyem, 2019; Hassan and Schneider, 2016a). Based on the data in Table 5 the MIMIC index can be calculated using equation 8 below.

$$\tilde{\eta} = 2.775 * x_{2t} + 0.063 * x_{3t} + 0.027 * x_{4t} + \zeta \qquad\qquad 8$$

The benchmarking process requires that equation 8 be based on a given benchmarked year. For this present study, the year 2000 is adopted using the average result of two studies of Hassan and Schneider (2016a) and Ogbuabor & Malaolu (2013). Hassan and Schneider (2016a) estimated the size of the informal economy of Nigeria at 56.21 ($\acute{\eta}_{2000} = 56.21$), which will be used as the reference value for estimating the size of the informal economy in this present study. For instance, to calculate the informal economy for 2018, we start by calculating the MIMIC index for the informal economy for 2018 and 2000 by replacing the values x_i in equation 8 in both years.

$$\tilde{\eta}_{2000} = 2.775 * 0.102 + 0.063 * 50.9 + 0.027 * 5.6 = 3.653$$

$$\tilde{\eta}_{2018} = 2.775 * 0.061 + 0.063 * 57.2 + 0.027 * 22.5 = 4.397$$

The above are the MIMIC indexes for 2000 and 2018. To calculate the size of the informal economy for 2018 we apply the formula below – adapted from the work of Nguyem (2019) and Hassan and Schneider (2016a). We simply replace the value above in the model to estimate the size of the informal economy.

$$\hat{\eta}_{2018} = \frac{\tilde{\eta}_{2018}}{\tilde{\eta}_{2000}} \, \acute{\eta}_{2000} = \frac{4.397}{3.653} * 56.21 = 67.65 \, (\%GDP) \qquad 9$$

The process is repeated to get the size of the informal economy for Nigeria from 1970 – 2018, and the detailed result is shown in Table 4.6 and plotted in Figure 2 below.
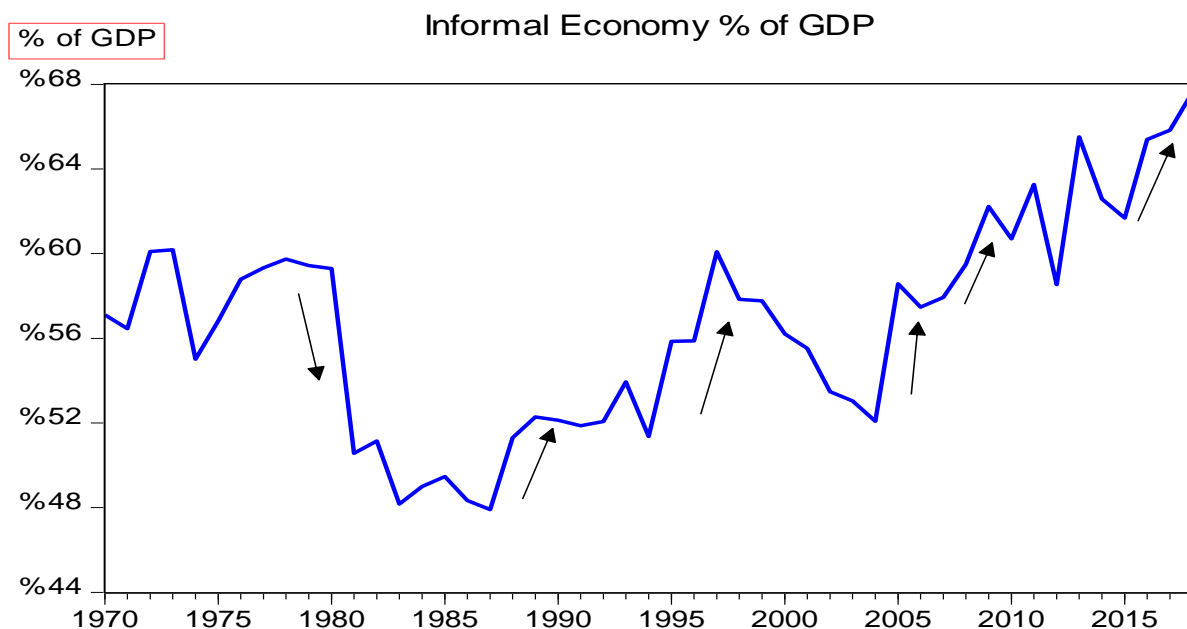
Figure 2: Informal Economy Size 1970-2018

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Table 6: Size of the Informal Economy

Years	GDP (₦Billion)	*Size of Informality (₦Billion)	*Informal Economy (% GDP)	FIRS Tax Revenue (₦Billion)	*Tax Revenue Loss Estimate (₦Billion)
1970	42.2000	24.10	57.10	1.63	0.93
1971	47.2000	26.64	56.45	1.17	0.66
1972	48.9000	29.39	60.10	1.41	0.85
1973	53.1000	31.95	60.18	1.68	1.01
1974	159.2000	87.57	55.01	1.70	0.94
1975	271.7000	154.39	56.82	4.54	2.58
1976	291.4000	171.32	58.79	5.51	3.24
1977	315.2000	187.00	59.33	6.77	4.02
1978	292.1000	174.51	59.74	8.04	4.80
1979	299.4000	177.96	59.44	7.37	4.38
1980	315.4000	187.00	59.29	10.91	6.47
1981	144.831	73.24	50.57	15.23	7.70
1982	154.978	79.28	51.15	13.29	6.80
1983	163.000	78.52	48.17	11.43	5.51
1984	170.378	83.47	48.99	10.51	5.15
1985	192.273	95.12	49.47	11.25	5.57
1986	202.436	97.84	48.33	15.05	7.27
1987	249.439	119.51	47.91	12.60	6.04
1988	320.329	164.32	51.30	25.38	13.02
1989	419.196	219.16	52.28	27.60	14.43
1990	499.677	260.48	52.13	53.87	28.08
1991	596.045	309.16	51.87	98.10	50.88
1992	909.803	473.74	52.07	100.99	52.59
1993	1259.070	679.10	53.94	190.95	102.99
1994	1762.813	905.44	51.36	192.77	99.01
1995	2895.201	1617.00	55.85	201.99	112.81
1996	3779.133	2111.76	55.88	459.99	257.04
1997	4111.641	2470.07	60.08	523.60	314.55
1998	4588.990	2654.16	57.84	582.81	337.08
1999	5307.362	3066.16	57.77	463.81	267.95
2000	6897.482	3877.07	56.21	949.91	533.94
2001	8134.142	4515.98	55.52	586.60	325.67

2002	11332.253	6059.38	53.47	676.87	361.92
2003	13301.559	7055.13	53.04	703.10	372.92
2004	17321.295	9021.14	52.08	1194.80	622.27
2005	22269.978	13042.95	58.57	1741.80	1020.13
2006	28662.469	16473.55	57.47	1866.20	1072.58
2007	32995.384	19112.59	57.93	1846.90	1069.82
2008	39157.884	23295.82	59.49	2972.20	1768.22
2009	44285.561	27553.34	62.22	2197.60	1367.29
2010	54612.264	33147.84	60.70	2839.30	1723.36
2011	62980.397	39839.10	63.26	4628.50	2927.82
2012	71713.935	41980.89	58.54	5007.70	2931.48
2013	80092.563	52472.56	65.51	4805.60	3148.38
2014	89043.615	55721.23	62.58	4714.60	2950.28
2015	94144.960	58064.80	61.68	3741.80	2307.79
2016	101489.492	66362.82	65.39	3307.50	2162.74
2017	113711.635	74861.09	65.83	4027.94	2651.76
2018	127762.546	86428.77	67.65	5320.52	3599.22

Table 6…

* indicates authors' computation.

From figure 2 and Table 6 above, it can be seen that the size of the informal economy in Nigeria averaged 56 percent, and ranged from 47 to 67 percent of the GDP, with the highest recorded in 2018. One observable fact in the data is that informality often rises when there is a sudden disruption in the formal economy as a result of several economic reasons. This disruption could be political or economic factors that are national or global. For instance, following the boom in oil revenue in 1973-74, the government embarked on several programmes that empowered many in the informal economy, pushing informality upward. Similarly, the Structural Adjustment Programme (SAP) era witnessed another sharp growth in informality and was stable till 1995 when it witnessed a major rise owing to several political turmoils that took place during General Sanni Abacha regime. In 2004, the financial crisis that precipitated banking sector recapitalization led to the loss of several jobs, leading many to take refuge in the informal economy. 2008 and 2016 also witnessed a sharp rise, attributable economic crises (2008 global economic crisis and 2016 commodity market crisis leading to Nigeria economic recession). The study agrees with Ogbuabor & Malaolu (2013), who noted that major economic and political disruptions in the formal economy often lead to an upsurge in informality.

Loss of Tax Revenue

One major concern about the rise in informality, outside economic policy distortion, is the increase in tax revenue loss. With a rise in informality, tax base falls, and potential tax revenue shrinks. This is a serious issue, especially when the public expenditure is rising, and the government is resorting to borrowing to finance its budget. From our estimates in Table 4.6, Nigeria lost about ₦3.5 trillion in potential tax revenue 2018 to informality, an amount that could have reduced the huge gap in the nation's budget.

CONCLUSION AND POLICY IMPLICATIONS

Few conclusions can be drawn from this study. The size of the informal economy in Nigeria ranges between 47 and 67 percent of GDP (1970-2018), with an average of 56%. Also, regulation burden, the unemployment rate in the formal economy, and institutions play the most significant role in an economic agent's decision to remain in the informal economy or not. Specifically, we discover that while the informal economy has been rising steadily in Nigeria, it often surges during the period of economic or political shocks. It could be said that the Nigerian government lost as much as 56 percent of potential tax revenue to informality every year, all things being equal. Lastly, if we borrow an insight from the work of Hassan & Schnider (2016a) and findings from studies on Germany, we can conclude that even if we exclude "do it yourself" (like housewives job at home) and illegal activities, which represent about 22 percent, informality still accounts for roughly 40 percent of the nation's formal GDP.

It is therefore imperative for the government of Nigeria, through the National Bureau of Statistics (in collaboration with the Central Bank of Nigeria), commence periodic (quarterly recommended) survey of the size, nature, and employment in the informal economy, as is done in most countries (including some African countries). This will ensure the availability of official data on the informal economy for policymaking and research purposes. Such data will provide the policymakers with accurate information on the activities, nature, and size of the informal economy, with which effective policies can be formulated. For instance, monetary policy does not only pass through the formal credit and interest channels to impact on the real sector but also through the informal credit and interest rate channels. And the operators of the informal economy will always find alternatives in the informal channels if they are not accommodated at the official channels, thereby distorting economic policies.

While this study does not advocate for the formalisation of the informal economy, it advocates the adoption of policies that will encourage most firms to formalize their operation

and enjoy the benefits of operating in a formal economy. Two major benefits will emerge from such a policy. First, the total factor productivity of the country will rise, boosting the competitiveness of Nigeria at the global stage, since data revealed that firms in the informal economy often are not very productive and operate below full capacity. Secondly, such policies will boost the tax revenue of the government of Nigeria significantly.

Policies encouraging firms within the informal economy to migrate to the formal economy may include the followings:

- The tax revenue collection process should be made more transparent and relevant information accessible to the public on a decentralized scale while the process of paying tax should be simplified. The public, especially the informal economy operators, can be enlightened on the process of paying tax through a series of TV and radio programmes where the processes of paying tax are explained in detail. There is also a need for FIRST to adopt technology to ease the payment process and work closely with banks for information on registered corporate accounts.

- Reduction in the number of regulations to quality regulation. Reforms should target the lowering of legal barriers (for instance, reducing the number of documents required for business registration and the need to collect business registration certificates in the CAC office).

- Establishing industrial training hubs, where individuals and SMEs can easily enroll to acquire certain skills and capacity building from leading industry experts. One of the reasons why most firms remain in the informal economy is the lack of managerial knowledge and skills. Industrial training hubs can provide a platform for SMEs to learn from big firms in certain operations. Most firms' owners do not know how to run an organisation and lack information on how to acquire the necessary skills. This is one of the reasons why most intervention programmes have failed to yield the desired results.

WAY FORWARD

The paper advocates for further studies on informality in Nigeria and beyond. Majority of the past studies have been on employment in informal economy. New studies should focus on informality and low productivity of the workers. On estimating the size of the informal economy, more studies could focus on developing standard approach to collecting informal economy data through survey. And econometric approach can incorporate different methodologies to see if there are patterns in the findings.

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