The Nexus Between Taxation and Gender-Based Informality: Evidence from Nigerian Enterprise Survey Data

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Article's history:

Received on 21st of June, 2022; *Received in revised form* on 17th of July, 2022; *Accepted* on 30th of August, 2022; *Published* on 30th of September, 2022.

Suggested citation:

Tahir, S., Sanda, A., Didia, D., Hasnat, B. (2022). The Nexus Between Taxation and Gender-Based Informality: Evidence from Nigerian Enterprise Survey Data. *Journal of Applied Economic Sciences*, Volume XVI, Fall, 3(77), 237–249.

Abstract:

Using the Nigerian enterprise survey data, this paper examines whether there is a gender dimension in the capacity of informal firms to contribute to tax revenues, a more specific question asked is whether tax rates and female gender ownership effects informality. Gender categorization of the firm's ownership shows an overwhelming dominance of men holding over women, with a favorable ratio of 6:1 of the total sample. The results of the investigation on firms owned by females revealed that they are more likely to remain in the informal sector. By using the cross-sectional logit regression approach, we found no statistical significance between tax rates and a firm's propensity to join the informal sector. It explains a typical scenario where the tax rates mechanism has failed to transmit effectively. Finally, we attained a divergent policy indication that suggests tax compliance enforcement and incentivizing female firms' owners, among other measures.

Keywords: tax evasion; avoidance; informal sector; economics of gender; firms; Nigeria; survey data.

JEL Classification: H26; H32; J78; K34; J16; 017.

Introduction

If a country has a large informal sector, it will create a distortion in the economy with informal sector enjoying an unfair cost advantage over formal sector through tax avoidance. If a country wants to expand its tax base, it should consider bringing the informal sector under the tax system. There is thus an urgent need to understand what the government can do to encourage the formalization of businesses in the informal sector so that they make a sustained contribution to economic growth and development. The ILO and Women in Informal Employment Globalizing and Organizing provide evidence that women are more likely than men to work in the informal economy. Gender consideration in the development of the informal sector's tax prospects should be considered seriously. Nigeria loses about 56% of its potential tax revenue annually to informality, with estimated tax revenue loss amounting to 3.5 trillion in 2018 (Tonuchi & Idowo, 2020). The paper examines whether tax rates are means of influencing the tax payment behavior of informal firms in Nigeria. It also investigates the ability of female-owned firms to remain in the informal sector or make a switch to a formal business. It develops logistic models and tests the models on a unique dataset.

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1. Literature Review

Tax evasion because of informal economies is acute. It amounts up to US$ 3.1 trillion annually, about 5% of the world's GDP (Molen, 2018). The existing literature on the link between tax and informality has shown compelling evidence on the harmful effects of a growing informal sector, especially in developing countries, which together lose an estimated US$285 billion annually to tax evasion (Torgler and Schneider, 2009). For this reason, informality is believed to breed tax evasion which has grave consequences, not least because it reduces tax collections.

In countries with significantly large informal economies, tax evasion can be particularly worrisome because, in addition to causing a reduction in tax revenues, it imposes an additional burden on compliant taxpayers, and significantly lowers the delivery of services by the state (Ali et al., 2014; Maiti and Bhattacharyya, 2020). Shane (2009) argued for the transition of informal to formal businesses to gain a tax advantage for the government.

However, some public sector economists seem to have an alternative view as Ordonez (2014) asserts that the informal sector can indeed make beneficial contributions to the economy. This sector could be the hidden engine of growth. Adherents of this view maintain that the underground economy is less regulated, often escapes taxation, and therefore is free from the distortionary effects of taxation. For this reason, the informal sector is believed to have the capacity to operate more efficiently than the formal sector in widening the tax revenue net.

Thus, even as Besley and Persson (2014), La Porta and Shleifer (2014), and Bethencourt and Kunze (2020) reasoned that the informal firms have poor record-keeping, thus making it difficult to assess them properly for tax purposes, it can be argued that informality's tax evasion in developing countries can be addressed with a coordinated approach.

Friedman, Johnson, Kaufmann, and Zoido-Lobaton (2000) examined tax rates as a potential factor driving firms into informality and found that businesses seem to tolerate taxes, but abhor extortions, bribery, and corruption. As Resnick (2020) pointed that the informal sector is often subjected to several layers of taxation, perhaps this could be a reason for the waning tax morale in the sector. This is as McCulloch et al. (2020) confirmed that instilling confidence in the tax system is important in building tax system social trust and enhancing morale. Thus, in addition to fair treatment of the informal sector in tax-related issues, the government should ensure the provision of services that include, protection, infrastructure, and welfare in fulfillment of tax systems' social contract. Thus, where there is a transparent mechanism of tax collection as well as a clear regime of reciprocity involving the collector providing services from the proceeds of taxation, compliance tends to be voluntary. Hence, the informal sector in developing countries is large, offering, at least on a theoretical level, vast opportunities for potential revenue generation.

In practice, however, revenue generation potential from taxing the informal sector is modest, according to Joshi, Prichard, and Heady (2014). However, beyond revenues, there are potential benefits associated with taxing the informal sector because of the potential to increase the culture of tax payment as implied in Alm (2019). Again, failure to tax the informal sector might prompt the formal sector firms to consider the tax regime as unfair. Additionally, taxing the informal sector has the added advantage of offering small enterprises protection from arbitrary extortions (Joshi et al., 2014).

Divergent views about tax and informality are examined in the extant literature. Gender influence on informality is one of the most prominently analyzed factors. Babbitt et al. (2015) indicated that for a wide variety of reasons, women prefer to remain in the informal sector in comparison to men. This may not be unconnected with the finding in McCulloch et al. (2020) that women are differently treated from their male counterparts in tax issues. Again, while emphasizing domestic responsibilities as the main factor which forces women to remain in the informal sector, Babbitt et al. (2015) found a divergent desire for transiting the informal business setting among Indonesia's women groups. What is not clear to us here is whether that preference relates to tax avoidance.

However, Friedman et al. (2000) provided the needed clue when they found informal firms as tolerant of taxes. In considering the case of female firms' tax avoidance in Nigeria, Meagher (2018) indicated women in the northern part of the country are less likely to complain against the increased burden of taxation. Thus, it is important to establish whether female-owned firms are more likely to remain in the informal sector. Achieving this objective will help tax authorities to devise a mechanism that could channel its tax drive to a potentially more rewarding target of the female-based informal sector. The finding reported in Meagher (2018), which stipulates females are less likely to resist increased tax burden, should offer a window of opportunity for governments to incentivize female firm owners to thrive and pay their taxes. This calls for an examination of factors that improve a business's ability to pay taxes.

The education level of a firm's employees, particularly the top managers' is an important factor in leading businesses to get organized and be able to pay government taxes. This position was emphasized in Koto (2015) when they found that the informal sector in Ghana is dominated by people with low levels of education, which implied it's being associated with low productivity levels. Considering that the education level of firms' managers is

expected to impact its effectiveness, Martínez-Román and Romero (2016) found an entrepreneur's education level to have played a significant role in improving a firm's innovativeness. This is not far from Garba and Kraemer-Mbula (2018) that found female workers' years of education to fully mediate the effect of gender diversity on the innovative capability of enterprises in Nigeria. Extant literature also recognized the relevance of electricity as an enabler for business formalization, Ali et al. (2014) found increased electricity to promote business growth and encourage tax compliance in the case of Kenya. Thus, there is a need to examine the potential obstacle the lack of stable electricity could cause the firm not to make an adequate profit to pay taxes.

Although Dabla-Norris, Gradstein, and Inchauste (2008) found firm size to be negatively correlated with the propensity to go informal, enhancing tax morale is key to ensuring tax compliance and not necessarily business magnitude. This is even as the level of tax morale and the quality of institutions in a country tend to affect the size of the informal sector as attested in both Torgler and Schneider (2009) and Besley and Persson (2014). Size here can equally imply the high quality of institutions. In addition, better institutions provide better incentives for good behavior and harsher punishment for illegal behavior and thus better tax compliance. However, the literature also provided enforcement measures where tax compliance is a problem among taxpayers. In this regard, Alm (2019) suggested that increased tax audit and penalty rates attain greater tax compliance. Although these measures are costly, their attainment could improve government revenue and the delivery of public services. Ali et al. (2014) identifies the need for economic deterrence and enforcement, in line with the provision of the economic deterrence theory where the taxpayers decide whether and how to comply in the light of rational cost-benefit calculations, that is, what they will gain from complying, and what are the likely costs to them from noncompliance. Compliance would be high if a person thought other taxpayers had a favorable attitude to taxes. In the final note, we argue that the existing literature provides evidence to target the informal sector for tax revenue improvement. This position thus paves the way for the empirical investigation of its effectiveness, a feat which this paper will examine.

2. Data and Methodology

2.1. Data

This research applies a cross-sectional dataset from the Nigeria Enterprise Survey conducted by the World Bank between April 2014 and February 2015 (World Bank, 2015). The dataset was collected using face-to-face interviews from 2,676 establishments based on stratified random sampling. After removing observations with missing information related to our focal area of interest, we ended up with 2,178 usable responses. The stratified random sampling adopted three levels of stratification based on industry, region, and size. To ensure that the sample is balanced, regions were selected based on establishment number, contribution to employment, and value-added. The regional stratification paid credence to the six geographical regions in the country: North-Central, North-East, North-West, South-East, South-South, and South-West in Nigeria.

The questionnaire included a wide variety of topics, resulting in measures for many discrete and continuous variables. Up to 90% of the questions were targeted at understanding the character of the Nigerian business environment. The additional 10% targeted issues constituting obstacles to the firms' operations as opined by the business owners. Guided by the extant literature, we obtained selected variables from the survey that are important for our study. These variables include informality, tax rates as an obstacle to firms and female-owned firms, firm size, top managers' education level, and electricity as obstacles to firms' operations for their control effect.

However, as much as we justified the data choice herein, a limitation may arise given the time-lag of the applied dataset, but such concerns could be allayed for at least three reasons. First, the World Bank has not undertaken any additional enterprise survey for Nigeria, and our preference is to make do with the data we have rather than wait until a fresh dataset is available. We have also seen empirical analyses such as Garba and Kraemer-Mbula (2018) adopting the same dataset. While recognizing that during the intervening time lag, the chosen country of analysis' economic fundamentals might well have changed to possibly reduce the value of the data for the current analysis, there are two reasons why such developments may not hinder our intended data analysis. One reason is that recessions (and the changes they engender) are normal cyclical events and, like the tide, come and go, leaving the structure of the economy for the most part unchanged. A second, related reason is that in a recession, all sectors are affected, and the underlying structure of the economy may well remain unchanged. This data set, therefore, provided us an opportunity to test the main hypotheses of this study concerning the tax rate and other determinants of informality in Nigeria.

2.2. Method of Data Analysis

We choose to use a logistic model to test our hypothesis because it can be easily extended to more than one predictor variable. One advantage of logit is its close approximation to cumulative normal function. The model takes the following form: $Pr(Y_i = 1) = P_i = e^L/(1+e^L)$, where L is a linear combination of the predictor variables, *i.e.,*

$$\mathrm{lIn_i} = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \mu_{it} \quad (1)$$

where: $\mathrm{lIn_i}$ represents informality and is a dichotomous dependent variable, taking a value of 1 if the firm was registered at the start of its operations and zero if otherwise. β_0 is the intercept of the model as a constant parameter and β_s are vectors of the respective coefficients. The independent variables in the equation are: X_{1i} represents tax rates; is X_{2i} is a dummy variable taking a value 1 for a female-owned firm, 0 otherwise; X_{3i} represents a vector of other control variables (top managers' education level, firm size, and electricity as an obstacle to firms' operations); and μ_{it} is the error term.

We introduce regional dummies and construe them into variables representing the six geographical regions of North-Central, North-East, North-West, South-East, South-South, and South-West in Nigeria. The rationale for this introduction is to examine the regional effects on a firm's informality and thus deepened our understanding. This approach has credence in Garba and Kraemer-Mbula (2018) where they examined gender diversity on the innovative capability of enterprises in Nigeria by both national and regional data.

Thus, our logit regression model under the given assumption here is specified as:

$$\mathrm{lIn_i} = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \mu_{it} \quad (2)$$

where all other parameters are as explained above, except the newly introduced X_{4i} which represents a vector of the six regions of the country as listed above.

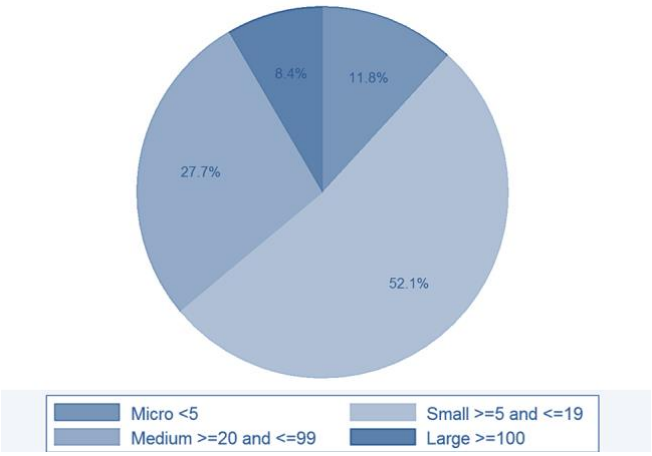
3. Results

We employed both descriptive and inferential methods in attaining the results reported in this research. The descriptive results contain issues about firm size, demographic properties of owners and management of enterprises, obstacles besetting the enterprises, as well as a breakdown of the enterprises by their categories of formality. To provide a preliminary flair of the dataset, we present descriptive statistics in Figures 1, Figure 2 and Table 1.

3.1. Descriptive Statistics

Figure 1 shows that slightly over one-half of all the surveyed firms (52.1%) are small and employed between 5 and 19 persons full-time. Medium enterprises, employing between 20 and 99 persons, account for 27.7% of the firms. There were a few large and micro firms, accounting for 8.4% and 11.8% of the firms, respectively.

Figure 1. Classification of firms by size



In panels 1 to 4 of Figure 2, we present descriptive statistics for informality, switch to formality, and firm ownership by gender. Panel 1 considered the level of informality amongst the 2,676 enterprises in the survey and the results showed that just over 38% of enterprises in the sample were unregistered, operating in the informal sector at the start of operations. Another aspect of the descriptive results is the finding that over time, enterprises without formal registration tend to seek some form of legal recognition as they go on to register in the formal sector.

At the point of the survey, Panel 2 shows that nearly 89% of the firms which started operations without registration went on to register. If there are a myriad of factors motivating informal enterprises to go on to join the formal sector, at least the size of their employees is one. We found that 841 of the firms that went on to join the formal sector through registration reported an average of 24.04 employees. This compares with the average of 6.8 employees reported by firms that refused to go on to register, years after starting a business. From these results, it could be stated that large firms are more likely to register compared to small ones.

It is perhaps more difficult for large firms to escape the tax net since their size would make them more noticeable. Another factor motivating such firms to go on to register for formal recognition is tax. The preliminary aspect of this study finds that taxes are levied even on informal sector enterprises. However, it is unclear what proportion of the informal sector enterprises are levied tax. What is evident is that about 16% of the firms in the informal sector in the sample confirmed having evaded taxes. As mentioned in the literature, there are challenges associated with taxing the informal sector enterprises such as the tendency for them to keep little records to enable proper tax assessment. In addition, their earnings are often small, making it difficult to tax them.

Panel 3 shows the sectoral distribution of female-owned firms. As we can see, while female firm ownership is generally low, it is lowest in the manufacturing sector (just 10.8%). Female-owned firms are higher in retail (18.4%) and service sectors (15.3%). Further analysis of the data showed that women fared badly in managerial and ownership positions of enterprises in the survey. As can be seen in Panel 4, men were exclusive owners in 83% of all enterprises, compared to women who held sway in only 13% of the firms, with the remaining 3.3% of the firm's ownership comprising both genders.

The perception of firms about the obstacles they faced in running their businesses is important for policymakers. Firms were asked to indicate the most important obstacles they faced. The results are shown in Table 1. Electricity was reported as the main obstacle by 32.1% of firms, followed by access to finance by 21.0% of firms, and corruption by 11.8% of firms. Tax rates presented an important obstacle for 7.2% of firms. As the table shows, transport, competition with the informal sector, and political instability also turn out other obstacles besetting enterprises in the survey.

Figure 2. Informality and female firm ownership

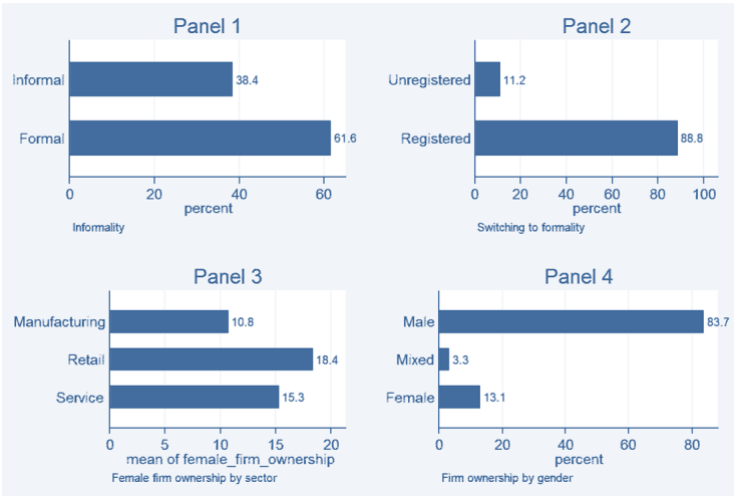


Table 1. Main obstacles to enterprise growth in Nigeria

Greatest obstacle	Frequency	%
Electricity	760	32.11
Access to finance	497	21.00
Corruption	279	11.79
Tax rates	170	7.18
Transport	153	6.46
Practices of competitors in the informal sector	124	5.24
Political instability	112	4.73
Access to land	76	3.21
Customs and trade regulations	51	2.15
Crime, theft, and disorder	37	1.56

Greatest obstacle	Frequency	%
Labor regulations	32	1.35
Tax administration	29	1.23
Business licensing and permits	27	1.14
Inadequately educated workforce	17	0.72
Courts	3	0.13
Total	2,367	100.00

Our results seem to re-echo earlier results in the literature. Entrepreneurs may participate in the informal sector as a stepping-stone to getting enrolled into the formal economy, and many others may continue with the informal setup (Williams and Nadin, 2010). In a study of workers in the informal sectors in Latin America, Maloney (2004) identifies voluntary micro- entrepreneurship activities where such entrepreneurs preferred the informal sector over the formal sectors and didn't treat it as a stepping-stone. For instance, in Mexico, over 60 percent of entrepreneurs in the informal sector left their previous jobs and entered the industry voluntarily. Such entrepreneur's device informal mechanisms anchored in their social networks and immediate neighborhood for managing risks.

3.2. Estimated Regression Results

We estimate various versions of equation 1 and present the results in Table 2. The model predicts informality in the Nigerian data well. Out of a total of 1,303 enterprises that registered and joined the formal sector, 1019 were correctly predicted. In comparison, there were 875 enterprises that did not register and therefore stayed in the informal sector. For this category of firms, the model correctly predicted 440. Thus, the logit model correctly predicted a total of 1,459 or 67% of the enterprises used in the estimation of the model. The high χ^2 statistics reveal that the null hypothesis of the regression coefficients is jointly equal to zero can be rejected at the 5% level for all models. It should be noted that the goodness of fit is of secondary importance in binary regression models; the expected signs of regression coefficients and their statistical significance are what matter the most (Gujarati and Porter 2009, p. 563). As mentioned previously in this paper, firm size appears to explain the choice of informality, with large firms more likely to join the formal sector. The logit model helps confront this stylized fact.

The results for the central hypothesis of this study of whether tax rates are a means of influencing the tax payment behavior of informal firms were not significant in all the tested models. The coefficient for the tax rate is -0.026 in model 1, which means that ceteris paribus, if the tax rate increases by a unit, on average the estimated logit decreases by about 0.026 units. This outcome seems counter to the conventional wisdom and extant literature, suggesting that tax rates tend to encourage firms to move to the informal sector. Concerning this outcome, Ihrig and Moe (2004) attempted to unravel the link between tax rates and informality, reporting that informal employment responds to tax policies. Although the insignificant outcome is surprising to conventional wisdom and academic literature, it could have just reflected the reality of the Nigerian business environment and taxation potential. In practice, what the outcome postulates is that the tax rate does not have the transmission mechanism to influence tax payment by the informal sector. This has brought out a clear indication of a weak level of enforcement as supported by Belitski et al. (2016) which identifies poor enforcement of tax compliance as more pronounced in developing countries. Thus, any increase in tax rate without a commensurate effort to bolster enforcement cannot induce additional tax payments, hence the government needs to ensure that tax rates changes are supported by an adequate implementation to achieve a desirable outcome.

The second result examined whether female-owned firms are more likely to remain in the informal sector. It can be seen from the table under both models 1 and 2 that the variable has a negative and statistically significant coefficient estimate. The coefficient for female-owned firms is -0.003 which means that, ceteris paribus, the odds ratio for informality is higher for female-owned businesses (note, the excluded group is non-female owned business). In other words, this outcome suggests that the higher the level of female ownership in a firm, the more likely it will remain an informal business enterprise. The outcome is consistent with the finding in Babbitt et al. (2015) which reported similar results for female groups in Indonesia. Again, the outcome supports their postulation of women as more likely to remain in the informal setting due to domestic responsibilities. This outcome is clearly in conformity with the position which stipulates that more women participate in the informal sector especially in Africa as compared to their male counterparts, a position which is consistent with Resnick (2020). Also, employment size is found to have a quadratic relationship with formality. This means that within a certain range, there is evidence that the size of employees increases formality.

The outcome relating to the top managers' education level returned a statistically significant coefficient estimate in both models 1 and 2. The common inference from this result is that the higher the level of education of the firm manager, the more the business will become organized and get out of the informal sector. Generally, the educational level of a firms' workforce has been found from the extant literature to influence the propensity of a firm to remain in the informal sector. Specifically, if a firm has a predominant workforce with a poor educational level, it will most likely remain in the informal sector. This position is consistent with the finding in Koto (2015) that the informal sector in Ghana is dominated by people with low levels of education and thus implies that such enterprises will be associated with low productivity. This means that where workers' education is generally poor, enterprises tend to operate in the informal sector. Table 2 equally presents the outcome of the investigation on electricity as a possible factor influencing a firm's likelihood of being in the informal sector. As can be seen from the table in both models 1 and 2 the variable has statistically significant negative coefficient estimates, an outcome which suggests the lower the level of electricity generation, the greater the likelihood it will operate in the informal sector. This is consistent with the finding in Ali et al. (2014) which detailed that access to electricity promotes business growth and encourages tax compliance.

Table 2. Regression results

Variables	Estimated Models	
	(1)	(2)
Tax Rates	-0.026	-0.041
	(0.045)	(0.046)
Females owned firms	-0.003***	-0.003**
	(0.001)	(0.001)
Top managers' education level	0.397***	0.340***
	(0.029)	(0.029)
Firm size	0.001	0.028***
	(0.001)	(0.004)
Electricity as an obstacle to business	-0.113***	-0.099**
	(0.038)	(0.039)
Firm size squared		-5.4e-06***
		(1.2e-06)
Constant	-1.386***	-1.448***
	(0.171)	(0.175)
Observations (n)	2,178	2,178
Log likelihood function	-1,345.25	-1,297.02
Model χ^2	244.9	340.65
% Correctly predicated	66.5	66.99
McFadden R^2	0.0832	0.1161

Note: Standard errors in parentheses. Percentage significance levels are *** p<0.01, ** p<0.05, * p<0.1

So far, the presentation and discussion of the results have paid credence to the examination of the data at the national level (that is for the whole country). Table 3 presents the outcome of the introduction of regional dummies into our model along with the results reported in Table 2. As can be seen from Table 3, the outcome indicates a mixed result. For instance, the South-South dummy has a positive and statistically significant coefficient estimate in both models 3 and 4 in the two regions both of which returned statistically insignificant coefficient estimates. To give a specific interpretation for the coefficient for South-South in model 4, it means that businesses in the South-South region are 2 times (found from taking antilog calculation) more likely to be formal than other regions, ceteris paribus. The surprise element here is that the results for South-East were found as non-significant in both models tested and South-West was non-significant in model 4. This is as the level of business awareness in the regions is better than the regions in the Northern part of the country.

To get some further insights into the issues discussed in the study, we conducted additional logit regressions where we include new explanatory variables such as business types (*i.e.,* retail), obstacles (*i.e.,* corruption, labor regulations, customs), informal competition, and so on. The results are reported in appendices Table A1 and A2. The results are broadly like the results we report in Table 2 and Table 3.

Conclusion and Policy Implications

This paper examines the effect of tax rates and informal sector in a sub-Saharan African country using the cross-sectional data of the Nigeria Enterprise Survey, conducted by the World Bank. We applied the logit regression model in analyzing the major independent variables which are tax rates as an obstacle to firms' operation and female-owned firms for their effect on the informal sector. We equally analyzed the role of firm size in motivating the transition from informal to the formal sector, just like the variables of top managers' education level and electricity as obstacles to firms' operation were also examined for their control effects. Various results which contribute to academic literature and motivate policy implications were attained given the empirical process' outcome. However, we focus here on the policy suggestions that will enhance the informal sector's capacity to contribute tax revenue to the government.

For instance, the results which found a statistically non-significant relationship between informality and tax rate indicates a general weakness in the ability of the tax rate to influence the informal sector. In articulating a policy agenda to respond to this finding, the Nigerian government should be advised to first identify the problem of transmission capacity of tax rate before venturing into achieving tax net improvement through the informal sector. Thus, the policy direction will not be for the government to abandon the tax rate as a tool of revenue improvement, but to look at enhancing its ability to improve the informal sectors' tax collection. One likely direction to look in achieving this target is the enforcement mechanism because the evidence here has indicated that regulating the tax rate alone cannot guarantee tax improvement. As Belitski et al. (2016) suggested, for such tax rates improvements to succeed in boosting revenues, they must be accompanied by tax enforcement compliance, especially in developing countries like Nigeria where rates are generally low now.

Table 3. Regional variations results

Variables	Estimated Models			
	(1)	(2)	(3)	(4)
Tax Rates	-0.026	-0.041	-0.027	-0.048
	(0.045)	(0.046)	(0.046)	(0.047)
Females owned firms	-0.003***	-0.003**	-0.003**	-0.003*
	(0.001)	(0.001)	(0.001)	(0.001)
Top managers' education level	0.397***	0.340***	0.395***	0.338***
	(0.029)	(0.029)	(0.029)	(0.030)
Firm size	0.001	0.028***	0.001	0.029***
	(0.001)	(0.004)	(0.001)	(0.004)
Electricity as an obstacle to business	-0.113***	-0.099**	-0.105***	-0.093**
	(0.038)	(0.039)	(0.039)	(0.039)
North-East			0.028	-0.041
			(0.217)	(0.221)
North-West			0.217*	0.199
			(0.124)	(0.126)
South-East			-0.132	-0.061
			(0.154)	(0.156)
South-South			0.625***	0.735***
			(0.238)	(0.239)
South-West			0.357**	0.233
			(0.156)	(0.160)
Firm size squared		-5.5e-06***		-5.5e-06***
		(1.3e-06)		(1.3e-06)
Constant	-1.386***	-1.448***	-1.534***	-1.575***
	(0.171)	(0.175)	(0.197)	(0.202)
Observations (n)	2,178	2,178	2,178	2,178
Log likelihood function	-1,345.25	-1,297,02	-1,336.74	-1,289.63
Model χ^2	244.19	340.65	261.21	355.43
% Correctly predicated	66.5	67.0	67.5	68.0
McFadden R^2	0.0832	0.1161	0.089	0.1211

Note: Standard errors in parentheses. Percentage significance levels are *** p<0.01, ** p<0.05, * p<0.1

Also, the outcome which indicated that the higher the level of female ownership in a firm, the more likely it will remain as an informal business will equally reveal dynamic policy suggestions to the government. The likely

policy direction herein is for the tax authorities to devise a mechanism that could channel its tax drive to a potentially more rewarding target of the female-based informal sector. This direction is equally helped by the indication in Meagher (2018) which stipulates those females are less likely to resist increased tax burden in Northern Nigeria. Based on this finding, the government should provide incentives to the females in the informal sector to thrive and pay their taxes. Where this drive is faced with resistance, then enforcement tools should be equally applied here too just as suggested in the case of tax rates application. For this reason, Alm (2019) suggested the application of tools such as increased audit and penalty rates to attain a greater level of tax compliance. Hence, in improving its fiscal space, the Nigerian government should take advantage of the tax gap evident in the female based-informal sector, while ensuring that the transmission mechanism is made more portent by enforcement. This is also the finding of Ihrig and Moe (2004) that informal employment is responsive to tax policies.

The results which stipulate that a higher level of education of the firm manager leads businesses to get out of the informal sector will equally infer policy suggestions, part of which is for the government to support a project for educating small business owners, especially in an informal manner. The approach should ensure the provision of business education to firm owners to promote their understanding of business strategies. Business clinics that will feature loan proposal writing, investment studies, computer literacy among other business enhancement skills will, in turn, engender informal business development and increase their ability to pay government tax. Again, reviewing the result which suggests a lower level of electricity generation makes the firms in Nigeria remain in the informal sector will give rise to policy suggestions for the government to support increased electricity access to businesses. Although Nigeria has in the past decade experienced power sector reform targeted at improving electricity access to the country, the exercise was generally seen as unsuccessful by Arowolo and Perez (2020). Hence, the need is urgent to ensure practical steps that will motivate the power sector value chain in yielding better electricity access to firms. More purposeful steps like improving the power grid infrastructure and tariff regulation could help in this direction.

Finally, the regional analysis results which brought about divergent as well as similar outcomes equally imply policy consideration. Part of this consideration is for the government to institute business support for regions like the South-East where we thought there is a potential for firms to become formal, but the results of our empirical analysis herein have shown otherwise. Again, an important consideration from the regional analysis outcome for both policy and academic research is the potential for a dynamic extension of the outcome in this research for expansion to other African regions especially the sub-Saharan African region. This implication is made possible given the Nigerian data's suitability for generalization based on the country's ownership of up to 20% population in the region. Hence, suitable suggestions for tax policy, gender, and informality extension towards regional integration are possible from this paper's outcome. On the suggestions for future studies, even as the current paper did not examine the dataset for the sub-Saharan Africa region, doing so in respect of panel application of individual countries or the entire regions' dataset is an option to drive regional integration agenda. Again, this paper's prominent suggestion of the informal sector's tax compliance enforcement not investigated herein remains a viable option for future studies.

Acknowledgment

The authors would like to register their appreciation to the Office of the Accountant-General of the Federation, Nigeria, for the research grant [grant number: R&I/2116/I/78] awarded to them to conduct some studies under a research project entitled *'The performance analysis of operating surplus and optimal independent revenue generation'.*

References

[1] Ali, M., Fjeldstad, O.H., Sjursen, I. H. (2014). To pay or not to pay? Citizens' attitudes toward taxation in Kenya, Tanzania, Uganda, and South Africa. *World Development*, 64, 828-842. https://doi.org/10.1016/j.worlddev.2014.07.006

[2] Alm, J. (2019). What motivates tax compliance? *Journal of Economic Surveys,* 33(2), 353-388. https://doi.org/10.1111/joes.12272

[3] Arowolo, W., & Perez, Y. (2020). Market reform in the Nigeria power sector: A review of the issues and potential solutions. *Energy Policy,* 144, 111580. https://doi.org/10.1016/j.enpol.2020.111580

[4] Babbitt, L. G., Brown, D., & Mazaheri, N. (2015). Gender, entrepreneurship, and the formal–informal dilemma: Evidence from Indonesia. *World Development*, 72, 163-174. https://doi.org/10.1016/j.worlddev.2015.02.019

[5] Belitski, M., Chowdhury, F., & Desai, S. (2016). Taxes, corruption, and entry. *Small Business Economics*, 47(1), 201-216. https://doi.org/10.1007/s11187-016-9724-y

[6] Besley, T., & Persson, T. (2014). Why do developing countries tax so little? *Journal of Economic Perspectives*, 28(4), 99-120. DOI: 10.1257/jep.28.4.99

[7] Bethencourt, C., & Kunze, L. (2020). Social norms and economic growth in a model with labor and capital income tax evasion. *Economic Modelling,* 86, 170-182. https://doi.org/10.1016/j.econmod.2019.06.009

[8] Dabla-Norris, E., Gradstein, M., & Inchauste, G. (2008). What causes firms to hide output? The determinants of informality. *Journal of Development Economics,* 85(1-2), 1-27. https://doi.org/10.1016/j.jdeveco.2006.05.007

[9] Friedman, E., Johnson, S., Kaufmann, D., & Zoido-Lobaton, P. (2000). Dodging the grabbing hand: the determinants of unofficial activity in 69 countries. *Journal of Public Economics*, 76(3), 459-493. https://doi.org/10.1016/S0047-2727(99)00093-6

[10] Garba, T., & Kraemer-Mbula, E. (2018). Gender diversity and enterprise innovative capability. *International Journal of Gender and Entrepreneurship,* 10(4), 290-309. https://doi.org/10.1108/IJGE-03-2018-0018

[11] Ihrig, J., & Moe, K. S. (2004). Lurking in the shadows: the informal sector and government policy. *Journal of Development Economics,* 73(2), 541-557. https://doi.org/10.1016/j.jdeveco.2003.04.004

[12] Joshi, A., Prichard, W., & Heady, C. (2014). Taxing the informal economy: The current state of knowledge and agendas for future research. *The Journal of Development Studies*, 50(10), 1325-1347. https://doi.org/10.1080/00220388.2014.940910

[13] Koto, P. S. (2015). An empirical analysis of the informal sector in Ghana. *The Journal of Developing Areas*, 93-108. https://www.jstor.org/stable/24241286

[14] La Porta, R., & Shleifer, A. (2014). Informality and development. *Journal of Economic Perspectives*, 28(3), 109-26. DOI: 10.1257/jep.28.3.109

[15] Maiti, D. & Bhattacharyya, C. (2020). Informality, enforcement and growth. *Economic Modelling*, 84, 259-274. https://doi.org/10.1016/j.econmod.2019.04.015

[16] Maloney, W. F. (2004). Informality revisited. *World Development*, 32(7), 1159-1178. https://doi.org/10.1016/j.worlddev.2004.01.008

[17] Martínez-Román, J.A. & Romero, I. (2016). Determinants of innovativeness in SMEs: Disentangling core innovation and technology adoption capabilities, *Review of Managerial Science*, 11(3), 543-569. https://doi.org/10.1007/s11846-016-0196-x

[18] McCulloch, N. E. I. L., Moerenhout, T., & Yang, J. (2020). Building a Social Contract? Understanding Tax Morale in Nigeria. *The Journal of Development Studies,* 1-18. https://doi.org/10.1080/00220388.2020.1797688

[19] Meagher, K. (2018). Taxing times: taxation, divided societies and the informal economy in Northern Nigeria. *The Journal of Development Studies*, 54(1), 1-17. https://doi.org/10.1080/00220388.2016.1262026

[20] van der Molen, P. (2018). Informal economies, state finances and surveyors. *Survey Review*, 50:358, 16-2. https://doi.org/10.1080/00396265.2016.1216922

[21] Ordonez, J. C. L. (2014). Tax collection, the informal sector, and productivity. *Review of Economic Dynamics*, 17(2), 262-286. https://doi.org/10.1016/j.red.2013.07.004

[22] Resnick, D. (2020). Taxing Informality: Compliance and Policy Preferences in Urban Zambia. *The Journal of Development Studies*, 1-23. https://doi.org/10.1080/00220388.2020.1841171

[23] Shane, S. (2009). Why encouraging more people to become entrepreneurs is bad public policy? *Small Business Economics,* 33(2), 141-149. https://doi.org/10.1007/s11187-009-9215-5

[24] Tonuchi, J. E. & Idowu, P. (2020). How Large Is the Size of Nigeria's Informal Economy? A Mimic Approach. *International Journal of Economics, Commerce and Management*. https://ssrn.com/abstract=3683765

[25] Torgler, B., & Schneider, F. (2009). The impact of tax morale and institutional quality on the shadow economy. *Journal of Economic Psychology*, 30(2), 228-245. https://doi.org/10.1016/j.joep.2008.08.004

[26] Williams, C. C., & Nadin, S. (2010). Entrepreneurship and the informal economy: An overview. *Journal of Developmental Entrepreneurship,* 15(04), 361-378. https://doi.org/10.1142/S1084946710001683

*** World Bank (2013). Nigeria Enterprise Survey 2007. Available at: https://microdata.worldbank.org/index.php/catalog/631/study-description (accessed 31/12/2020).

*** World Bank (2015). Nigeria Enterprise Survey 2014. Available at: https://microdata.worldbank.org/index.php/catalog/2361/data-dictionary/F4?filename=nigeria_2014_full_data (accessed 03/12/2020).

Appendices

Table A1. Regression results

Variables	(1)	(2)	(3)	(4)	(5)
Employee size	0.0283***	0.029***	0.0283***	0.0290***	0.029***
	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)
Employee square	-5.4e-06***	-5.6e-06***	-5.4e-06***	-5.6e-06***	-5.6e-06***
	(1.3e-06)	(1.3e-06)	(1.3e-06)	(1.3e-06)	(1.3e-06)
Females owned firms	-0.003**	-0.004**	-0.003**	-0.003**	-0.003***
	(0.00141)	(0.001)	(0.001)	(0.001)	(0.001)
Dummy: Retail	-0.0315	-0.015	-0.033	0.0267	0.003
	(0.131)	(0.131)	(0.131)	(0.129)	(0.128)
Dum: Other services	0.296***	0.310***	0.281**	0.345***	0.327***
	(0.114)	(0.115)	(0.113)	(0.113)	(0.112)
Manager education	0.325***	0.322***	0.326***	0.326***	0.315***
	(0.030)	(0.031)	(0.031)	(0.030)	(0.030)
Obstacle: Tax rates	0.031		0.024	-0.054	-0.050
	(0.054)		(0.053)	(0.054)	(0.054)
Obstacle: Corruption	-0.045	-0.042		-0.065	-0.068
	(0.046)	(0.046)		(0.045)	(0.044)
Obstacle: Courts	0.073	0.022	0.061	0.035	0.0260
	(0.063)	(0.065)	(0.062)	(0.064)	(0.063)
Labour regulations	-0.018	-0.037	-0.025	-0.062	-0.159**
	(0.070)	(0.070)	(0.070)	(0.069)	(0.0643)
Poor Education	-0.226***	-0.236***	-0.229***	-0.244***	
	(0.061)	(0.061)	(0.061)	(0.060)	
Obstacle: Electricity	-0.042	-0.038	-0.049		
	(0.042)	(0.042)	(0.0416)		
Telecommunications	-0.008	-0.013	-0.006	-0.083	-0.123*
	(0.069)	(0.970)	(0.0691)	(0.067)	(0.066)
Transport	-0.243***	-0.253***	-0.247***		
	(0.057)	(0.057)	(0.057)		
Customs	0.074	0.0517	0.074		
	(0.057)	(0.057)	(0.057)		
Informal competition	0.199**	0.085*	0.095**	0.0697	0.051
	(0.048)	(0.048)	(0.048)	(0.047)	(0.047)
Business licensing		0.177***		0.172***	0.153**
		(0.062)		(0.062)	(0.062)
Constant	-1.274***	-1.306***	-1.309***	-1.502***	-1.505***
	(0.196)	(0.196)	(0.193)	(0.190)	(0.188)
Observations (n)	2,062	2,061	2,063	2,097	2,100
Log likelihood function	-1208.00	-1204.13	-1209.22	-1235.19	-1247.06
Model χ^2	357.22	363.94	355.8	358.75	338.88
% Correctly predicated	67.5	67.8	67.4	67.4	66.4
McFadden R^2	0.1288	0.1313	0.1283	0.1268	0.1196

Note: Standard errors in parentheses. The percentage significant levels are *** p<0.01, ** p<0.05, * p<0.1

Table A2. Regional variations regression results

Variables	(1)	(2)	(3)	(4)	(5)
Employee size	0.028***	0.029***	0.028***	0.029***	0.029***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Employee square	-5.4e-06***	-5.5e-06***	-5.4e-06***	-5.5e-06***	-5.6e-06***
	(1.3e-06)	(1.3e-06)	(1.3e-06)	(1.3e-06)	(1.3e-06)
Percentage owned by females	-0.003**	-0.003**	-0.003**	-0.003**	-0.003**
	(0.001)	(0.001)	(0.001)	(0.00141)	(0.001)
Dummy: Retail	-0.062	-0.045	-0.063	-0.013	-0.0317
	(0.132)	(0.132)	(0.132)	(0.131)	(0.130)
Dummy: Other services	0.292**	0.306***	0.279**	0.348***	0.339***
	(0.116)	(0.116)	(0.115)	(0.114)	(0.114)
North - East	0.015	0.074	0.033	0.203	0.162
	(0.231)	(0.231)	(0.231)	(0.229)	(0.228)
North - West	0.175	0.170	0.176	0.320**	0.263**
	(0.133)	(0.133)	(0.133)	(0.130)	(0.128)
South-East	-0.068	-0.097	-0.063	-0.006	-0.049
	(0.163)	(0.163)	(0.162)	(0.161)	(0.160)
South-South	0.838***	0.813***	0.849***	0.803***	0.800***
	(0.262)	(0.257)	(0.262)	(0.248)	(0.245)
South-West	0.124	0.127	0.131	0.250	0.327*
	(0.177)	(0.177)	(0.177)	(0.170)	(0.168)
Manager education	0.327***	0.325***	0.328***	0.331***	0.317***
	(0.032)	(0.032)	(0.032)	(0.031)	(0.031)
Obstacle: Tax rates	-0.001		-0.008	-0.083	-0.081
	(0.056)		(0.055)	(0.056)	(0.056)
Obstacle: Corruption	-0.039	-0.042		-0.058	-0.0595
	(0.046)	(0.046)		(0.045)	(0.045)
Obstacle: Courts	0.059	0.005	0.049	0.023	0.012
	(0.064)	(0.066)	(0.063)	(0.064)	(0.064)
Labor regulations	-0.00104	-0.030	-0.007	-0.050	-0.140**
	(0.072)	(0.072)	(0.071)	(0.070)	(0.066)
Poor education	-0.219***	-0.228***	-0.221***	-0.241***	
	(0.063)	(0.063)	(0.063)	(0.061)	
Obstacle: Electricity	-0.043	-0.041	-0.050		
	(0.043)	(0.042)	(0.042)		
Telecommunications	-0.008	-0.014	-0.007	-0.084	-0.121*
	(0.070)	(0.070)	(0.070)	(0.067)	(0.066)
Transport	-0.233***	-0.245***	-0.236***		
	(0.058)	(0.058)	(0.060)		
Customs	0.084	0.060	0.084		
	(0.057)	(0.058)	(0.057)		
Informal competition	0.119**	0.102**	0.115**	0.093*	0.073
	(0.049)	(0.049)	(0.049)	(0.048)	(0.048)
Business licensing		0.179***		0.189***	0.172***
		(0.063)		(0.063)	(0.063)
Constant	-1.419***	-1.460***	-1.453***	-1.757***	-1.730***
	(0.225)	(0.226)	(0.222)	(0.216)	(0.214)
Observations (n)	2,062	2,061	2,063	2,097	2,100
Log likelihood function	-1201.04	-1197.14	-1202.18	-1227.00	-1238.64
Model χ^2	371.14	377.93	369.87	375.14	355.73
% Correctly predicated	68.1	68.6	67.8	68.7	67.4
McFadden R^2	0.1338	0.1363	0.1333	0.1326	0.1256

Note: Standard errors in parentheses. The percentage significant levels are *** p<0.01, ** p<0.05, * p<0.1