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Welfare Implication of Tax Rates Increase in a Recessionary Economy

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Abstract

In this work, we compare the welfare cost of the two tax policy options in Nigeria, by applying a small-open economy within the New-Keynesian Dynamic Stochastic General Equilibrium Model (NKDSGE) of Nigeria augmented by a robust fiscal sector with several tax rules. Increase in tax rates has different welfare implications in a recessive economy. Increase in Consumption tax VAT rate is welfare superior compared to increase in CIT rate, which harms private agents' incentive to invest in either new or existing venture. Hence, data does not support tax reform in the form of increase in Company Income Tax rate. Our finding implies that the current Nigerian tax reform in the form of an increase in VAT rate while allowing other tax rates unchanged is the right policy direction.

Key words: DSGE Models; Fiscal Policy; Welfare

JEL: C63, E37, D61

1   Introduction

The 2016 recession has placed the Nigerian fiscal authority at the spotlight as par its importance and performance in the management of the recession (Umar & Abubakar, 2019). The after math of the 2014-2016 global dip in oil prices creates limited fiscal space in the country, which limits the ability of the country to respond to any shock without resorting to alternatives sources. Considering the low tax to GDP ratio in the country, tax increase becomes the most reliable option.

The big question the government was faced with was mainly; in this recessive economy which tax rate raise will promote the greatest happiness of the highest number of people ; direct or indirect tax? In other words, which amongst the duo of consumption tax and company income tax if increased by government is welfare superior in a recessionary economy? Policy makers and researchers are confronted with this kind of question within tax reform. This concern is further intensified by Keynesian theoretical postulation, which proposed government spending during recession to influence either of the components of aggregate demand (Ekpo, 2017; Fatás & Summers, 2018). Contrary to the Keynesian theoretical proposition, counties in recession with low tax to GDP ratio and active stimulus program, tent to increase tax rates to complement shortfalls in revenue and support the stimulus program.

However, the crux of the matter in tax reform is whether to increase it directly or indirectly. Put differently, whether an increase in consumption tax rate is welfare superior compared to an increase in company tax rate. This is fundamentally important particularly to the government in order to achieve the targeted objective in the most optimal way possible. This is because, increasing tax rates whether direct or indirect has serious implications and opportunity costs particularly on the welfare of the citizenry. Therefore, before any government embark on tax raise policy particularly during recession, it must analyze these welfare costs in order to make an informed policy choice. As such, comparing the welfare cost of increase in tax rates is of paramount importance This is what motivated earlier works on tax reform, such as : Ahmed, Jalil, and Idrees (2013), Kabukçuoğlu (2014), Gaarder (2016) etc. and what motivates this study. Finding answers to this question of welfare superiority ultimately requires us to compare the welfare cost of the tax rates increase.Understanding the welfare implication of tax raise is underscored by the fact that increasing the wrong tax may lead to welfare deterioration and ultimately harm the economy and the recovery process of a recessive economy.

The settings of this study is Nigeria, which slip into recession in 2016 following shortfalls in government revenue caused by the 2014 to 2016 global dip in oil prices as presented in Figure 1.

Figure 1 Global Oil Price and Nigerian Oil Revenue
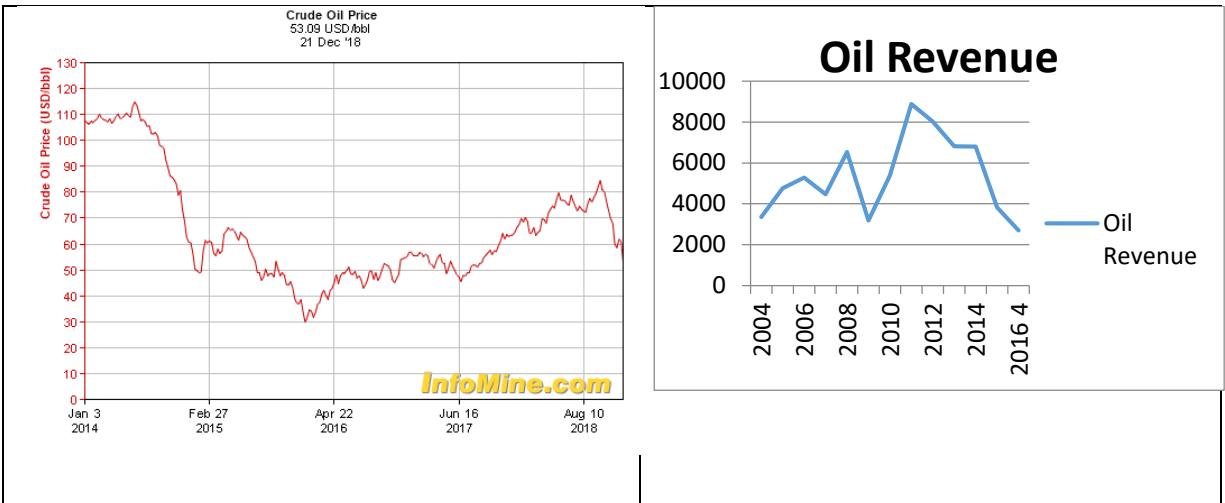
The 2016 recession in Nigeria has culminated in an increased focus on the economic diversification approach. An important area of focus is taxation, because it is the second largest contributor to government revenue in Nigeria. Globally, taxation is seen as a principal source of government revenue being spent on infrastructure and other economic development initiatives. However, tax to GDP ratio in Nigeria remains as low as 6% (Solomon & Fidelis, 2018). Odusola (2006) characterized the Nigerian tax system as lopsided, complex, distortionary and largely inequitable. Such a tax system is inadequate to cushion the recovering Nigerian economy. It is on this note that many have called for tax reform in Nigeria with key objectives to streamline multiple taxation, eliminate tax evasion, encourage tax incentives and waivers (Yekeen, 2018).

Noteworthy is that, there is considerable amount of empirical works that focused on different aspects of tax reform in Nigeria. For example (Ebi & Ayodele, 2017; Oriakhi & Ahuru, 2014) examined the effect of tax reform on Nigeria's revenue and concluded that tax reform positively impacted on the revenue flow of Nigeria while (Jelilov, Abdulrahman, & Isik, 2015; Nwaorgu, Herbert, & Onyilo, 2016; Ogbonna & Ebimobowei, 2012) established a positive link between tax and economic performance in Nigeria. On the whole, there appears to be a consensus that tax reform positively spurs the economic activities of an economy particularly in Nigeria.

The main objective of this paper is to give an empirical assessment of the welfare implications of tax rates increase in a recessive economy, by comparing the welfare cost of increase in the consumption tax proxied by Value Added Tax (henceforth VAT) with increase in Company

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Income Tax (henceforth, CIT) rates. This question is a lacuna observed in the previous literature. Hence, answering the question is the main preoccupation of this work. In an effort to answer this question we employed the use of a model such as NKDSGE, which is very suitable for quantitative policy analysis. This study builds on previous studies on tax reforms in Nigeria, by comparing the welfare cost of increase in different tax rates within the context of NKDSGE model. Informed of this special case, we proceed to simulate the model and compute the welfare cost of increase in tax rates using the NKDSGE model. The specification of our model allows the achievement of the set objective of this study.

Other sections of the paper are: Sections 2 provides literature review and the theoretical anchor that guides the through-process of the analytical structure of the study. In the same section, literature gap is drawn from the empirical literature reviewed in the section. Section 3 covers the methodological aspect of the study, it start by illustrating the specification of the model, thereafter the calibration strategy is provided as well as the performed dynamic simulation of this study. Section 4 presents the result and discussion. Finally, the paper ends with section 5, which draws conclusion and present policy implications.

2 Literature Review

2.1 Theoretical Literature

There are competing theories that seeks to explain the relationship between taxation and economic growth. As noted by Odhiambo and Olushola (2018), the two notable theories are the Lindahl Model and Bowen Model. The former views the relationship in terms of voluntary exchange, where the state provide public goods and services in return of the tax paid by the citizens. While the latter views the production of public good as opportunity cost of private goods.

The Bowen model is adopted as the theoretical anchor of this study. The choice of this theory is informed by its ability to present the implication of social goods financed through cost increase

and it best described the economic structure of Nigeria as resource based economy (Odhiambo & Olushola, 2018)

2.2   Empirical Literature

Noteworthy is that, there is considerable amount of empirical works that focused on different aspects of tax reform. Among others, Taha, Ahmad, Endut, and Baatwah (2020) investigate the welfare implication of the Malaysian tax reform on consumer by analysing and comparing consumer prices of pre-reform, during and post-reformation periods. The study found that tax reform does not lead to general price increase and consumer welfare was not affected by the reform. A contrasting result was found in the Democratic Republic of Congo, Adoho and Gansey (2019) applied a compensating variation measure of welfare and found that the purchasing power of all Congolese household decreases by a factor 10 and 12 percent following the introduction of value added tax in the country.

Computable general equilibrium model are often used to assess the welfare implications of tax reform. In this spirit, Amir, Asafu-Adjaye, and Ducpham (2013) evaluate the welfare impact of Indonesian tax reform and found that personal income and company income tax cuts lead to reduction in poverty incidence at the cost of widening income inequality under balanced budget. In the same vein, Nguyen, Nguyen, and Le (2017) found that simultaneous tax cut is associated with the highest welfare in Vietnam, even though at the cost of higher deficit and income inequality. Still in Vietnam, following a different approach Bhattarai, Nguyen, and Nguyen (2019) utilized the computable general equilibrium approach and compare the welfare implication of change in VAT rate to change in corporate income tax (CIT) rate. The study found that increase in VAT rate by 2 percent and decrease in corporate income tare rate by 3 percent is associated with the highest welfare. In Nigeria, Aminu (2019) applied same methodology to investigate how Nigeria can achieve 15% VAT increase that satisfy both the public and ensure maximum revenue generation for the government. The study found that Nigeria can achieve such policy in four year by increasing the rate by 2.5% annually.

This study build upon previous studies by comparing the welfare implication of alternative tax increase in the recessive Nigerian economy. An attractive point of departure from Aminu (2019)

is that the current study utilized the New Keynesian Dynamic Stochastic General Equilibrium model and applied a welfare cost criteria instead of the usual compensating variation.

3 Methodology

3.1 Model Specification

The model adapted for this paper is based on and drawn from the work of Iwata (2009), Beltran and Draper (2008) and Almeida, Castro, Mourinho, and Maria (2010). The choice of these models is informed by the nature of the study. The redesigned model includes the following characteristic: First, the model is augmented by a detailed set of distortionary taxes such as taxes on consumer purchases, labour income tax, tax on capital income and profits income and social security contributions by firms. In addition, the model features government consumption expenditure, lump sum government transfer to household and government investment. Thus, it provides us with the tools to analyse fiscal policy instruments. Second, it is suitable for quantitative policy analysis, forecasting and assessing the macroeconomic impact of tax reform. In addition to, the distributional effects of shocks. Third, numerous nominal rigidities, real rigidities and real frictions which are empirically significant in macroeconomic analysis like the habit formation, sticky prices and financial frictions in the form of a fraction of liquidity constrained household are incorporated.

3.2 Household

The household sector consists of non-liquidly constrained and liquidity constrained households. The non-liquidly constrained household forms a fraction of $(1 - \omega)$ of the total population, while Liquidity constrained household from the remaining proportion of the population.

3.2.1 Ricardian Household (Non-liquidity constraint)

The household maximizes its intertemporal utility by choosing consumption, investment and leisure and also decides on saving instrument i.e. physical capital or government bonds. The household earned income sources are; wages (W); interest, rent to firms (R) and returns from government securities acquired previously. The household also pays VAT, personal income tax and capital income tax. The household maximizes its intertemporal utility subject to a budget constraint as follows:

$$\left(1+\tau_t^c\right)C_t^R\left(r\right)+I_t\left(r\right)+\psi\left(Z_t\left(r\right)K_{t-1}\left(r\right)+\frac{B_t\left(r\right)}{R_t P_t}=$$

$$\left(1+\tau_t^l\right)W_t\left(i\right)L_t^R\left(r\right)+\left(1-\tau_t^k\right)r_t^k Z_t\left(r\right)K_{t-1}\left(r\right)+\left(1-\tau_t^k\right)\frac{D_t\left(r\right)}{P_t}+\frac{B_{t-1}\left(r\right)}{P_t}$$

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3.2.2 Non-Ricardian Household (Liquidity constraint)

The Non-Ricardian household has a simpler behaviour i.e. does not maximizes intertemporal utility. The Non-Ricardian household earned income from only a source i.e. wage income and received government transfer. Like the non-liquidity constrained household, the liquidity constrains household pays VAT and personal income tax on wage income. Thus, the Non-Ricardian household simply allocates his entire income to consumption under the below hypothesis:

$$\left(1+\tau_c\right)C_t^{NR}\left(j\right)=\left(1-\tau_t^l\right)W_t\left(j\right)L_t^{NR}\left(j\right)+G_t$$

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3.2.3 Wage Settings

The Ricardian household is a wage ($W_t^R(i)$) setters for its differentiated labour services $L_t^R(i)$ in a monopolistically competitive labour market while its nominal wage is set in the spirit of (Calvo, 1983). The Non-Ricardian household, on the other hand, set its wage $W_t^{NR}(j)$ for its differentiated labour service $L_t^{NR}(j)$ to be equal to its average nominal wage. Within each group of household, wages and labour hours are equal, as household face the same labour demand schedule. I.e. $W_t^R = W_t^{NR} = W_t(n)$ and $L_t^R = L_t^{NR} = L_t(n)$. It is assumed that an independently competitive employment agent bundles the differentiated labour services $L_t(n)$ into one type of effective labour input L_t. The aggregate wage law of motion follows the below process:

$$W_t=\left[\left(1-\varepsilon_w\right)\left(W_t^*\left(n\right)\right)^{-\frac{1}{\lambda_{w,t}}}+\varepsilon_w\left(\left(\frac{P_{t-1}}{P_{t-2}}\right)^{\gamma_w}W_{t-1}\left(i\right)\right)^{-\frac{1}{\lambda_{w,t}}}\right]^{-\lambda_{w,t}}$$

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3.3 Firms

There exist only two firms in the domestic economy, i.e. perfectly competitive final-good firms and monopolistically competitive intermediate-good firms (henceforth; IGFs) indexed by $f \epsilon [0,1]$, in addition, to the domestic retail importers.

3.3.1 Intermediate Goods Firms

Here, a continuum of IGFs in the domestic economy is assumed such that; each firm is producing a differentiated good $Y_t(j)$ using increasing-returns-to-scale Cobb-Douglas technology. The IGFs set prices in staggered manner as proposed by Calvo (1983). Each intermediate goods producer j maximized profit conditional upon the demand for goods from the IGFs, production technology and capital accumulation. The profit maximization solution of the intermediate good producer becomes

$$D_t^j = OCF_t - \tau_t^k \left(NOF_t \right) \qquad 4$$

Where $D_t^J(j)$ is period t dividend and OCF_t is the difference between overall revenue and expenditure

$$OCF_t = P_t Y_t - \frac{\left(1 - TSP_t W_t^{1-\alpha} \left(K_t^r \right)^\alpha \right)}{\varepsilon_t^a \alpha^\alpha \left(1 - \alpha \right)^{1-\alpha}} \qquad 5$$

In 5 $(1 - Tsp_t W_t^{1-\alpha})$ is the cost of labour plus employer's social security contributions, while τ_t^K is a tax deduction on dividend and net operating cash flow, which is defined as

$$NOCF_t = P_t Y_t - \frac{\left(1 - TSP_t W_t^{1-\alpha} + Q_t \left(K_t^r \right)^\alpha \right)}{\varepsilon_t^\alpha \alpha^\alpha \left(1 - \alpha \right)^{1-\alpha}} \qquad 6$$

In the above equation, 6 Q_t isTobin's Q.

3.3.2 Distributors

In the domestic economy, there exist a continuance of distributors for each form of final goods. Each form of final good is bought by a distinct type of customer: household demands for consumer

goods (C), firms demand for capital goods (I) while government demanded for goods (G). Distributors sell their goods at a price plus a markup over the marginal costs $P_t^f(f)$. Domestic distributors set prices in a similar fashion with domestic intermediate goods producers.

3.3.3 Domestic Retail Importers

In the domestic economy, there is a continuum of retails importers distributing differentiated goods. Importers pay the world-market price in the domestic currency for the imported goods. To set prices in local currency optimally, the retail importers must solve an optimal markup problem. Thus, a deviation from the law of one price becomes obvious. Import retailers, like the domestic producers set prices $\dot{P}_f^I(f)$ in Calvo style, in order to maximize profit. Its markup solution becomes:

$$\sum_{k=0}^{\infty} (\theta_f \beta)^k v_{t,t+k} C_{f,t+k}(j) \left[P_f,t(j) - \left(1 + u_t^f\right) \varepsilon_{t+k} P_{t+k}^* \right] = 0 \qquad 7$$

3.4 Monetary and Fiscal Authorities

3.4.1 Monetary Policy

The apex bank sets the country's interest rates according to a modified Taylor rule following (CBN, 2013) in the form of:

$$i_t = \left[\rho_i i_{t-1} + \left(1 - \rho_i\right) \right] \left(\varphi_\pi \pi + \varphi_x \ddot{x} + \varphi_e \left(e_t - e_{t-1}\right) \right) + \varepsilon_t \qquad 8$$

3.4.2 Fiscal Authority

The fiscal authority earned revenue through a VAT, labour income tax, capital income tax and social security contributions on firms' payroll $\tau_t^c, \tau_t^l \, \tau_t^k$ and f TSP_t respectively. In addition, the fiscal authority issues bonds B_t which pay debt interest outlays $(i_{t-1} - 1)B_{t-1}$. The fiscal authority spent the earned revenue on government consumption G_t, government investment G_{it} and performs lump-sum transfers to household TRG_t. Thus, the fiscal authority has the below budget constraint:

$$G_t + \frac{B_{t-1}}{P_t} + TRG_t + GI_t = C_t \tau_t^c + W_t L_t \tau_t^l + \tau_t^k r_t^k Z_t K_{t-1} + r_t^k \frac{D_t}{P_t} + \frac{1}{R_t} \frac{B_t}{P_t} \qquad 9$$

Based on the above budget constraint the following fiscal rules are adopted from (Iwata, 2009)

$$\widehat{\tau}_t^c = \rho_{tc} \widehat{\tau}_{t-1} + \left(1 - \rho_{tc}\right) \varphi_{tc} \left(\widehat{b}_{t-1} - \widehat{Y}_{t-1}\right) + \eta_t^{tc} \qquad 10$$

$$\widehat{\tau}_t^l = \rho_{tl} \widehat{\tau}_{t-1} + \left(1 - \rho_{tl}\right) \varphi_{tl} \left(\widehat{b}_{t-1} - \widehat{Y}_{t-1}\right) + \eta_t^{tl} \qquad 11$$

$$\widehat{\tau}_t^k = \rho_{tk} \widehat{\tau}_{t-1} + \left(1 - \rho_{tk}\right) \varphi_{tk} \left(\widehat{b}_{t-1} - \widehat{Y}_{t-1}\right) + \eta_t^{tk} \qquad 12$$

$$\widehat{G}_t = \rho_g \widehat{G}_{t-1} + \left(1 - \rho_g\right) \phi_{gy} \widehat{Y}_{t-1} + \eta_t^g \qquad 13$$

$$\widehat{GI}_t = \rho_{gi} \widehat{GI}_{t-1} + \left(1 - \rho_{gi}\right) \phi_{gi} \widehat{Y}_{t-1} + \eta_t^i \qquad 14$$

$$\widehat{TRG}_t = \rho_{trg} \widehat{TRG}_{t-1} + \left(1 - \rho_{trg}\right) \phi_{gty} \widehat{Y}_{t-1} + \eta_t^{tg} \qquad 15$$

3.5 Rest of the World

We adopted (Beltran & Draper, 2008) to model the entire world economy as a closed economy.

3.6 Calibration

Accordingly, the parameters of this model are calibrated, so as to simulate the model and then compare the welfare cost of tax rates in Nigeria. Following the tradition of NKDSGE model, parameters are adopted from the literature on the economies sharing similar structure with the Nigerian economy, or estimated from observed data for the Nigerian economy. Table 1 present the calibrated parameters of the model.

Table 1 Calibrated Parameters and Steady-state Ratios

Fiscal steady-state parameters	Parameters	Values	Source
VAT	τ_c	0.05	(FIRS)
Personal income tax	τ_l	0.24	(FIRS)
CIT	τ_k	0.30	(FIRS)

The model steady-state parameters are estimated on the Nigerian data from 2007:Q1 to 2016:Q3. We followed Iwata (2009) and Li and Spencer (2016), by taking the sample period averages, as reported in table 1. For other steady-state parameters like the inverse adjustment, capital utilization, depreciation cost, labour-output ratio, steady-state wage increment etc., we set their values to be consistent with the steady-state conditions implied by the model, as reported in Table 1.

A Bayesian approach is used in estimating the model, using pre-recession Nigerian data (2007-2016). The estimated model implies impulse response functions to the two exogenous shocks that are consistent with economic intuition.

4   Result and Discussion

4.1   Macroeconomic Impact of Tax Reform

In order to quantify the welfare cost of tax rates increase on the Nigerian economy. We implemented a set of simulation using the equations 1-15 as presented in section 2 above.

The analysis is achieved through impulse response graphs, where the impact of each policy shock on the main macroeconomic variables is analyzed in isolation. In the first scenario, the VAT burden is increased by 10 percent points (PP) while other tax rates and expenditure components are held constant. In the second scenario a 5 PP is increased to CIT burden while, other tax rates and spending components are held constant

4.2   Welfare Cost of Tax Reform in Nigeria

The models presented in section 2 allows us to assess the quantitative effects of tax reform in the form of increase in consumption or CIT burden respectively on the household's welfare. We implemented a set of simulations and formulated two scenarios. In the first scenario, the baseline VAT burden is increased by 10 percent points (PP) while other tax rates and expenditure components are held constant. In the second scenario a 5 PP is increased to CIT burden while, other tax rates and spending components are held constant. The analysis is achieved by adopting Schmitt-Grohé and Uribe (2000) welfare criteria. The welfare cost associated with a particular change in tax burden is estimated by the fraction of non-stochastic steady-state consumption that household will sacrifice in order to remain indifferent between the corresponding constant sequences of consumption $(c_t - hc_{t-1})$ including habit formation and hours $l_{t.}$. In addition to the equilibrium stochastic processes for these variables associated with the reform (Schmitt-Grohé & Uribe, 2000). Therefore, the welfare cost of the tax reforms is measured by ξ such that:

$$u\big((1-\xi)c,h\big) = E\big[u(c,h)\big]$$

(16)

In equation 16, *E* denotes the unconditional mathematical expectation and the equation implies that a positive ξ indicate that tax reform is costly while a negative ξ indicates that the tax reform is beneficial. Second order Taylor expansion is used in approximating ξ with respect to $(\ln c_t, \ln h_t)$, while $\text{Eln}\left(\frac{y}{t}\right) = 0$ for all $y_t = c_t, h_t$ is also an approximation. ξ is given as

$$\xi = 1 - \left[1 + \frac{(1-\sigma)^2}{2} \text{var}(\hat{x}_t)\right]^{\frac{1}{v(1-\sigma)}}$$

(17)

Where

$$\hat{x}_t = c_t^v (1-h_t)^{1-v}$$

Where: σ and v are preference parameter respectively. While $Var(\widehat{x_t})$ denotes the log-deviation from the nonstochastic steady state of the unconditional variance of x_t.

The welfare costs of the tax reform simulated in this paper are presented in Table 2. The result of the above exercise reveals that an increase in the VAT burden appears to be welfare superior compared to the increase in CIT burden. The household is willing to give up around 24 percent of their non-stochastic steady-state consumption to ensure that tax reform in the form of an increase in the VAT burden is implemented. Tax reform in the form of an increase in CIT burden takes away private agents incentive to invest in new or existing venture, because it erodes profit. Consequently, high unemployment, low consumption, low output and fall in standard of living

Table 2

Forms of tax reforms	Welfare cost
Increase in VAT	12.0341
Increase in Company Income Tax	24.1901

Source: Authors' calculation

5   SUMMARY AND CONCLUSION

In this paper, we have shown that in recessive economy, increase in tax rates whether company direct or indirect is costly and increase in these tax rates has different welfare implications. In this study we simulate two scenarios; first scenario, a 10 percent points are added to the baseline value of the VAT rate, while in the second scenario a 5 percent points are added to the baseline value of the CIT rate. With these modifications to the baseline model, we then simulate the models and obtained the welfare cost of each scenario.

The main findings of this study are as follows:

Firstly, increases in tax rates in a recessionary economy is costly. Secondly, the increase in the VAT appears to be welfare superior compared to the increase in CIT burden, this is evident in Bhattarai et al. (2019). Thirdly, increase in CIT burden removes the incentive to invest in new or existing venture because it erodes profit. To conclude, we compare the welfare cost of each scenario and draw our conclusion based on those values.

Increase in CIT burden is welfare inferior, because it takes away the incentive for private investors to invest in either new or existing venture. Consequently, unemployment becomes high which leads to low consumption and translate to low output and ultimately fall in living standards.

The implication of this finding is that the Nigerian tax reform in the form of an increase in VAT rate and allowing other tax rates unchanged is the right policy direction, because it is welfare superior to other alternative.

Declarations of competing interest: none

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