The Macroeconomic Effect of Minimum Wage Increase in Nigeria: A DSGE Approach

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Abstract

The minimum wage is an economic policy tool aimed at raising the earning of low-income households with the ultimate objective to improve the living standard of these group of workers. Nigeria, has over time, enacted four national minimum wage acts. The most recent is the Minimum Wage Repeal and Enactment Act 2019 which has increased the minimum payment to workers from N18, 000 to N30, 000, representing a surge of about 66.67 per cent. Upon implementation of this new bill, it is expected to have varying macroeconomic effects ranging from wage effects, employment effects, distributional effects, welfare effects and price effects among others. This study, therefore examines the macroeconomic effects of the four episodes of the minimum wage increase in Nigeria by calibrating and log-linearising a New Keynesian Dynamic Stochastic General Equilibrium (DSGE) model that is extended to include labour heterogeneity. The study found that minimum wage increase does not improve household welfare and living standard neither does it have any positive growth effect. Furthermore, it strains government finances. The implication of the finding is that minimum wage policy should

be complemented with other pro-poor and inclusive development policies in order to improve the quality of life for the poor and vulnerable low income workers.

1. Introduction

The minimum wage can be referred to as a legally binding order by the government to employers to pay a certain least amount as wages to employees. Since 1981, there have been four changes to the Nigerian minimum wage. The most recent change in the minimum wage came up in early 2019 with the Federal Government of Nigeria approving a 66.67 percent increase to N30,000 from the N18,000 minimum wage set in 2011[1]. The National Labour Congress (NLC) has been the major advocates for an increase in the minimum wage in Nigeria citing the need to boost the living standard of the people.

From the literature, the existing empirical and theoretical studies present mixed evidence and predictions of the impact of an increased minimum wage. Moreover, the empirical literature shows that minimum wage has varying macroeconomic effects ranging from wage effects (Wong, 2019); employment effects (Baducco and Janiak, 2018); distributional effects (Neumark, 2006); welfare effects (Gorostiaga and Rubio-Ramirez, 2007); price effects (Folawewo, 2007) among others. On one hand, an increase in the minimum wage is expected to enhance the standard of living of the people; and also, positively affect the productivity of employees, increase consumption spending and aggregate demand in an economy (Cuong, 2011). On the other hand, evidence subsists that an increase in the minimum wage might not itself deduce any welfare increase to workers, especially when firms attempt to hedge cost by reducing non-cash components (labour employment) or even respond by increasing the price of their goods and services. The aggregate effect of the behaviour of the firms could inadvertently lead to an increase in both the unemployment and inflation rate (Antonova, 2018).

Against this background, this study asks the pertinent questions: First, what has been the effect of the previous minimum wage increases on macroeconomic variables such as output, inflation, welfare and wages in Nigeria?; Second, what will be the macroeconomic effect of the proposed N30000 minimum wage? From these questions, the objectives of this study are to (1) empirically

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[1] Details can be found in the stylized facts section of the paper.

measure the macroeconomic effect of the previous minimum wage regimes and, (2) simulate the effect of the new minimum wage in Nigeria using a Dynamic Stochastic General Equilibrium (DSGE) approach. This study is relevant given the dynamic labour market in Nigeria, with over 92 percent of the households outside the regulated labour market[2] and the volatile macroeconomic arrangement, it becomes expedient to assess the resulting macroeconomic outlook following the proposed minimum wage increase. The rest of the paper is as structured as follows: Following the introductory section 1, Section 2, stylized facts on the on minimum wage are presented. The Dynamic Stochastic General Equilibrium model and its calibration is specified in section 3. In sections 4 and 5, the results that is, impulse response function, policy experiments and its discussions are presented while in section 6 conclusions are made.

2. Stylised Facts

The Minimum Wage Trend and Inflation Dynamics in Nigeria

There have been three minimum wages changes from 1981 to 2018 in Nigeria, with the exception of the 2019 change which is yet to be implemented by the Federal Government. The provision of the National Minimum Wage Act of 1981 obligated employees to pay ₦125 as the lowest amount to employees. In 2000, the Act was amended and the minimum wage was increased to ₦5500, and by the 2011 it was adjusted to ₦18,000. These changes indicate that the nominal minimum wage increased by 4300 percent in 2000, while in 2011, the minimum wage rose by 227 percent.
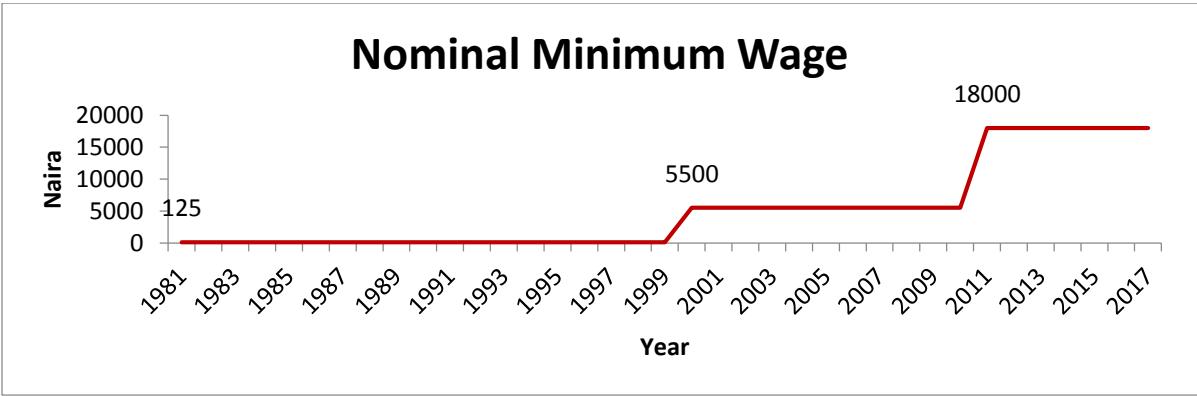

Figure 1: Minimum Wage Trend in Nigeria

Source: National Minimum Wage Act 1981, 2001 and 2011

However, while the minimum wage in Nigeria appreciated by 227 percent from 2011 to 2018, there was a decline in the real minimum wage of Nigerians due to the effect of inflation. Inflation is measured by changes in the consumer price index (CPI) and it is used to determine the average change over time in the prices of goods and services consumed by individuals. Table 1 presents the real minimum wage of Nigerian adjusted for using 2010 CPI and it shows that year-on-year, there was a decrease in the actual value of the minimum wage earned by the least paid Nigerian. Although, it also shows that the least paid Nigerian at the minimum wage is better-off in 2018 than in 2010 because his real income increased from ₦5,500 in 2010 to ₦6,555.59 in 2018 (19.19% increase).

Table 1: Real Minimum Wage (2010 Base Year) and Inflation in Nigeria

Year	CPI	Nominal Minimum Wage (₦)	Real Minimum Wage (₦' 2010 base year)
2010	100	5,500	5,500.00
2011	110.84	18,000	16,239.62
2012	124.38	18,000	14,471.52
2013	134.92	18,000	13,340.78
2014	145.80	18,000	12,345.43
2015	158.94	18,000	11,325.11
2016	183.85	18,000	9,790.43
2017	214.23	18,000	8,402.10
2018	274.57	18,000	6,555.59

Source: CPI obtained from World Bank, Real Minimum Wage are based on Researchers' Estimate

However, conducting a 5-year analysis on the real minimum wage earned by the least paid Nigerian (adjusting nominal wage using 2014 CPI), it can be seen that an individual being paid a minimum wage of ₦18,000 in 2018, has seen a decline in purchasing power or real income by about 46.90 percent from 2014 to 2018. The trend analysis on the real minimum wage using 2014 as the base year actually reveals a falling purchasing power year-on-year for the least paid Nigerian from 2015 to 2018 due to increased inflationary pressure on the economy as Nigerian experienced an economic recession in 2016/2017.

Table 2: Real Minimum Wage (2010 Base Year) and Inflation in Nigeria

Year	CPI	Nominal Minimum Wage (₦)	Real Minimum Wage (₦' 2014 base year)

2014	145.80	18,000.00	18,000.00
2015	158.94	18,000.00	16,512.34
2016	183.85	18,000.00	14,274.73
2017	214.23	18,000.00	12,250.51
2018	274.57	18,000.00	9,558.24

Source: Researchers' Estimate

3. DSGE Model

3.1.1 Household

The household comprises of two representative agents: fraction γ, which represents the skilled household that has access to financial assets and can adjust consumption intertemporally and another fraction $1 - \gamma$, representing the unskilled household that does not have access to financial assets and consume all of their disposable income.

The Skilled Household

The skilled household has attained a high educational level and behaves in the manner of the Ricardian household. The representative household is assumed to choose consumption and provides skilled labour. The household maximises his lifetime utility function given as:

$$U(C_t, N_t) = E_t \sum_{t=0}^{\infty} \beta^t \left[\frac{C_{s,t}^{1-\sigma}}{1-\sigma} - \Gamma_t^s \frac{N_{s,t}^{1+\varphi^s}}{1+\varphi^s} \right] \tag{1}$$

Where β and σ represents the discount factor indicative of the choice of the household overtime and the inverse elasticity of substitution for consumption while Γ_t^s denote the disutility parameter for offering labour services. Parameter φ^s represents the inverse labour supply elasticity for providing skilled services. The skilled household is also assumed to form habit in its consumption pattern such that: $C_{s,t} = hC_{s,t-1}$ where h denotes the habit formation parameter.

The budget constraint of the household is defined by the wages received from labour ($W_t^s N_{s,t}^s$), W_t^{minw} denotes a minimum wage, the returns from capital investment ($r_t^k K_t$), firm profit (Π_t), transfer payment from the government (TP_t) and the dividends from government bond (B_t). This is represented as follows:

$$P_t C_t + P_t I_t + E_t(Q_{t,t+1} B_{t+1}) = (1 - \tau_h)(W_t^s N_{s,t}^s) + r_t^k K_t + \Pi_t + B_t + TP_t \tag{2}$$

Capital accumulation is assumed to follows the low of motion process:

$$k_{t+1} = (1 - \delta)k_t + I_t \tag{3}$$

The Unskilled Household

The unskilled household is assumed to have attained a low educational level and behaves like the Non-Ricardian household where all of their income is spent. The representative unskilled household has a similar utility function to the skilled household. However, the difference is that they have no access to financial markets, and they provide unskilled labour. The utility function is given as:

$$U(C_t, N_t) = E_t \sum_{t=0}^{\infty} \beta^t \left[\frac{\bar{C}_{u,t}^{1-\sigma}}{1-\sigma} - \Gamma_t^u \frac{N_{u,t}^{1+\varphi^u}}{1+\varphi^u} \right] \tag{4}$$

And the budget constraint is such the unskilled individual spends all his income after tax on consumption of goods. This is represented as:

$$P_t C_t = (1 - \tau_h)\left(W_t^u N_{u,t}^u\right) \tag{5}$$

Household Labour Supply Decision

A proportion of the household (ω) provides skilled labour and the other $(1 - \omega)$ offers unskilled labour to the firms. Therefore, the aggregate labour supply expressed as a Constant Elasticity of Substitution (CES) index is given as:

$$N_t = [\omega^{-\kappa}(N_t^s)^{1+\kappa} + (1 - \omega)^{-\kappa}(N_t^u)^{1+\kappa}]^{\frac{1}{1+\kappa}} \tag{6}$$

Minimum Wage

The government dictates the amount of wage that can be given to unskilled labour, such that:

$$W_t^u = W_t^{minw} \tag{7}$$

Where W_t^{minw} denotes a minimum wage. The choice of the household is to supply more unskilled labour that is demanded at the minimum wage, thereby allowing the firms to dictate how much unskilled labour they require. The real minimum wage process is adaped from Antonova (2018) as:

$$\left(W_t^{minw}\right) - \left(W_{ss}{}^{minw}\right) = \rho_w\left(\left(W_{t-1}^{minw}\right) - \left(W_{ss}{}^{minw}\right)\right) + \rho_{\pi w}(\pi_t) - (\pi_{ss}) + \varepsilon_w \tag{8}$$

Where ε_w denotes an exogenous shock assumed to be normally distributed. $\rho_{\pi w}$ is assumed to be less than zero which allows for an inverse relationship between real wage and inflation. The assumption is based on the assertion that the government does not perfectly index the nominal wage to inflation in each period. Consequently, the nominal minimum wage does not reflect living standards in the economy.

3.1.2 Firms

There is a representative intermediate good producing firm that operates in a monopolistic competitive market and uses capital and both skilled and unskilled labour as inputs in its production process given as:

$$Y_t = A_t K_t^\alpha (N_t^u)^\gamma (N_t^s)^{1-\alpha-\gamma} \tag{9}$$

Where A_t indicates total factor productivity, N_t^u , N_t^s represent the unskilled labour and skilled labour input while K_t denotes the capital input of the firm.

Equation (9) is log-linearised as:

$$y_t = a_t + \alpha k_t + \gamma(n_t^u) + (1 - \alpha - \gamma)(n_t^s) \tag{10}$$

a_t is assumed to follow an AR(1) process, such that:

$$a_t = \rho_a a_{t-1} + \varepsilon_t^a \tag{11}$$

Where the technological shock to production is represented by ε_t^a. The aggregate output produced is measured as an index of output represented by:

$$Y_t = \left[\int_0^1 Y_t^{\frac{\varepsilon-1}{\varepsilon}} dj\right]^{\frac{\varepsilon}{\varepsilon-1}} \tag{12}$$

The firm's optimisation is in two stages: minimising cost given its output level and the second stage is determining the optimal price for its good. The cost function of the firm is given as:

$$Min\ C_t = \frac{W_t^u N_t^u}{P_t} + \frac{W_t^s N_t^s}{P_t} + \frac{r_t^k K_t}{P_t} \tag{13}$$

The real wages and real rent on capital are denoted by $w_t^u n_t^u$, $w_t^s n_t^s$ and $r_t^k k_t$, respectively. The price setting process of the firm is based on the Calvo (1983) staggered price-setting principle. It is assumed that a fraction $1 - \theta$ of firms can set a new optimal price in each period. The remaining fractions do not change their price. The representative firm adjust their price (P_t^*) based on the profit maximisation process as shown as:

$$\pi = Max \; E_t \sum_{k=0}^{\infty} \theta^k \; E_t \left[Q_{t,t+k} Y_{t+k} (P_t^* - MC_{t+k}) \right] \tag{14}$$

Subject to the firm's demand function for their goods:

$$Y_{t+k} = \left(\frac{P_t^*}{P_{t+k}} \right)^{-\varepsilon} Y_{t+k} \tag{15}$$

3.1.3 Monetary Authority

We follow the standard practice in the literature by assuming the Central Bank of Nigeria adopts an interest rate policy based on the Taylor (1993) rule asserting that central banks adjust the nominal interest rate to respond to deviations in inflation and output from their targets. The Taylor rule function is given as follows:

$$\frac{R_t}{R} = \left[\frac{R_{t-1}}{R} \right]^{\rho_R} \left[\left(\frac{Y_t}{Y} \right)^{\upsilon_Y} \left(\frac{\pi_t}{\pi} \right)^{\upsilon_\pi} \right]^{1-\rho_R} \varepsilon_t^R \tag{16}$$

Where R_t and R_{t-1} represent both the nominal and lagged interest rate, respectively, Y_t, π_t and E_t denote output and inflation rate respectively. ε_t^R indicates innovation to monetary policy.

Log-linearising equation (16) gives:

$$r_t = \rho_r r_{t-1} + (1 - \rho_r) \left[\upsilon_y y_t + \upsilon_\pi \pi_t \right] + \varepsilon_t^r \tag{17}$$

Where υ_y and υ_π are the parameters reflecting the responsiveness of CBN to output gap and inflation. The degree of interest rate smoothing is represented by ρ_r.

3.1.4 Government

The Federal Government of Nigeria is assumed to issue bonds and consume final goods (G_t through the use of distortionary income taxes. Therefore, budget constraint for the government is defined as:

$$G_t + \frac{B_{t-1}}{P_t} = \tau_t^n (W_t^{minm} N_{u,t}^u + W_t^s N_{s,t}^s) + \frac{B_t}{P_t} \tag{18}$$

Where τ_t^n denotes the labour income tax. Furthermore, government spending is assumed to adjust to the state of the economy such that:

$$g_t = \rho_g y_t + \varepsilon_t^g \tag{19}$$

3.1.5 Market Clearing Conditions

The market clearing condition for the domestic economy requires that aggregate output equals aggregate domestic consumption, investment and government spending such that:

$$Y_t = C_t + I_t + G_t \tag{20}$$

3.1.6 Aggregation

Total consumption: $c_t = \omega c_{s,t} + (1 - \omega) c_{s,t}$ (21)

Total labour supply: $n_t = \omega n_{s,t} + (1 - \omega) n_{s,t}$ (22)

3.2 Parameter Calibration

The parameters values used in this study are calibrated based on existing long trend data, values reported in existing studies and the researchers' subjective belief as informed by the literature. Structural parameters such as inverse elasticity of substitution (σ), capital depreciation rate (Δ), habit formation (h), calvo price setting (θ) are set to be 2.00, 0.025, 0.70 and 0.75 as obtained from Tule, Iklaga and Yusuf (2018) in their study on the Nigerian economy. The inverse elasticity of labour supply (φ) is calibrated as 4.38 based on Cebi (2011). The parameter value of the income tax rate (τ) is fixed at 0.24 reflecting the value of the personal income tax rate as stipulated by the Federal Inland Revenue Service for period between 2011 and 2018. The share of capital in firm's output (α), is fixed as 0.37 according to the mean value of the capital-output ratio series for Nigeria over the annual period from 1981-2017. The share of unskilled labour (ω), is calibrated as 0.80 to match the International Labour Organisation (2018) estimate of the proportion of informal employment to total employment in Nigeria. The share of skilled labour in output (γ) is calculated as (1-parameter value of (ω))*(1- parameter value of (α)) to be 0.14. The autocorrelation parameter on minimum wage (ρ_w) and the response of inflation to

changes in minimum wage ($\rho_{\pi w}$) are set by regression estimation of equation (8) using annual data from 1981 to 2017. It is fixed as 0.94 and -0.22 respectively. Monetary policy parameters including the reaction of inflation (v_π) and output (v_y) to deviations in the interest rate are fixed as 1.5 and 0.5 as obtained from Adegboye (2015). The AR(1) parameter on interest rate (ρ_r) and the response of output to government (ρ_y) is obtained by regression estimates and takes the values of 0.8 and 1.23 respectively. The AR(1) parameter on technology (ρ_A) is derived from Tule, Iklaga and Yusuf (2018) at 0.85. The shock parameters on technology, minimum wage, government spending and interest rate are chosen at 0.04 to match the model's moment to the moment of actual macroeconomic data series for Nigeria over the annual period of 1981 to 2017. The calibrated parameter values are listed in Table 3.

Table 3: Calibrated values

Symbol	Description	Parameter value
sigma (σ)	Inverse elasticity of substitution	2.00
delta (δ)	Depreciation rate	0.025
phi (φ)	Inverse elasticity of labour supply	4.38
Theta (θ)	calvo price setting	0.75
(h)	habit formation	0.70
Tau (τ)	income tax rate	0.24
Alpha(α)	share of capital in firm's output	0.37
gama (γ)	share of skilled labour in output	0.14
Omega (ω)	share of unskilled labour	0.80
rrho_w (ρ_w)	autocorrelation parameter on minimum wage	0.94
rrho_πw ($\rho_{\pi w}$)	response of inflation to changes in minimum wage	-0.22
upsilon_π(v_π)	reaction of inflation to deviations in the interest rate	1.50
upsilon_y(v_y)	reaction of output to deviations in the interest rate	0.50
rrho_r (ρ_r)	AR(1) parameter on interest rate	0.80
rrho_y (ρ_y)	response of output to government spending	1.23
rrho_A (ρ_A)	Persistent parameter in Technology	0.85
eps_A	Technology shock	0.1
eps_w	Minimum wage shock	0.1
eps_r	Interest rate shock	0.1
eps_g	Government spending shock	0.1

4. Results: Model Fit and Dynamics

4.1 Model Fit

The DSGE model specified in this study is solved by log-linearisation that involves a first order approximation of the model's equilibrium conditions as it deviates from the steady state. Table 4 presents the theoretical moments of the DSGE model and the actual moments based on annual time series over the period 1981-2017 for some selected macroeconomic variables. It is necessary for the theoretical moments to closely (although inexactly) match actual moments so that the DSGE model is validated to be a good policy workhorse to replicate the actual economy. The result in Table 4 shows that both moments are quite close. The theoretical means are all zeros as expected of a log-linearised model with steady state value of zero. The actual means are seen to be tending towards zero. The second moments are fairly similar.

Table 4: Theoretical versus Actual Moments

Macroeconomic variables	Theoretical Moments		Actual Moments	
	Mean	**Standard deviation**	**Mean**	**Standard deviation**
Output	0.0000	0.19	$6.92*10^{-11}$	0.17
Inflation rate	0.0000	0.43	$-2.97*10^{-9}$	0.62
Interest rate	0.0000	0.65	$5.00*10^{-10}$	0.14
Government spending	0.0000	0.27	$2.52*10^{-9}$	0.41
Total consumption	0.0000	0.07	$-2.52*10^{-10}$	0.21
Total labour	0.0000	0.11	$1.20*10^{-11}$	0.002

Source: Author's computation using Dynare

*The year 1981 is chosen since a minimum wage was first introduced in Nigeria in that year.

*Both moments are obtained by hp-filtering logged variables (lambda value=400 for annual series)

4.2 Model Dynamics: Minimum wage shock

From Figures 2(a) and (b), a one standard devaiation positive shock to minimum wage is seen to increase the wage payments to unskilled workers which also triggers them to supply more units of labour. In contrast, minimum wage increases does not raise the wage of skilled workers. Rather, the wage of skilled workers fall in response to a surge in the wage floor, yet skilled workers are still willing to supply more labour units. The explanation for the decline in the level of skilled wages in response to a positive shock in minimum wage can be linked to skilled employment. First of all, it is important to note that not every organisation is compelled to pay the minimum wage in Nigeria. The national minimum wage act in Nigeria exempts micro and

small businesses from paying the minimum wage (organisations with less than 50 employees); and also organisations engaging employees on a part-time basis. Therefore, a fall in skilled wages could be as a result of firm restructing their employment pattern in favour of contract employment (cheaper skilled labour) in order to manage their labour costs.

Evidence from statistics compiled from NBS on employment showed that the total number of those on full-time employment dropped from 55.2 million people in 2014Q4 to 51.3 million people in Q32018. On the other hand, part-time employment rose to 18.2 million people from 13.1 million people during the same period. Interestingly, the rise in unskilled wages does not translate to improved welfare as the consumption of unskilled households fall. This is, however, not surprising because of inflationary pressures. The stylised facts section has been able to show that for a person earning a minimum wage of N18000 in 2011, by 2012 the real income of the individual declined by 20% because of inflationary pressures (Table 2). This means that when the inflation rate rises above the increase in the minimum wage will lead to a decline the level of purchasing power.

In the same vein, the consumption of skilled households also fell following the reduction in the income of skilled workers. Aggregate consumption and output invariably trend downwards in response to the positive minimum wage shock This implies that increasing the minimum wage can neither serve as a good redistributive policy to improve quality of life for the poor nor does it enhance the growtb of the Nigerian economy.
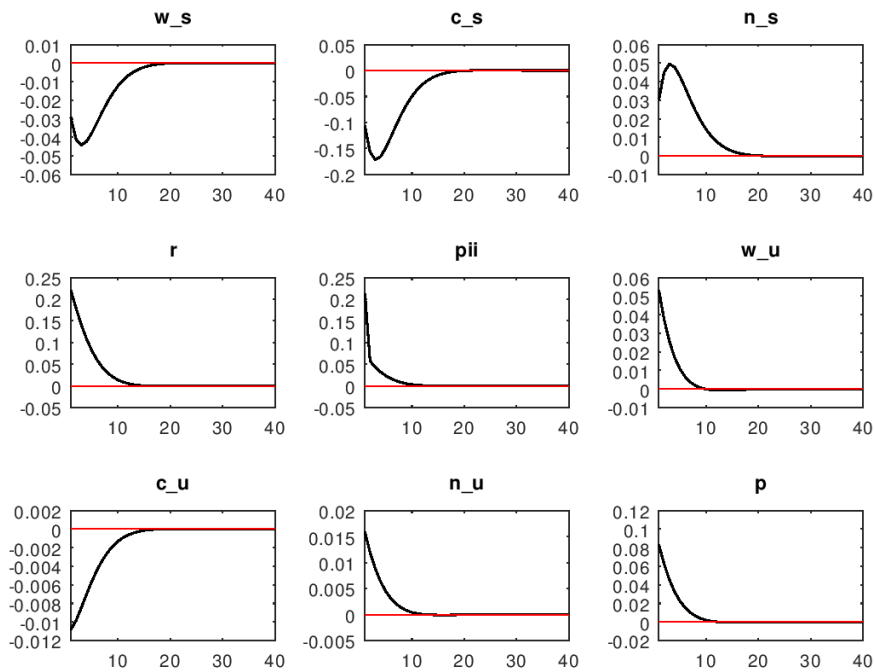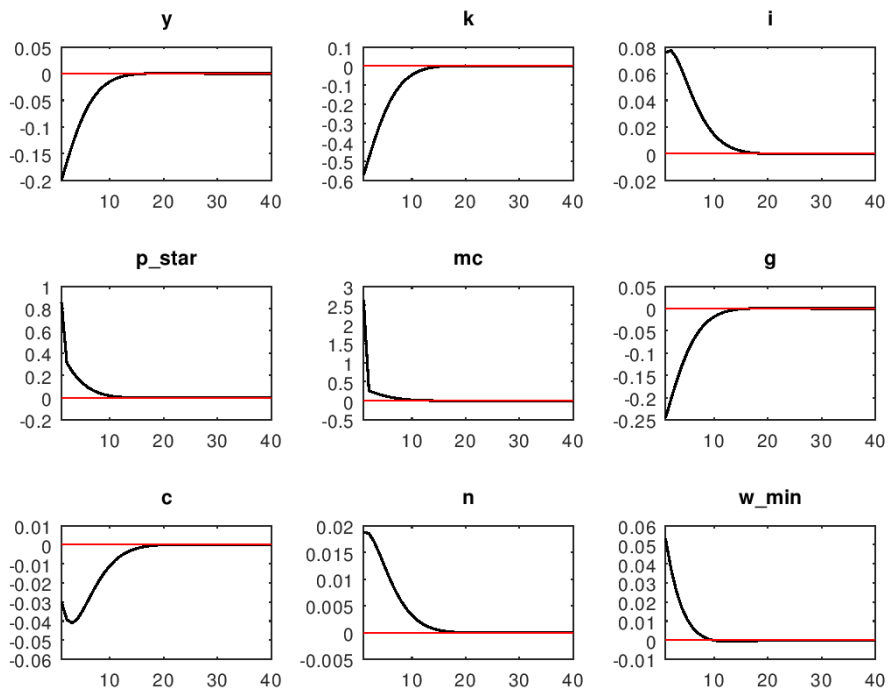
Figure 2(a): Impulse Response to Minimum wage Shock

Figure 2(b): Impulse Response to Minimum wage Shock

5. Policy Experiments

Two types of policy experiments are conducted in this section. The first experiment considers the macroeconomic impact of the magnitude of the four episodes of minimum wage increases while the second experiment considers the shock effect of changes to the minimum wage.

Experiment 1: Magnitude effect of minimum wage increase

The minimum wage Act of 1981 stipulated the minimum wage at N125. By the year 2000, it was rescaled to N5,500 and was further raised to N18,000 in 2011. Presently, a new minimum wage has been ratified at N30,000. In this policy experiment, the effect of the different minimum wage values are considered. Each wage value is fed into the model in its natural logarithmic form. This implies the corresponding minimum wage values of 4.83, 8.61, 9.79 and 10.31. Table 5(a) reports the average value of selected macroeconomic variables over the different minimum wage regimes. A key feature is that the average value of these variables have persistently increased in response to successive wage floor regimes. Table 5(b) shows the percentage change in the mean values relative to the minimum wage introduced in 2019. The result reveals that the impact of the N30,000 minimum wage on the Nigerian economy is over 100% greater compared to the impact of the 1981 minimum wage. Furthermore, compared to the economic effect of the wage floor fixed in 2000 and 2011, the 2019 minimum wage will exert only about 19% and 5% better economic outcomes. This implies that the 2019 minimum wage price at N30,000 which is over 66.67% higher than the 2011 price of N18,000 has only 5% higher benefits on the Nigerian economy relative to the impact of the 2011 minimum wage which can be attributed to the minimum wage not being indexed to inflationary levels in the economy. The difference between the impact of the 2011 and 2019 minimum wage is quite small stemming from the need to improve the living standards of poor and unskilled Nigerians. This meagre benefit is, moreover, vulnerable to being eroded away in the face of uncertainty and other shocks that have not been accounted for in this study.

Table 5(a): Theoretical mean at different minimum wage regimes in Nigeria

Macroeconomic variables	1981 Min_wage= (ln(125))	2000 Min_wage= (ln(5,500))	2011 Min_wage= (ln(18,000))	2019 Min_wage= (ln(30,000))
	Mean	Mean	Mean	Mean
Skilled wage	0.9098	1.6218	1.8441	1.9420
Skilled consumption	-6.6048	-11.7738	-13.3874	-14.0985
Skilled labour	2.4998	4.4562	5.0669	5.3360
Inflation rate	-1.3173	-2.3482	-2.6700	-2.8118
unskilled wage	0.9263	1.6512	1.8775	1.9772
unskilled consumption	0.4097	0.7303	0.8304	0.8745
unskilled labour	0.0693	0.1235	0.1405	0.1479
Output	3.4249	6.1053	6.9420	7.3107
Government spending	4.2126	7.5095	8.5387	8.9922
Total consumption	-0.9932	-1.7705	-2.0131	-2.1201
Total labour	0.5554	0.9901	1.1257	1.1855

Source: Author's computation using Dynare

Table 5(b): % change in mean relative to 2019 minimum wage

Macroeconomic variables	Min_wage= 4.83 (ln(125))	Min_wage= 8.61 (ln(5,500))	Min_wage= 9.79 (ln(18,000))	Min_wage= 10.31 (ln(30,000))
Skilled wage	113.4535	19.74349	5.308823	100
Skilled consumption	113.4584	19.74469	5.311711	100
Skilled labour	113.4571	19.74328	5.31094	100
unskilled wage	113.4518	19.74278	5.310861	100
unskilled consumption	113.4518	19.74278	5.310861	100
unskilled labour	113.4514	19.74322	5.310253	100
Output	113.4489	19.74531	5.310694	100
Government spending	113.4199	19.75709	5.266904	100
Total consumption	113.4573	19.7435	5.31115	100
Total labour	113.4596	19.74432	5.311113	100

Source: Author's computation using Dynare

Experiment 2: Shock effect of minimum wage increase

This policy experiment reports the response of Nigeria's macroeconomy to shocks implied by the introduction or change in the minimum wage. The shocks corresponding to the introduction of the Minimum Wage Act of 1981, 2000, 2011 and 2019 is estimated by regressing minimum wage on its lagged value and on inflation (as specified in equation 8) using cyclical annual data series from 1980 to 2019. Upon estimation, the residual values for year 1981, 2000, 2011 and 2019 was computed and used to approximate the size of the various shocks emanating from the introduction or change in the minimum wage since 1981. Table 6 shows that the Nigerian economy was most perturbed by the minimum wage shock of the legislative Act of year 2000. The minimum wage announcement of 2019 is seen to have the least volatile effect on the Nigerian economy. It may be due to the fact that Nigerian households and firms had expected it to be enacted into law in the wake of President Buhari's effort to implement populist policy that would have guaranteed his re-election.

Table 6: Size of minimum wage shock

Year	Shock size
1981	1.22%
2000	2.30%
2011	0.64%
2019	0.13%

Table 7 shows that raising the minimum wage to N30,000, that is the 2019 shock has a negative impact of -0.1 percentage points on skilled wage . This stems from decision of employers to restructure their employment pattern as previously discussed and supported by data compiled from the NBS. It corroborates with existing theoretical prediction that legislating wage increase often triggers unemployment as workers are laid off in order for firms to absorb the higher overhead cost (Sabia, 2015). The consumption spending of skilled workers also decline in response to a rise in minimum wage which could be linked to the view that firms restructure employment in favour of cheaper labour (contract employment), hence causing loss of skilled employment and wages. In contrast, skilled individuals are seen to be willing to supply more

labour, thereby creating a situation of excess supply of skilled workers over the demand by employers which therefore causes skilled wages to further trend downwards. Furthermore, inflation rises by 0.8% point in response to an increase in the 2019 minimum wage because prices of goods and services usually trend upwards as the wage floor rises in order for firms to boost their declining profit margin. Wages of low-income workers rise by 0.2% point in response to a positive minimum wage shock but the increased earning fails to translate to a rise in the consumption spending of unskilled household. This indicates that their purchasing power following the minimum wage rise have been eroded by inflation. The aggregate consumption of both skilled and unskilled household dipped which indicates that demand for firms' output declines and stalls domestic production. This invariably causes aggregate output to drop by -0.7% point in response to the 2019 minimum wage. From the fiscal angle, the minimum wage shock impacts negatively on government finance since government is a major employer of labour, the wage rise increases its overhead cost which can pressure government finances.

Table 7: Impulse Response of macroeconomic variables to the different minimum wage shocks (on impact)

Variable	1981 shock	2000 shock	2011 shock	2019 shock
Skilled wage	-0.35	-0.4	-0.25	-0.1
Skilled consumption	-1.25	-1.5	-0.75	-0.4
Skilled labour	0.35	0.5	0.25	0.11
Inflation rate	2.5	3	1.5	0.8
unskilled wage	0.6	0.8	0.4	0.2
unskilled consumption	-0.12	-0.15	-0.08	-0.04
unskilled labour	0.75	0.25	0.125	0.055
Output	-2	-3	-1.5	-0.7
Government spending	-2.5	-3.5	-2	-0.8
Aggregate consumption	-0.35	-0.5	-0.25	-0.11
Total labour	0.2	0.3	0.15	0.07

Source: Author's computation using Dynare

6. Conclusion

This study examined the macroeconomic effect of the four episodes of the minimum wage increase in Nigeria by calibrating a Dynamic Stochastic General Equilibrium model. The DSGE model was initially fitted to the Nigerian economy such that it can replicate the actual

macroeconomic statistics of Nigeria. Thereafter, the impulse responses of the economy to an arbitrary minimum wage shock size that fits Nigerian economic features was obtained. The impulse responses graphs showed that the minimum wage shocks impacted negatively on the consumption of both unskilled and skilled household and on aggregate economic output suggesting that the minimum wage policy is not an effective redistributive or growth-enhancing policy for Nigeria.

Two policy experiments investigating the magnitude and shock effect of minimum wage increase were conducted. The result of the magnitude experiment revealed that the 2019 minimum wage price at N30,000 which is over 66.67% higher than the 2011 wage price of N18,000 has only 5% higher impact on the Nigerian economy relative to the impact of the 2011 minimum wage. This difference is quite small stemming from the need to improve the living standards of poor Nigerians and signals that the N30,000 minimum wage price is insufficient. The shock experiment shows that while the Nigerian economy was most perturbed by the minimum wage shock of the legislative Act of year 2000. The minimum wage announcement of 2019 is seen to have the least volatile effect on the Nigerian economy. Furthermore, in line with model fitted to the Nigerian economy, the 2019 minimum wage shock does not improve household welfare and living standards neither does it have any positive outcome effect. Furthermore, it strains government finances.

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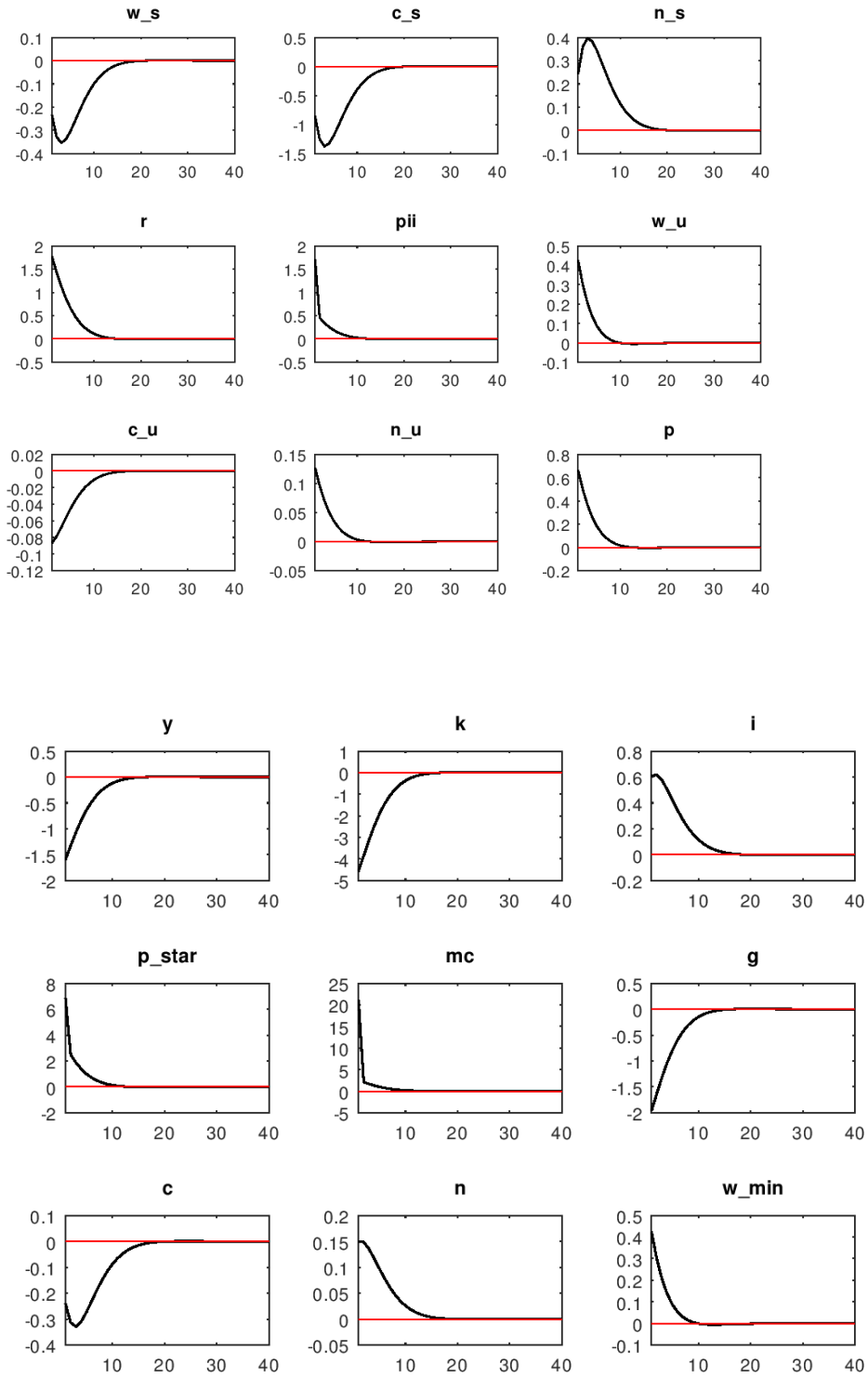
Appendix 1:

Impulse Response of macroeconomic variables to minimum wage shock in 1981

w_s   c_s   n_s

r   pii   w_u

c_u   n_u   p

y   k   i

p_star   mc   g

c   n   w_min
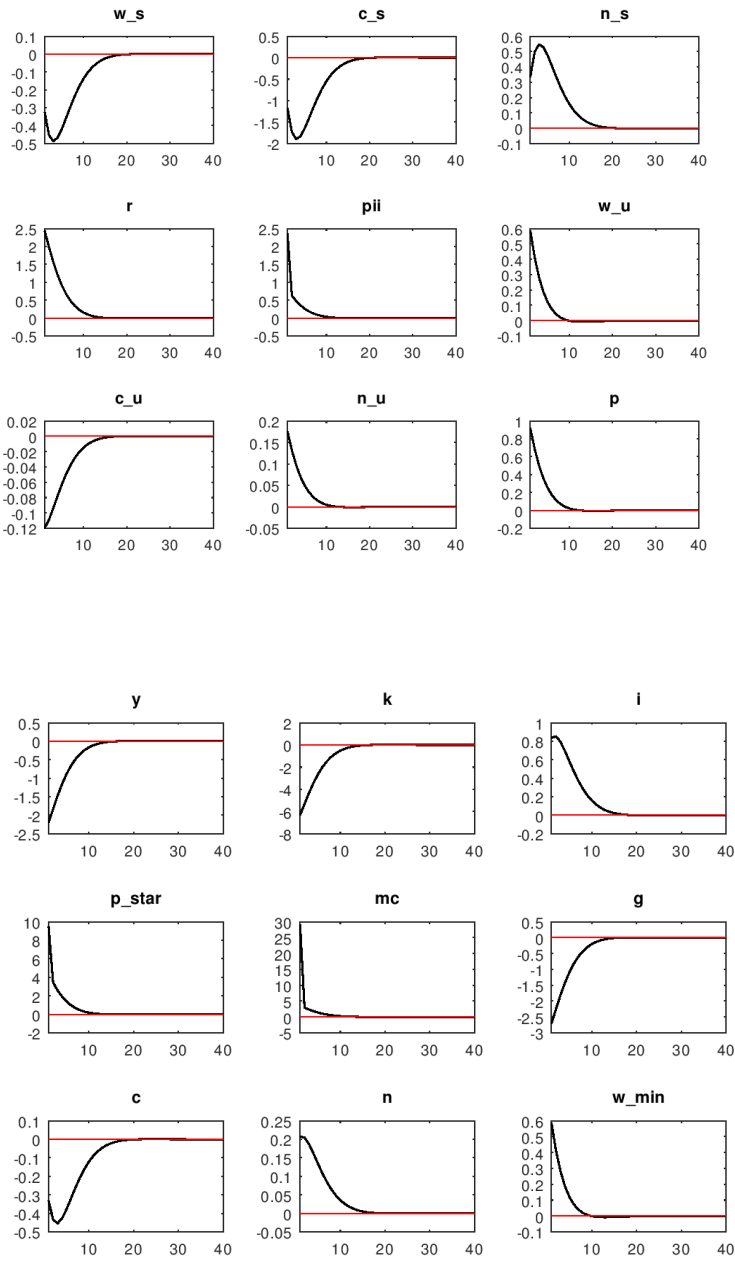
Impulse Response of macroeconomic variables to minimum wage shock in 2000
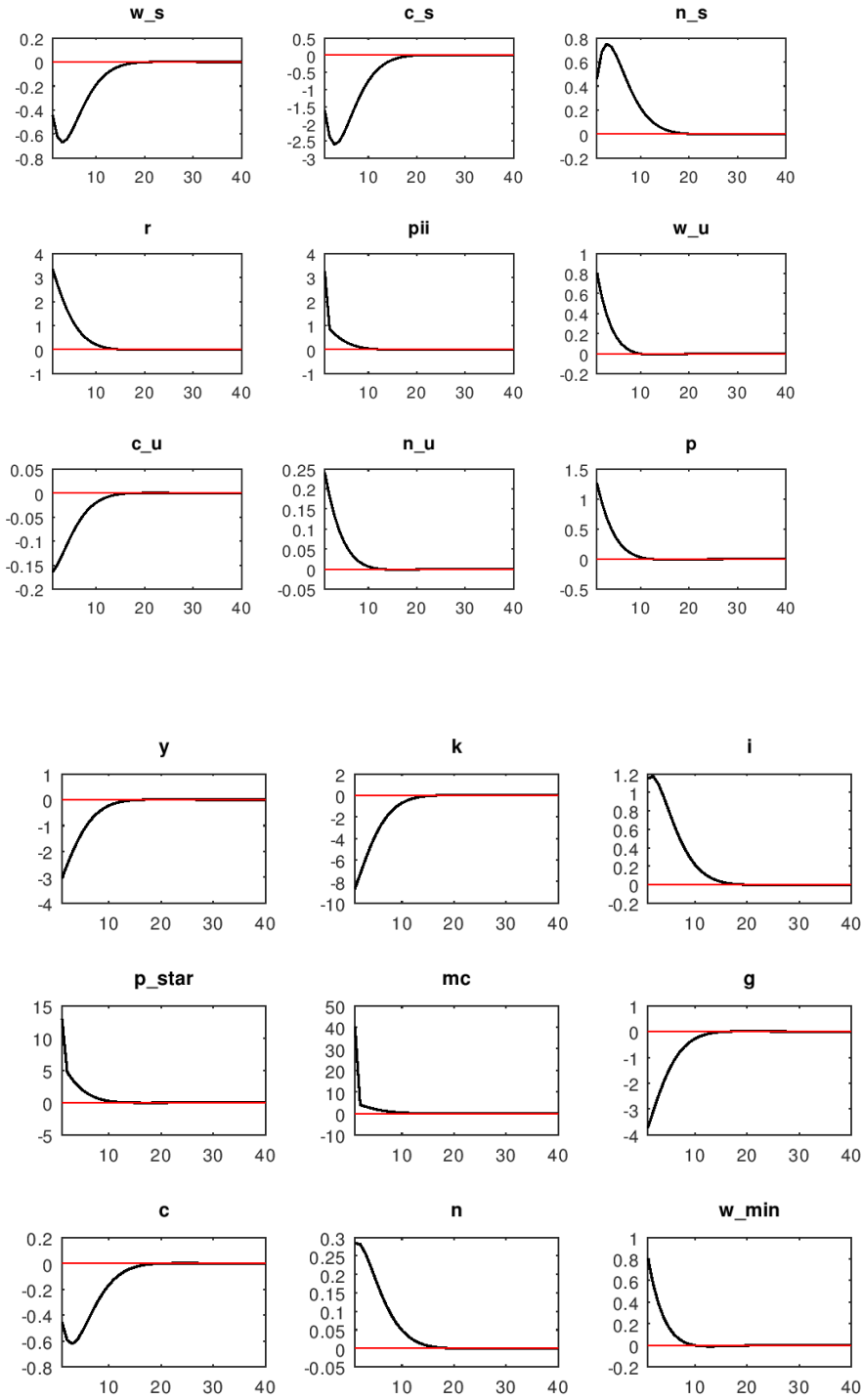
Impulse Response of macroeconomic variables to minimum wage shocks in 2011

Impulse Response of macroeconomic variables to minimum wage shocks in 2019